

A REVISION OF THE SERRANID FISHES
OF THE SUBGENUS *MIROLABRICHTHYS* (ANTHIINAE: *ANTHIAS*),
WITH DESCRIPTIONS OF FIVE NEW SPECIES¹

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ABSTRACT. The Indo-Pacific subgenus *Mirolabrichthys* of the serranid fish genus *Anthias* is characterized chiefly by the thickened front part of the upper lip of the male, which is usually pointed and movable. The subgenus is represented by 11 colorful species: *tuka* (Herre and Montalban) from the Philippines, Indonesia, Great Barrier Reef, Papua New Guinea, Solomons, and Palau; the closely related *pascalus* (Jordan and Tanaka) from the Ryukyus and Oceania; *evansi* Smith from the Indian Ocean; *dispar* (Herre) from the central and western Pacific; *bicolor* Randall from Hawaii to Réunion; *lori* Lubbock and Randall from the central and western Pacific; *parvirostris* from the Solomons and Philippines; *smithvanizi* from the western Pacific and Cocos-Keeling Islands; *ignitus* (related to *dispar*) from the Maldives; *bartlettorum* from the Marshalls; and *regalis* from the Marquesas. The last five species are described as new. The most important characters to distinguish these fishes are the number of dorsal, anal, and pectoral rays, the number of lateral-line and circumpeduncular scales, the number of opercular spines (two or three), the presence or absence of prominent papillae on the posterior margin of the orbit, the relative length of dorsal spines (certain spines may be prolonged, especially in males), the presence or absence of scales on the mandible, and color. Most species exhibit sexual dichromatism.

INTRODUCTION

The small colorful seabasses generally classified in the Indo-Pacific genus *Mirolabrichthys* Herre and Montalban (subfamily Anthiinae, family Serranidae) are more abundant than the few records in the literature would indicate. They are among our loveliest of fishes, displaying colors of pink, red, orange, yellow, and violet in various combinations. They often occur in dense aggregations on coral reefs, typically in areas of clear water at escarpments. They feed on zooplankton above the bottom but retire to shelter within the reef at the approach of predaceous fishes. Because of their small size and their immunity from capture by ordinary commercial methods such as trawls and seines, they have no value as food fishes. However, with the development in recent years of the marine aquarium fish trade, these fishes have become economically important. A great need exists to revise the classification of this group, particularly to describe five new species collected by the authors and diving associates.

In his synopsis of the nominal Indo-Pacific serranid fishes of the genus *Anthias*, Heemstra (1973) included the three known species of the related genus *Mirolabrichthys*: *M. dispar* Herre from the Solomon Islands, *M. evansi* (Smith) from Kenya, Aldabra, and the Seychelles, and *M. tuka* Herre and Montalban.

He divided *M. tuka* into two subspecies: *M. tuka tuka* from the Philippine Islands, East Indies, and Solomon Islands, and *M. tuka pascalus* from the Ryukyu Islands, Caroline Islands, and Gilbert Islands. He separated the two on the basis of higher though overlapping pectoral-ray and lateral-line scale counts of *M. pascalus*. He wrote, "In view of the apparent allopatric distribution of these two forms, it seems best to recognize them as subspecies until additional field work is done to confirm these distributions and secure further information on fresh coloration." Whitley (1964) also preferred to treat *M. tuka* and *M. pascalus* as subspecies. The senior author, however, has collected both *M. tuka* and *M. pascalus* in the Palau Islands—on one occasion from the same rotenone station. Thus we conclude that these two forms are closely related species, not subspecies.

Mirolabrichthys has been separated from *Anthias* principally by two characters: the front of the upper lip of the male is developed into a fleshy protuberance, which juts anterior to the lower jaw, and the members of the genus possess two instead of three opercular spines. However, all five new species, *Anthias* (*Mirolabrichthys*) *bicolor* Randall, and *Anthias* (*Mirolabrichthys*) *lori* Lubbock and Randall, have a third opercular spine at the upper end of the gill opening (though, for most, it is obtuse and not well developed). This leaves only the hypertrophied anterior part of the upper lip of the male as a generic character. In aggregations of these fishes, the males are few in number compared to females. They are probably all the result of sex reversal, if we may extrapolate what is known of *Sacura margaritacea* (Hilgendorf) (Okada 1965), *Anthias squamipinnis* (Peters) (Fishelson 1970; Popper and Fishelson 1973), and *Mirolabrichthys pascalus* (Jordan and Tanaka) (Katayama 1974). When collections are made proportional to the percentages of the sexes (as by rotenone), relatively few males are taken, which means that most of the fishes would not be identified as belonging to the genus *Mirolabrichthys*. Furthermore, though one of our new species (*A. parvirostris*) generally resembles the smaller *Mirolabrichthys*, the male has only a slightly thickened upper lip without any pointed protuberance. This fish is so intermediate to typical *Mirolabrichthys* and some *Anthias*

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that it is difficult to decide into which genus to place it. Under the circumstances, it would seem best to regard *Mirolabrichthys* as a subgenus of *Anthias*.

A question still remains: whether the genus *Anthias* should be restricted to the eastern Atlantic and Mediterranean species *Anthias anthias* (Linnaeus) or whether the name should continue to be applied broadly to many Indo-Pacific species. If the genus is restricted to the eastern Atlantic species, the majority of the Indo-Pacific fishes now placed in *Anthias* should be shifted to *Pseudanthias* Bleeker. Phillip C. Heemstra and the senior author are presently trying to clarify this generic problem.

Males of the monotypic genus *Nemanthias* Smith (1954) also have a thickened, somewhat pointed upper lip, but this taxon is here provisionally recognized as distinct from *Mirolabrichthys* in its possession of 11 dorsal spines and prolonged first two dorsal spines. Probably it should also be classified as a subgenus of *Anthias*.

METHODS AND MATERIALS

Standard length (SL) is the straight-line distance from the front of the upper lip to the base of the caudal fin (posterior end of hypural plate). The depth of the body is the maximum depth from the base of the dorsal spines; width of body is measured just posterior to the gill opening. Head length is taken from the front of the upper lip to the most posterior point of the opercular flap; snout length is measured from the front of the upper lip to the fleshy edge of the orbit. Orbit diameter is the greatest fleshy diameter of the orbit, but the interorbital width is the least bony width. The depth of the caudal peduncle is the least depth; the length of the peduncle is the horizontal distance from the rear base of the anal fin to the base of the caudal fin. Fin spine and ray measurements are taken to the extreme bases. Pectoral and pelvic fin lengths are the lengths of the longest rays. The caudal concavity is the horizontal distance between verticals at the distal tips of the longest and shortest rays. The last dorsal and anal rays, though usually divided to the base, are counted as one ray. Pectoral ray counts include the upper rudimentary ray. Gillraker counts include all rudiments.

Type specimens of the new species have been deposited variously in the following institutions: Academy of Natural Sciences of Philadelphia (ANSP); Australian Museum, Sydney (AMS); Bernice P. Bishop Museum, Honolulu (BPBM); British Museum (Natural History), London [BM(NH)]; California Academy of Sciences, San Francisco (CAS; SU); Natural History Museum, Los Angeles County (LACM); Muséum National d'Histoire Naturelle, Paris (MNHN); U.S. National Museum of Natural History, Washington, D.C. (USNM); and Western Australian Museum, Perth (WAM).

Data in parentheses in the descriptions of new species apply to paratypes. Table 1 is a comparison of the principal external characters used to distinguish the species of *Anthias* of the subgenus *Mirolabrichthys*. Tables 2 to 4 present the meristic data of these fishes, Table 7 gives proportional measurements of *Anthias lori*, and the remaining tables give the proportional mea-

surements of the new species. More measurements are given in the last six tables than are summarized in the text.

SYSTEMATICS

Genus *Anthias* Subgenus *Mirolabrichthys*

Mirolabrichthys Herre and Montalban in Herre 1927, p. 413 (type species, *Mirolabrichthys tuka* Herre and Montalban, by monotypy).

Entonanthias Jordan and Tanaka 1927, p. 385 (type species, *Entonanthias pascalus* Jordan and Tanaka, by monotypy).⁴

DIAGNOSIS. Dorsal rays X, 15–18; anal rays III, 7 or 8; branched caudal rays 13; lateral line in a smooth curve following contour of back, the pored scales 21–36; body moderately elongate, the depth 2.56–4.03 in SL; upper lip of males thickened anteriorly, and pointed (except *A. parvirostris*); patch of villiform teeth on vomer roundish to quadrangular; two or three opercular spines; first dorsal spine never prolonged (but second and/or third spines may be elongate); pelvic fins of males often extending posterior to origin of anal fin.

DESCRIPTION. Dorsal rays X, 15 to 18; anal rays III, 7 or 8; pectoral rays 15 to 22, generally the upper two and often the lowermost unbranched, pelvic rays 1, 5; principal caudal rays 15 (upper and lower unbranched); lateral-line scales 41 to 64; circumpeduncular scales 21 to 36; gill rakers 8–12 + 20–29, usually longer than gill filaments; branchiostegal rays 7; vertebrae 26 (rarely 25); predorsal bones 1–3.

Body moderately elongate, the depth 2.56 to 4.03 in SL, and moderately compressed, the width 1.56 to 2.54 in depth; head length 2.81 to 3.7 in SL; snout 3.1 to 5.59 in head, the upper lip thickened anteriorly in males, with a pointed proboscis-like protuberance (except in *A. parvirostris*), which is freely movable dorsoventrally; diameter of orbit 2.87 to 5.3 in head; margin of posterior half of orbit of some species with prominent fleshy papillae; interorbital space convex, the bony width 3.2 to 4.67 in head; least depth of caudal peduncle 1.92 to 2.93 in head.

Mouth terminal, becoming inferior in males with development of the proboscis at front of upper lip; mouth oblique and moderately large, the maxilla reaching beyond a vertical at center of eye (but rarely posterior to eye); no supplemental maxillary bone (supramaxilla). A band of villiform teeth in jaws, broader anteriorly, the outer row the largest (may be of canine proportions), often inclined forward except anteriorly; a stout canine tooth anteriorly on each side of jaws, those on lower jaw projecting forward and outward; an incurved canine tooth on outer side of lower jaw about one-third distance from front of jaw; villiform teeth in a roundish to quadrangular patch on vomer and in a band on palatines. Tongue pointed, without teeth. Anterior nostril in a membranous tube (higher dorsoposteriorly); posterior nostril large, with little or no rim.

4. Myers (1929) has shown that the name *Mirolabrichthys* has priority over *Entonanthias* by a scant margin of 3 months in publication time.

Gill membranes free from isthmus. Opercle with two or three spines (when a third spine is present, at upper position, it is usually obtuse and indistinct); upper margin of preopercle and often the rounded corner serrate; no serrae or spines on lower margin of preopercle; subopercle and interopercle not serrate.

Scales ctenoid; auxiliary scales present or absent; mandibles scaled or naked; snout fully scaled or with a naked zone anterior to eye that may include nostrils in its upper part; dorsal and anal fins naked or scaled basally; caudal fin with small scales

more than three-fourths distance to posterior margin; pectoral fins with small scales on basal one-fourth to one-third. Lateral line complete, running in a smooth curve following contour of back, the last pored scale usually ending slightly anterior to base of hypural.

Origin of dorsal fin varying from just posterior to upper margin of preopercle to over pectoral base; certain dorsal spines may be prolonged, particularly in males, but never the first; no marked indentation between spinous and soft portions of dorsal

Table 1. Comparison of distinguishing external characters of species of the genus *Anthias*, subgenus *Mirolabrichthys*.

| Species | Auxiliary scales | Mandibles | Lateral-line scales | Circumpeduncular scales | Papillae on posterior margin of orbit | Pectoral fin rays | Opercular spines | Prolonged dorsal spines of males |
|------------------------|------------------|-----------|---------------------|-------------------------|---------------------------------------|-------------------|------------------|----------------------------------|
| <i>A. evansi</i> | present | scaled | 47-50 | 26-28 | absent | 16-18 | 2 | none |
| <i>A. parvirostris</i> | absent | scaled | 41-44 | 21-24 | present | 17 | 3 | none |
| <i>A. tuka</i> | present | scaled | 45-49 | 23-26 | present | 15-17 | 2 | none |
| <i>A. pascalus</i> | present | scaled | 48-52 | 25-27 | present | 16-19 | 2 | none |
| <i>A. smithvanizi</i> | absent | scaled | 44-48 | 23-25 | present | 16-17 (18)* | 3 | 3rd |
| <i>A. lori</i> | absent | scaled | 49-52 | 25-28 | present | (16) 17-18 | 3 | 3rd |
| <i>A. dispar</i> | absent | scaled | 55-63 | 32-35 | absent | (18) 19-20 | 2 | none |
| <i>A. ignitus</i> | absent | scaled | 53-58 | 29-33 | absent? | (19) 20 | 3 | none |
| <i>A. bicolor</i> | absent | naked | 57-64 | 31-33 | absent | 19-20 (21) | 3 | 2nd & 3rd** |
| <i>A. bartlettorum</i> | absent | naked | 54-58 | 29-32 | absent | (20) 21 | 3 | 2nd |
| <i>A. regalis</i> | absent | naked | 56-62 | 32-36 | absent | 21 (22) | 3 | 2nd*** |

*() = rarely

**third prolonged in females as well as males

***also prolonged in females, though less than in males

Table 2. Fin-ray counts of species of *Anthias*, subgenus *Mirolabrichthys*.

| | Dorsal Soft Rays | | | | Anal Soft Rays | | Pectoral Rays | | | | | | | |
|------------------------|------------------|----|----|----|----------------|----|---------------|----|----|----|----|----|----|------|
| | 15 | 16 | 17 | 18 | 7 | 8 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| <i>A. evansi</i> | | 4 | 18 | 5 | | 27 | | 5 | 20 | 2 | | | | |
| <i>A. parvirostris</i> | 1 | 10 | | | | 11 | | | 11 | | | | | |
| <i>A. tuka</i> | 2 | 27 | 1 | | | 29 | 1 | 3 | 21 | 6 | | | | |
| <i>A. pascalus</i> | 2 | 29 | 3 | | | 33 | 1 | | 3 | 9 | 19 | 3 | | |
| <i>A. smithvanizi</i> | 2 | 22 | 1 | | | 24 | 1 | | 10 | 14 | 1 | | | |
| <i>A. lori</i> | | 16 | 1 | | | 16 | 1 | | 1 | 10 | 6 | | | |
| <i>A. dispar</i> | | 3 | 25 | 2 | | 29 | 1 | | | | 1 | 11 | 18 | |
| <i>A. ignitus</i> | | 5 | 3 | | | 8 | | | | | | 1 | 7 | |
| <i>A. bicolor</i> | | 1 | 22 | 6 | | 27 | 2 | | | | | 10 | 18 | 1 |
| <i>A. bartlettorum</i> | | | 8 | 1 | | 9 | | | | | | | 1 | 8 |
| <i>A. regalis</i> | | | 15 | 3 | | 18 | | | | | | | | 15 3 |

fin; fourth anal ray may be prolonged on some species; caudal fin lunate, the lobes often filamentous; pectoral fins rounded to slightly pointed, usually not extending posterior to a vertical at origin of anal fin; pelvic fins generally longer in males than females, principally as a result of prolongation of the second ray (pelvics often extend beyond spinous portion of anal fin).

**KEY TO THE
SPECIES OF ANTHIAS OF THE
SUBGENUS MIROLABRICHTHYS**

- 1a. Lateral-line scales 41 to 52; pectoral rays 15 to 19 (rarely 19) 2
- 1b. Lateral-line scales 53–64; pectoral rays 18 to 22 (rarely 18 or 19) 7
- 2a. A series of prominent papillae along edge of posterior half of orbit; anal soft rays 7 (rarely 8); color not as in 2b .. 3
- 2b. No papillae along posterior margin of orbit; anal soft rays 8; violet to fuchsia with yellow dots, the back above a demarcation from dorsal fin origin to midbase of caudal fin bright yellow; dorsal and caudal fins largely yellow (Indian Ocean) *evansi*
- 3a. Fourth to tenth dorsal spines longest; two or three opercular spines 4
- 3b. Third dorsal spine the longest; three opercular spines... 6
- 4a. Teeth along sides of jaws relatively small (except for canine in lower jaw) and not inclined forward; two opercular spines; auxiliary scales present; lateral-line scales 45 to 52; snout moderately long, 3.2 to 3.8 in head; caudal fin entirely violet or with yellow lobes 5
- 4b. Teeth along sides of jaws relatively large and inclined forward (except anteriorly); lateral-line scales 41 to 44; three opercular spines (though uppermost obtuse and indistinct); no auxiliary scales; snout short, 4.6 to 5.6 in head; caudal fin yellow, the upper and lower margins violet (Solomon Islands and Philippines).... *parvirostris* new species
- 5a. Lateral-line scales 45 to 49 (rarely 49); pectoral rays 15 to 17 (usually 16); females with a band of bright yellow on back, and caudal lobes broadly yellow (Melanesia, Great Barrier Reef, Indonesia, Philippines, and Palau Islands) ..
..... *tuka*
- 5b. Lateral-line scales 48 to 52 (rarely 48); pectoral rays 16 to 19 (usually 18); no yellow band on back, and no yellow on caudal fin (Ryukyu Islands, Japan, and Oceania)
..... *pascalus*
- 6a. Lateral-line scales 44 to 48; depth of body 3.1 to 3.35 in SL; pink with yellow dots on upper two-thirds of body, shading ventrally to light lavender; a narrow band of yellow on back at base of dorsal fin (Western Pacific and Cocos-Keeling Islands, Indian Ocean)
..... *smithvanizi* new species
- 6b. Lateral-line scales 49 to 52; depth of body 3.35 to 4.05 in SL; salmon pink shading to pinkish white ventrally, with a row of subquadrangular red blotches along body beneath dorsal fin (except anteriorly) and a broad horizontal red band nearly covering upper half of caudal peduncle and

extending slightly anterior to it (Central and Western Pacific) *lori*

- 7a. No dorsal spines greatly prolonged (second dorsal spine of males of *A. dispar* may be slightly elongate); two or three opercular spines; dorsal fin primarily red 8
- 7b. Second and/or third dorsal spines of adults greatly prolonged; three opercular spines (though uppermost usually obtuse); dorsal fin not primarily red 9
- 8a. Dorsal soft rays usually 17; opercular spines 2; lateral-line scales 55 to 63 (modally 60); circumpeduncular scales 32 to 35; two irregular rows of small teeth on palatine at widest place (Central and Western Pacific) *dispar*
- 8b. Dorsal soft rays usually 16; opercular spine 3; lateral-line scales 53 to 58; circumpeduncular scales 29 to 33; three to six irregular rows of palatine teeth at widest place (Maldive Islands) *ignitus* new species
- 9a. Second anal spine slightly longer than third; second and third dorsal spines prolonged in adults (the third the longest, but the two spines nearly equal on males, with yellow membranous tips); maximum number of preopercular serrae 36 (serrae increasing generally with size); maximum standard length at least 111 mm (Indo-Pacific).... *bicolor*
- 9b. Third anal spine longer than second; second dorsal spine prolonged in adults; maximum number of preopercular serrae 24; maximum standard length about 65 mm 10
- 10a. Lateral-line scales 54 to 58; circumpeduncular scales 29 to 32; three to five irregular rows of small teeth on palatines at widest place; pelvic fins of large males moderately elongate, reaching posteriorly just to soft portion of anal fin; back and caudal fin yellow, side and ventral part of head and body abruptly violet (Marshall Islands)
..... *bartlettorum* new species
- 10b. Lateral-line scales 56 to 62, circumpeduncular scales 32 to 36; two irregular rows of small teeth on palatines at widest place; pelvic fins of large males very elongate, reaching posteriorly to rear base of anal fin; females orange-yellow, shading to red posteriorly; males violet, the upper postorbital head and nape yellow (Marquesas Islands) *regalis* new species

Anthias evansi
Figure 1, Tables 1–4

Anthias evansi Smith 1954, p. 1, fig. 1 (type locality, Shimoni, Kenya); Smith 1955, p. 342 (Aldabra, islands of the Cosmoledo Group, Seychelles); Smith 1961, p. 363, pl. 35A; Smith and Smith 1963, p. 18, pl. 58A.

Mirolabrichthys evansi Heemstra 1973, p. 207, fig. 3 (top); Burgess and Axelrod 1973b, pp. 648, 651, figs. 113, 114, 117 (Mombasa and Maldive Islands).

DIAGNOSIS. Dorsal soft rays 16 to 18 (usually 17); anal soft rays 8, pectoral rays 16 to 18 (usually 17); lateral-line scales 47 to 50 [Heemstra (1973) recorded 2 of 24 *A. evansi* with 47]; circumpeduncular scales 26 to 28; auxiliary scales present; mandibles scaled; snout fully scaled except for a zone running diagonally downward in front of anterior nostril; teeth along

sides of jaws relatively small (smaller only in *A. tuka* and *A. pascalus*) and not oblique; gill rakers 9-10 + 22-26; three predorsal bones; no papillae on margin of orbit; two opercular spines; origin of dorsal fin over pectoral base; fourth dorsal spine usually longest (but not prolonged); snout length 3.9 to 4.4 in head length; depth of body 3.1 to 3.4 in SL; dorsal and anal fins scaled basally; adult males with second pelvic ray, fourth and fifth anal rays, and tenth to thirteenth dorsal rays prolonged.

Back yellow above a demarcation from origin of dorsal fin to lower caudal base, violet to heliotrope below with scattered yellow dots; an orange band from snout through lower part of

eye to pectoral base; caudal fin yellow; dorsal fin yellow except for small posterior portion and margin, which are violet; remaining fins pale violet.

REMARKS. *A. evansi* is known only from the Indian Ocean. Smith (1954) based his description of the species on six specimens, 82 to 113 mm total length from Kenya (including the holotype from Shimoni, his largest specimen, 87 mm SL) and Pemba, Mozambique.

We have collected *A. evansi* from the Maldives, Réunion, and Mauritius (two from the stomach of a 310-mm specimen of *Aphareus furcatus*). We have examined two lots of specimens from the Cocos-Keeling Islands at the Academy of

Table 3. Lateral-line scales of species of *Anthias*, subgenus *Mirolabrichthys*.

| | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 |
|------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| <i>A. evansi</i> | | | | | | | | 7 | 12 | 8 | | | | | | | | | | | | | | |
| <i>A. parvirostris</i> | 3 | 3 | 3 | 1 | | | | | | | | | | | | | | | | | | | | |
| <i>A. tuka</i> | | | | | 3 | 8 | 10 | 7 | 2 | | | | | | | | | | | | | | | |
| <i>A. pascalus</i> | | | | | | | | 1 | 7 | 14 | 9 | 3 | | | | | | | | | | | | |
| <i>A. smithvanizi</i> | | | | 1 | 5 | 6 | 7 | 6 | | | | | | | | | | | | | | | | |
| <i>A. lori</i> | | | | | | | | | 1 | 3 | 5 | 6 | | | | | | | | | | | | |
| <i>A. dispar</i> | | | | | | | | | | | | | | | 1 | 1 | 2 | 5 | 6 | 8 | 3 | 2 | 1 | |
| <i>A. ignitus</i> | | | | | | | | | | | | | 1 | 1 | 1 | 2 | 2 | 1 | | | | | | |
| <i>A. bicolor</i> | | | | | | | | | | | | | | | | | 2 | 5 | 4 | 7 | 6 | 2 | 2 | 1 |
| <i>A. bartlettorum</i> | | | | | | | | | | | | | | 5 | 1 | 1 | | 2 | | | | | | |
| <i>A. regalis</i> | | | | | | | | | | | | | | | | 1 | 5 | 1 | 4 | 2 | 1 | 1 | | |

Table 4. Gill-raker counts of species of *Anthias*, subgenus *Mirolabrichthys*.

| | Upper Limb | | | | | Lower Limb | | | | | | | | | |
|------------------------|------------|----|----|----|----|------------|----|----|----|----|----|----|----|----|----|
| | 8 | 9 | 10 | 11 | 12 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 |
| <i>A. evansi</i> | | 14 | 13 | | | | | | 2 | 9 | 9 | 6 | 1 | | |
| <i>A. parvirostris</i> | 1 | 5 | 4 | 1 | | | | | 3 | 4 | 4 | | | | |
| <i>A. tuka</i> | 2 | 22 | 6 | | | | | | 5 | 10 | 9 | 5 | 1 | | |
| <i>A. pascalus</i> | | 6 | 22 | 6 | | | | | 2 | 7 | 15 | 6 | 4 | | |
| <i>A. smithvanizi</i> | 16 | 9 | | | | 2 | 4 | 10 | 8 | 1 | | | | | |
| <i>A. lori</i> | 13 | 4 | | | | | 2 | 6 | 7 | 2 | | | | | |
| <i>A. dispar</i> | | 2 | 16 | 10 | 2 | | | | 1 | 10 | 10 | 8 | 1 | | |
| <i>A. ignitus</i> | | | | 6 | 2 | | | | 2 | 1 | 4 | 1 | | | |
| <i>A. bicolor</i> | | | | 13 | 16 | | | | | | | 6 | 15 | 7 | 1 |
| <i>A. bartlettorum</i> | | | 4 | 4 | | | | | 1 | 5 | 1 | 1 | | | |
| <i>A. regalis</i> | | | 3 | 12 | 3 | | | | | 1 | 7 | 8 | 1 | 1 | |

Natural Sciences of Philadelphia collected by William F. Smith-Vaniz and associates and one lot from the Seychelles collected by James E. Böhlke and associates. The depth range for all of these specimens was 4 to 30 m. The largest, BPBM 20007, 93 mm SL, is from Réunion.

Anthias parvirostris new species

Figures 2A and B, Tables 1–5

HOLOTYPE. BPBM 15605, male, 48.3 mm SL, SOLOMON ISLANDS, Alite Reef (off Malaita), outer reef slope on west side, bottom mainly rubble, 60 m, dynamite and rotenone, J.E. Randall, W.A. Starck, II, B. Goldman, and W. Doak, 24 July 1973.

PARATYPES. BPBM 20448, 6: 23.3–36.1 mm SL; BM(NH) 1976.9.30.10, 35.8 mm SL; CAS 37886, 29.7 mm SL; LACM 35904-1, 27.4 mm SL; USNM 216490, 39.9 mm SL, SOLOMON ISLANDS, collected with holotype; BM(NH) 1979.1.3.1, 58.9 mm SL, PHILIPPINE ISLANDS, Palawan, 0.5 km N of Tagtuan R., isolated coral on sand, 35 m, R. Lubbock, 17 August 1978.

DIAGNOSIS. Dorsal soft rays 15 or 16 (rarely 15); pectoral rays 17; lateral-line scales 41 to 44; circumpeduncular scales 21 to 24; no auxiliary scales; mandibles scaled; gill rakers 8–11 + 22–24; side of jaws with a row of moderate canine teeth; about five rows of teeth on palatines at widest place; posterior edge of orbit with fleshy papillae; three opercular spines; snout short, 4.6 to 5.6 in head; body depth 2.8 to 3.0 in SL; soft dorsal and anal fins scaled over basal half to quarter; colors of fresh specimens as in Figure 2.

DESCRIPTION. Dorsal rays X, 16 (15 or 16, only one fish with 15); anal rays III, 7; pectoral rays 17 (upper two and lower unbranched); pelvic rays 1, 5; principal caudal rays 15 (upper and lower unbranched); lateral-line scales 43 (41–44); scales above lateral line to origin of dorsal fin 5 (4–5); scales below lateral line to origin of anal fin 15 (14–15); circumpeduncular scales 23 (21–24); gill rakers 10 + 23 (8–11 + 22–24); branchiostegal rays 7; vertebrae 26; predorsal bones 2.

Body somewhat elongate, the depth 3.02 (2.79–2.89) in SL; body moderately compressed, the width 1.99 (1.89–2.13) in depth; head length 3.10 (2.86–2.98) in SL; snout 4.61 (4.60–5.59) in head; front of upper lip of male holotype barely thickened; diameter of orbit 3.63 (2.99–3.48) in head; posterior edge of orbit with fleshy papillae (13–16 in holotype); interorbital space convex, the bony width 3.99 (4.29–4.67) in head; least depth of caudal peduncle 2.29 (2.17–2.35) in head.

Mouth oblique and moderately large, the maxilla reaching to, or posterior to, a vertical at rear edge of pupil; mouth terminal; posterior end of maxilla rounded, its greatest depth 1.43 in orbit of holotype; no supplemental maxillary bone. Upper jaw with a band of villiform teeth, the band broader anteriorly, the teeth at the front enlarged; one (rarely two) large curved canine anteriorly on each side of upper jaw; an outer row of enlarged teeth (15 to 17 on holotype) on side of jaw, inclined forward; lower jaw with a patch of villiform teeth anteriorly, the front ones slightly enlarged; two large curved canine teeth on each side of lower jaw (one laterally at front of jaw, angled outward,

and the other about one-third back in jaw, curved slightly posterior); a row of moderate canines (17 on holotype) on side of jaw posterior to second large canine, inclined forward; vomer with very small teeth; palatines with a band of villiform teeth in approximately five irregular rows at broadest place; tongue pointed, the upper surface with scattered very small papillae. Gill membranes free from isthmus. Gill rakers slender and long (largest 1.48 in orbit of holotype), notably longer than gill filaments (longest gill filament of first arch of holotype 1.45 in longest raker).

Opercle with three flattened spines, the central one the largest and most posterior, the upper just anterior to lower (two lower spines acute, the upper obtuse and rather indistinct); distance between two lower spines about seven-eighths the distance between central and upper spines; lower margin of preopercle smooth, the rounded corner and upper margin serrate (25 serrae on holotype).

Anterior nostril in a short membranous tube (higher dorso-posteriorly) directly anterior to middle of eye about half the distance from edge of orbit to edge of groove separating upper lip from rest of snout; posterior nostril diagonally upward and posterior to anterior nostril, with a low rim anteriorly, and rather large, the greatest diameter of opening about half the distance between nostrils, 10.75 in orbit of holotype.

Scales ctenoid; no auxiliary scales on body; head scaled except throat and gill membranes, lips, extreme front of snout, and a broad zone on side of snout anterior to center of eye that includes nostrils in its upper part; dorsal fin scaled basally from third spine onwards, the scales covering basal half of center of fin, posteriorly covering basal quarter of fin; basal third to quarter of anal fin scaled; caudal fin with small scales more than three-fourths distance to posterior margin; pectoral fins with small scales on basal third or more of fin; pelvic fins with small scales on medial surface.

Lateral line a smooth curve following contour of back, the last pored scale slightly anterior to, or just beyond, end of hypural plate. Some pores of cephalic lateralis system obscured by scales. Prominent are a pore in front of anterior nostril, one between nostrils, one medial to nostrils, two close together in interorbital space above front of eye, a series near edge of orbit around posterior half of eye, about eleven scattered pores between upper margin of opercle and posterior margin of eye, four on suborbital and preorbital region anterior to a vertical through center of eye (two nearest vertical very close together, large, about half greatest diameter of posterior nostril), and six in a mandibular series beginning at end of lower margin of preopercle (last two on chin close together).

Origin of dorsal fin just anterior to a vertical through posterior margin of opercle; no marked prolongation of dorsal spines in males or females; third dorsal spine 10.53 (10.20–11.36) in SL; longest dorsal soft ray 2.23 (2.13–2.60) in head; third anal spine 2.78 (2.97–3.38) in head; caudal fin lunate, the lobes somewhat filamentous, the caudal concavity 7.25 (5.38–6.45) in SL; pectoral fin length 3.04 (2.84–3.08) in SL; pelvic fins moderately long, 3.38 (2.96–3.16) in SL, reaching to anal fin origin in smaller specimens, and to just beyond spinous portion of anal fin in larger specimens.

Color in alcohol: pale with no dark markings. Color of male

holotype when fresh (from transparency): dorsal part of head and body yellow, that on body interspersed with numerous pinkish lavender spots on scale edges; ventral part of head and body pinkish lavender; posterior margin of operculum golden dorsally; heliotrope band from upper front of eye to base of dorsal fin, parallel to a second short broken heliotrope band running backwards from upper posterior margin of orbit; iris magenta with a yellow ring around pupil; dorsal fin heliotrope basally (except rear part of soft portion where yellow en-

croaches onto base of fin), violet distally; anal fin lavender hyaline with light lavender distal margin (except posteriorly); caudal fin yellow, a few pinkish lavender spots near base, yellowish hyaline towards concavity, with broad heliotrope upper and lower margins and magenta submarginal lines; paired fins pinkish hyaline. Color of 36.1-mm-SL female paratype (BPBM 20448) when fresh (from transparency): dorsal part of head and body yellow, the yellow on body interspersed with numerous pinkish lavender spots on scale edges; remainder of head and

Table 5. Proportional measurements of type specimens of *Anthias parvirostris* expressed as a percentage of the standard length.

| | Holotype | | Paratypes | | |
|--------------------------------|---------------|-----------------|------------------------|---------------|----------------|
| | BPBM 15605 | LACM 35904-1 | BM(NH) 1976.9.30.10 | BPBM 20448 | USNM 216490 |
| Standard length (mm) | 48.3 | 27.4 | 35.8 | 36.1 | 39.9 |
| Depth of body | 33.1 | 35.8 | 35.2 | 34.6 | 35.1 |
| Width of body | 16.6 | 16.8 | 17.0 | 18.3 | 16.5 |
| Head length | 32.3 | 35.0 | 34.1 | 34.3 | 33.6 |
| Snout length | 7.0 | 6.6 | 6.1 | 7.2 | 7.3 |
| Diameter of orbit | 8.9 | 11.7 | 9.8 | 10.5 | 10.0 |
| Bony interorbital width | 8.1 | 8.0 | 7.3 | 8.0 | 7.8 |
| Length of maxilla | 16.4 | 16.8 | 15.9 | 17.2 | 16.5 |
| Least depth of caudal peduncle | 14.1 | 15.0 | 14.5 | 15.8 | 14.8 |
| Length of caudal peduncle | 16.4 | 13.9 | 12.8 | 14.4 | 13.3 |
| Predorsal length | 33.7 | 36.5 | 34.4 | 34.1 | 35.1 |
| Preanal length | 59.4 | 64.6 | 66.8 | 65.1 | 61.9 |
| Prepelvic length | 34.2 | 35.4 | 34.9 | 36.3 | 34.8 |
| Length of first dorsal spine | 3.7 | 3.6 | 4.5 | 4.2 | 4.0 |
| Length of second dorsal spine | 6.8 | 7.7 | 6.7 | 6.6 | 7.3 |
| Length of third dorsal spine | 9.5 | 8.8 | 8.9 | 8.9 | 9.8 |
| Length of tenth dorsal spine | 11.2 | 10.2 | 10.9 | 11.4 | 11.5 |
| Length of longest dorsal ray | 14.5 | 14.2 | 13.1 | 15.5 | 15.8 |
| Length of dorsal fin base | 55.5 | 54.4 | 50.6 | 56.0 | 56.6 |
| Length of first anal spine | 5.6 | 5.1 | 5.0 | 5.0 | 6.5 |
| Length of second anal spine | 9.1 | 9.9 | 8.9 | 9.7 | 10.3 |
| Length of third anal spine | 11.6 | 10.6 | 10.1 | 11.4 | 11.3 |
| Length of longest anal ray | 18.8 | 23.4 | 22.6 | 22.7 | 22.6 |
| Length of anal fin base | 19.0 | 19.3 | 17.6 | 20.2 | 21.1 |
| Length of pectoral fin | 32.9 | 32.5 | 34.6 | 35.2 | 33.3 |
| Length of pelvic spine | 15.7 | 15.7 | 16.2 | 15.8 | 16.1 |
| Length of pelvic fin | 29.6 | 32.8 | 32.4 | 31.6 | 33.8 |
| Length of caudal fin | 36.0 | 34.3 | 39.9 | 39.6 | 40.9 |
| Caudal concavity | 22.2 | 15.7 | 24.0 | 24.1 | 24.6 |

body pink, lighter ventrally; a magenta band from upper anterior edge of orbit to just before dorsal fin base; two rather indistinct pinkish lavender bands on head running backward and diagonally upward from hind margin of orbit, fainter posteriorly; iris yellow immediately above and below pupil, otherwise magenta; dorsal fin yellow basally, becoming pink, then yellowish pink, and finally yellow near distal margin; tips of dorsal spines and distal margin of anterior part of soft dorsal fin violet; anal fin yellow with a lavender distal margin (except posteriorly); caudal fin yellow, with pinkish lavender spots near base, yellowish hyaline towards concavity, with narrow heliotrope upper and lower margins; paired fins yellowish hyaline, the pelvics with a lavender anterior margin.

REMARKS. All but one of our specimens have been taken from a single SCUBA station at 60 m off Alite Reef, Solomon Islands. The one other fish was collected off Palawan, Philippine Islands, in 35 m. *A. smithvanizi* was collected in the same Alite Reef station as the series of *A. parvirostris*.

As mentioned in the introduction, the male of this species has only a thickened anterior upper lip, lacking the pointed movable protuberance that is typical of other species of the subgenus. In this respect, it is intermediate to *Mirolabrichthys* and *Anthias* of the subgenus *Pseudanthias*.

ETYMOLOGY. Named *parvirostris* in reference to the relatively short snout.

Anthias tuka

Figures 3 and 4, Tables 1–4

Mirolabrichthys tuka Herre and Montalban in Herre 1927, p. 413 (type locality, Maricaban Island, Philippine Islands); Burgess and Axelrod 1975, pp. 1474–1475, figs. 150–153 (Solomon Islands).

Mirolabrichthys tuka tuka Heemstra 1973, p. 208, fig. 3 (lower) (Philippines, Borneo, Celebes, Moluccas, and Solomons).

DIAGNOSIS. Dorsal soft rays 15 to 17 (usually 16); anal soft rays 7 or 8 (rarely 8); pectoral rays 15 to 17 (usually 16); lateral-line scales 45 to 49; circumpeduncular scales 23 to 26; auxiliary scales present; mandibles scaled; snout fully scaled; teeth along sides of jaws (except canine in lower jaw) relatively small and not inclined forward (teeth larger on other species except *A. pascalus*); gill rakers 8–10 + 22–26; three predorsal bones; a series of prominent papillae along edge of posterior half of orbit; two opercular spines; snout moderately long, 3.2 to 3.8 in head; depth of body 2.8 to 3.3 in SL; dorsal and anal fins scaled basally; origin of dorsal fin over pectoral base; fifth to tenth dorsal spines the longest, subequal; adult males with caudal lobes, second pelvic ray, and fourth anal ray prolonged and most of soft portion of dorsal fin elevated.

Color in life bright heliotrope, becoming yellowish ventrally on head, thorax, and abdomen; females with a band of yellow along back at base of dorsal fin continuing onto dorsal part of caudal peduncle and upper lobe of caudal fin; lower lobe of fin also with a broad band of yellow; males with more yellow on head below level of lower edge of eye, the upper part of head

with a suffusion of orange, the two regions separated by a band of orange running to pectoral base.

REMARKS. We have collected specimens of *Anthias tuka* in the Palau Islands, Solomon Islands, Bismarck Archipelago, southeast New Guinea, Great Barrier Reef, and Ambon, Indonesia, in the depth range of 7 to 15 m; these are deposited in the Bishop Museum and the British Museum (Natural History). We have also examined specimens from the Philippine Islands and Indonesia at the U.S. National Museum of Natural History and the California Academy of Sciences. One lot of 15 specimens labeled as *tuka* from Cagayan Island, Philippines (USNM 164978) consisted of but a single 65-mm specimen of *A. tuka* and 14 of *A. smithvanizi*; the latter have been recatalogued as USNM 215964.

The largest specimen of *A. tuka* examined (SU 26951) measures 80 mm SL; it was taken in Dumaguete, Philippines.

Some specimens of *A. pascalus* have been misidentified as *tuka*.

Anthias pascalus

Figures 5 and 6, Tables 1–4

Entonanthias pascalus Jordan and Tanaka 1927, p. 385, pl. 34, fig. 2 (type locality, Okinawa); Kamohara 1958, p. 35 (Kochi, Japan); Katayama 1960, p. 162, pl. 83.

Mirolabrichthys tuka Randall (*non* Herre and Montalban) 1955, p. 61 (Gilbert Islands); Burgess and Axelrod 1973a, p. 422, fig. 269 (Marshall Islands).

Mirolabrichthys tuka pascalus Heemstra 1973, p. 208 (Caroline Islands).

DIAGNOSIS. Dorsal soft rays 15 to 17 (usually 16); anal soft rays 7 (rarely 8); pectoral rays 16 to 19 (modally 18); lateral-line scales 48 to 52; circumpeduncular scales 25 to 27; auxiliary scales present; mandibles scaled; snout fully scaled; dentition as in *A. tuka*; gill rakers 9–11 + 23–27; two or three predorsal bones; a series of prominent papillae along edge of posterior half of orbit; two opercular spines; fifth to tenth dorsal spines the longest, subequal (fifth generally the longest in small individuals, and the tenth usually longest in large adults); snout moderately long, 3.2 to 3.8 in head; depth of body 2.9 to 3.4 in SL; dorsal and anal fins scaled basally; origin of dorsal fin over pectoral base; adult males with caudal lobes, second pelvic ray, and fourth anal ray prolonged and most of soft portion of dorsal fin elevated (sometimes with posterior rays free at tips).

Color in life bright heliotrope; an orange band from snout along lower edge of eye to pectoral base; head and thorax below this band yellowish; membranes of distal half or more of soft portion of dorsal fin of adult males red.

REMARKS. We have collected specimens of *A. pascalus* from the Ryukyu Islands, Marshall Islands, Gilbert Islands, Tuamotu Archipelago, Society Islands, Samoa Islands, and Palau Islands in the depth range of 5 to 45 m. The Academy of Natural Sciences of Philadelphia has two lots from Fiji, previously unreported, which were collected by William F. Smith-Vaniz, Bruce A. Carlson, Barry Goldman, and Dan M. Popper. The California Academy of Sciences has specimens from

Ifaluk and Kapingamarangi in the Caroline Islands. Pierre Fourmanoir kindly sent on loan two specimens from New Caledonia.

Heemstra (1973) commented on the apparent allopatric distribution of *A. pascalus* and the closely related *A. tuka*, suspecting that they were subspecies of a single species. As mentioned, we have specimens of these two forms from the Palau Islands and thus conclude that they are species.

Although *A. pascalus* is wide-ranging in the Central and Western Pacific, it appears to be absent from the Hawaiian Islands, Easter Island, Pitcairn Group, Rapa, Marquesas Islands, and the Line Islands (Christmas Island of this group not visited by us). The species is not yet recorded from the Philippines or Taiwan but might be expected to occur there.

This is the largest species of the subgenus; the largest specimen we have collected (BPBM 19126, 117 mm SL, 170 mm TL) is from Okinawa. The holotype (FMNH 59184, 104.7 mm SL) was first deposited in the Carnegie Museum; it is now at the Field Museum of Natural History, Chicago.

The stomach contents of seven adult specimens from Enewetak, Marshall Islands consisted of unidentified crustacean fragments (36%), calanoid copepods (24%), cyclopoid copepods (19%), fish eggs (9%) decapod crustacean larvae (6%), pteropods (3%), amphipods (2%), ostracods (1%), foraminifera (0.7%), and fish scales (0.3%).

The specimen from the stomach of a *Caranx melampygus* speared in the Gilbert Islands, which was reported by Randall (1955) as *Mirolabrichthys tuka*, is *A. pascalus*.

Anthias smithvanizi new species

Figures 7, 8A and B, Tables 1-4, 6

HOLOTYPE. BPBM 15606, male, 58.2 mm SL. SOLOMON ISLANDS, Alite Reef (off Malaita), outer reef slope on west side, bottom mainly rubble, 60 m, dynamite and rotenone, J.E. Randall, W.A. Starck, II, B. Goldman, and W. Doak, 24 July 1973.

PARATYPES. USNM 215964, 14: 41-58 mm SL, PHILIPPINE ISLANDS, Cagayan Island, 1-18 m, dynamite, Philippine Expedition, "Albatross," 31 March 1909; BPBM 9632, 3: 53.0-55.1 mm SL, PALAU ISLANDS, Augulpelu Reef, SW edge at base of drop-off, 33.5 m, spear and rotenone, J.E. Randall, 22 April 1970; BPBM 15592, 29.3 mm SL, SOLOMON ISLANDS, Savo, SW side, small coral head, 46 m, dynamite, J.E. Randall, B. Goldman, and G.R. Allen, 17 July 1973; BPBM 19694, 5: 36.1-43.3 mm SL, collected with holotype; AMS I.18093-001, 2: 39-42.3 mm SL, collected with holotype; BPBM 15726, 2: 47-52.6 mm SL, NEW BRITAIN, former submarine base near Rabaul, vertical drop-off, 30 m, spear, J.E. Randall, 8 August 1973; ANSP 134046, 53.4 mm SL, E Indian Ocean, COCOS-KEELING ISLANDS, Turk Reef, N side on drop-off (12° 06' 30" S, 96° 49' 35" E), 7.5-18 m, Sta. 15, rotenone, W.F. Smith-Vaniz and P.L. Colin, 1 March 1974; ANSP 134047, 47.5 mm SL, same locality as preceding, 18-24 m, Sta. 24, rotenone, W.F. Smith-Vaniz and P.L. Colin, 7

March 1974; ANSP 134048, 46.8 mm SL, same locality as preceding, 46 m, Sta. 27, rotenone, W.F. Smith-Vaniz and P.L. Colin, 9 March 1974; ANSP 134049, 51.8 mm SL, Cocos-Keeling Islands, West Island, 1.5-3 km E of N end of island (12° 07' 40" S, 96° 49' 50" E), 6-7.5 m, Sta. 38, W.F. Smith-Vaniz et al., 16 March 1974; ANSP 134050, 49: 26.3-47.8 mm SL, same locality as ANSP 134046, 30 m, Sta. 55, rotenone, W.F. Smith-Vaniz and P.L. Colin, 24 March 1974; BPBM 19269, 9: 22.5-54.5 mm SL, INDONESIA, Molucca Islands, Ambon, Latuhalat (south coast of island), isolated coral block off front of fringing reef, small cave in 36.5 m, rotenone, J.E. Randall and G.R. Allen, 21 January 1975; ANSP 134016, 4: 26.5-50.6 mm SL, same data as preceding; USNM 215264, 4: 30.1-47.8 mm SL, same data as preceding; WAM P.25492-001, 4: 27.3-48.3 mm SL, same data as preceding; BPBM 18389, 8: 28.5-52.4 mm SL, MARSHALL ISLANDS, Enewetak Atoll, Rigili (Leroy) Islet, west side (ocean reef), cave in vertical drop-off, 46 m, rotenone, J.E. Randall, G.W. Tribble, A.Y. Suzumoto, and P. Lamberson, 5 July 1975; LACM 35553-1, 8: 28.2-49.3 mm SL, same data as preceding; BPBM 18434, 54.4 mm SL, Marshall Islands, Kwajalein Atoll, outside reef near small boat passage at south end of atoll, steeply sloping bottom of coral, rock and sand in 32 m, quinaldine, J.E. Randall, 18 July 1975; BM(NH) 1976.9.30.13-14, 2: 52.7-57.3 mm SL, NEW BRITAIN, Nodup (near Rabaul), boulder with caves on coral and rubble bottom 35-45 m, rotenone, R. Lubbock and B. Parkinson, 29 July 1975; BM(NH) 1976.9.30.12, 35.3 mm SL, New Britain, Tawui (near Rabaul), former Japanese submarine base, cave on vertical drop-off, 25 m, quinaldine, R. Lubbock, 4 August 1975, BM(NH) 1976.9.30.15, 57.6 mm SL, same locality as preceding, 30 m, quinaldine, R. Lubbock, 7 August 1975.

DIAGNOSIS. Dorsal soft rays 15 to 17 (usually 16); pectoral rays 16 to 18 (rarely 18); lateral-line scales 44 to 48; circumpectuncular scales 23 to 25; no auxiliary scales; mandibles scaled; gill rakers 8 or 9 + 20-24; a row of small forward-projecting canine teeth on side of jaws; about three rows of teeth on palatines at widest place; posterior edge of orbit with fleshy papillae; three opercular spines; snout 4.0 to 4.3 in head; body depth 3.1 to 3.3 in SL; third dorsal spine of males prolonged; soft dorsal and anal fins scaled only at extreme base; colors of fresh specimens as in Figure 8.

DESCRIPTION. Dorsal rays X, 16 (21 paratypes with 16, two with 15, and one with 17), last branched to base; anal rays 11, 7 (23 paratypes with 7, one with 8), last branched to base; pectoral rays 17 (10 paratypes with 16, 13 with 17, and one with 18), upper two and lowermost unbranched; pelvic rays 1, 5; principal caudal rays 15, the uppermost and lowermost unbranched; lateral-line scales 44 (45-48); scales above lateral line to origin of dorsal fin 5 (4-5); scales below lateral line to origin of anal fin 12 (12-14); circumpunctuncular scales 23 (23-25); gill rakers 9 + 24 (8 or 9 + 20-24); branchiostegal rays 7; vertebrae 26; predorsal bones 2.

Body moderately elongate, the depth 3.22 (3.12-3.33) in SL, and moderately compressed, the width 1.8 (1.79-2.01) in depth; head length 3.29 (3.11-3.37) in SL; snout 4.0 (4.05-4.28) in head, the upper lip hypertrophied anteriorly, moder-

Figure 1. *Anthias evansi* Smith, male, 93 mm SL, BPBM 20007, Réunion.



Figure 2. *Anthias parvirostris*. A. Holotype, male, 48.3 mm SL, BPBM 15605, Solomon Islands. B. Paratype, female, 36.1 mm SL, BPBM 20448, Solomon Islands.



ately pointed in males; diameter of orbit 3.87 (3.05–3.62) in head, the edge of the posterior half of the orbit lined with fleshy papillae (25 in holotype, largest dorsoposteriorly); interorbital space convex, the bony width 3.75 (3.74–3.92) in head; least depth of caudal peduncle 2.08 (2.07–2.19) in head.

Mouth oblique and moderately large, the maxilla reaching posterior to a vertical at center of eye; posterior end of maxilla rounded, the greatest depth 1.7 in orbit of holotype; mouth terminal on small individuals but lower jaw inferior on larger ones due to hypertrophy of upper lip. Upper jaw with a band of very small villiform teeth, broadest anteriorly (a few teeth anterior in band slightly enlarged), and a stout short canine tooth or close-set pair of canines at front corner of jaw adjacent and anterior to villiform band; an outer row of slender small forward-projecting curved canines on side of upper jaw (23 on one side of holotype and 26 on the other); lower jaw with a short stout canine tooth or close-set pair of teeth at front on each side

that project diagonally outward and forward; a small patch of small teeth medial to each canine; a single row of small slender curved canines on side of lower jaw, those toward front inclined inward and those posteriorly inclined forward (27 such teeth on each side of jaw of holotype); a small patch of about 9 very small teeth on vomer; palatine with a narrow band of tiny villiform teeth in about 3 irregular rows; tongue pointed, the upper surface with scattered tiny papillae; inner surface of thickened anterior upper lip plicate. Gill membranes free from isthmus. Gill rakers slender, the longest about equal to longest gill filament, 1.6 in orbit of holotype.

Opercle with three flattened spines, the central one the largest and most posterior, the upper one slightly anterior to the lower; two lower spines acute, the upper forming an angle of about 90 degrees; distance between tips of two lower spines about two-thirds the distance between central and upper spines. Lower margin and rounded corner of preopercle smooth; upper



Figure 3. *Anthias tuka* (Herre and Montalban), male, 62 mm SL, BPBM 16056, Solomon Islands.



Figure 4. *Anthias tuka* (Herre and Montalban), female, 50 mm SL, BPBM 16056, Solomon Islands.



Figure 5. *Anthias pascalus* (Jordan and Tanaka), male, 101.5 mm SL, BPBM 12895, Marshall Islands.



Figure 6. *Anthias pascalus* (Jordan and Tanaka), female, 72.5 mm SL, BPBM 6244, Marshall Islands.

margin with 29 serrae on holotype (serrae increase with size, from 14 on 29-mm specimen to 20 on 36-mm specimen, and 29 to 32 on individuals over 55 mm SL).

Anterior nostril in a short membranous tube directly anterior to middle of eye about half the distance from edge of orbit to edge of groove separating upper lip from rest of snout; posterior nostril diagonally upward and posterior to anterior nostril, with little or no rim, separated by a space from the anterior, which is contained about 4.5 times in orbit.

Scales ctenoid; no auxiliary scales on body; head scaled ex-

cept throat, gill membranes, lips, extreme front of snout, and a broad zone in front of eye that contains nostrils in its upper part; dorsal and anal fins scaled only at extreme base (naked anteriorly); caudal fin with small scales more than three-fourths distance to posterior margin; pectoral fins with small scales on approximately the basal fourth; pelvic fins with rows of small scales paralleling rays basally on medial surface.

Some pores of cephalic lateralis system obscured by scales. Those readily apparent are a snout-supraorbital series beginning with a pore in front of anterior nostril, then one between

Table 6. Proportional measurements of type specimens of *Anthias smithvanizi* expressed as a percentage of the standard length.

| | Holotype | | Paratypes | | |
|--------------------------------|---------------|---------------|---------------|---------------|--------------|
| | BPBM 15606 | BPBM 15592 | BPBM 19694 | BPBM 19694 | BPBM 9632 |
| Standard length (mm) | 58.2 | 29.3 | 36.1 | 41.8 | 55.1 |
| Depth of body | 31.0 | 32.1 | 31.4 | 30.0 | 30.8 |
| Width of body | 17.2 | 16.7 | 16.4 | 16.7 | 16.2 |
| Head length | 30.4 | 32.1 | 31.6 | 30.3 | 29.6 |
| Snout length | 7.6 | 7.5 | 7.5 | 7.2 | 7.3 |
| Diameter of orbit | 7.9 | 10.2 | 9.1 | 9.1 | 8.2 |
| Bony interorbital width | 8.1 | 8.2 | 8.3 | 8.1 | 7.7 |
| Length of maxilla | 15.3 | 15.0 | 14.5 | 14.4 | 14.7 |
| Least depth of caudal peduncle | 14.6 | 14.7 | 14.4 | 14.1 | 14.3 |
| Length of caudal peduncle | 22.2 | 20.6 | 20.5 | 21.2 | 21.8 |
| Predorsal length | 29.6 | 31.7 | 31.6 | 30.8 | 29.4 |
| Preanal length | 56.0 | 59.0 | 59.3 | 57.0 | 58.2 |
| Prepelvic length | 32.6 | 32.7 | 33.0 | 32.9 | 33.5 |
| Length of first dorsal spine | 5.7 | 5.5 | 5.6 | 5.7 | 5.4 |
| Length of third dorsal spine | 18.9 | 13.6 | 13.3 | 13.2 | 16.5 |
| Length of tenth dorsal spine | abnormal | 12.3 | 12.5 | 12.4 | 11.8 |
| Length of longest dorsal ray | 20.6 | 17.4 | 18.6 | 17.2 | 20.9 |
| Length of dorsal fin base | 58.4 | 56.3 | 58.7 | 57.3 | 58.0 |
| Length of first anal spine | 8.6 | 7.9 | 8.0 | 8.1 | 7.9 |
| Length of second anal spine | 12.0 | 13.6 | 12.5 | 12.7 | 11.3 |
| Length of third anal spine | 13.6 | 14.0 | 13.9 | 13.2 | 13.6 |
| Length of longest anal ray | 26.6 | 20.8 | 20.2 | 21.0 | 27.3 |
| Length of anal fin base | 23.2 | 21.8 | 22.4 | 22.4 | 22.1 |
| Length of pectoral fin | 30.7 | 30.7 | 31.2 | 30.4 | 29.3 |
| Length of pelvic spine | 15.3 | 17.1 | 16.7 | 16.0 | 15.8 |
| Length of pelvic fin | 30.0 | 29.4 | 28.3 | 27.0 | 36.3 |
| Length of caudal fin | 52.8 | 40.3 | 44.9 | 40.2 | 53.3 |
| Caudal concavity | 39.8 | 26.0 | 29.1 | 26.5 | 40.0 |

nostrils, a third medial to this, and three in interorbital space; a series near edge of posterior rim of orbit in close association with the fleshy papillae; another series around posterior and lower part of eye, each at the end of a tube radiating from near edge of eye, six in mandibular series beginning in front of lower margin of preopercle, the anterior two close together near front of chin; a median dorsal pore and one to each side are all that are readily seen of the occipital series.

Origin of dorsal fin above upper end of gill opening (and first lateral-line scale); third or fourth dorsal spines longest, apparently depending on sex; of the eight larger specimens (48.5 to 58.2 mm SL) on which the description is based, all are males and all have prolonged third dorsal spines, the spine length 1.61 (1.67–1.98) in head; fourth dorsal spine slightly longer than third in females (to 47 mm SL), the length of fourth 2.04–2.19 in head; a cirrus from interspinous membrane behind tip of each dorsal spine, the one from the prolonged third dorsal spine of males enlarged (cirrus length in holotype 2 in orbit); longest dorsal soft ray (eleventh to fourteenth) 1.48 (1.42–1.84) in head; origin of anal fin slightly posterior to a vertical at base of first dorsal soft ray; third anal spine 2.23 (2.17–2.29) in head; longest anal soft ray (fourth or fifth) 1.14 (1.08–1.56) in head; caudal fin lunate, the lobes filamentous in males, the caudal concavity 2.52 (2.5–3.84) in SL; pectoral fins long, extending to or beyond a vertical at base of third anal spine, the longest ray (ninth or tenth) 3.26 (3.21–3.41) in SL; edges of distal part of longest pectoral rays serrate (Fig. 7); pelvic fins long, reaching to anus in females and beyond spinous portion of anal fin in males due to prolongation of second ray, the fin length 3.33 (2.76–3.7) in SL.

Color in alcohol: uniformly pale with no dark markings. Color of males when fresh: violet, shading nearly to white ventrally, the edges of the scales orange-red on upper half of body gradually becoming lavender ventrally; numerous small yellow spots on side of body and postorbital region of head; a bright yellow horizontal band from front of upper lip to orbit; a median yellow band on head that continues along entire base of dorsal fin; spinous portion of dorsal fin yellow, the spine tips and cirri violet, with a row of violet spots at base, one per membrane, which increase in size posteriorly and merge to form a band that continues and broadens in soft portion of fin and extends out on posterior rays; yellow of spinous portion of dorsal also continuing into soft portion but soon replaced except for a submarginal band by a broad median zone of red; margin of soft portion of fin violet; anal fin pale lavender pink with faint yellow dots on membranes, a submarginal zone of light yellow, and a narrow pale lavender margin; caudal fin with a broad band (narrowing at ends) of heliotrope on edge of upper lobe; below this a narrow irregular orange line and a band of yellow; a broad median zone of deep orange in fin; lower lobe pale lavender faintly blotched with light orange; paired fins whitish with lavender cast; outer part of iris purplish blue, the inner yellow, the two separated by a narrow ring of heliotrope.

Females are similar in color, but there is less violet in the ground color and none on the dorsal fin except for the margin; also the yellow in the fin (except for basal band) is confined to an indistinct submarginal zone in the spinous portion; the cau-

dal fin has broad bands of red-orange on the lobes, the upper with a narrow margin of heliotrope.

REMARKS. We have collected specimens of *A. smithvanizi* in the Solomon Islands, New Britain, Indonesia, Palau Islands, and Marshall Islands. We have examined specimens from the Philippine Islands taken by the "Albatross" and from the Cocos-Keeling Islands, Indian Ocean, collected by William F. Smith-Vaniz and associates. Our specimens were obtained from the depth range of 25 to 60 m, but the Philippine material was collected from 1 to 18 m and one Cocos-Keeling individual from 6 to 7.5 m. This species usually occurs in aggregations and is generally seen in the vicinity of caves or ledges. Although it appears to feed on zooplankton, it does not venture as far from the bottom as most other species of the subgenus.

ETYMOLOGY. Named in honor of William F. Smith-Vaniz of the Academy of Natural Sciences of Philadelphia who kindly made available his Cocos-Keeling specimens of this species for our study of the subgenus; he had independently determined that his specimens represented an undescribed species.

Anthias lori

Figure 9, Tables 1–4, 7

Anthias lori Lubbock and Randall in Fourmanoir and Laboute 1976, p. 287, figs. on pp. 280, 287 (type locality, Point Mackau, Loyalty Islands).

Mirolabrichthys imeldae Burgess 1977, p. 39, figs. on pp. 40, 41 (Philippine Islands).

HOLOTYPE. MNHN 1976-1, 52.9 mm SL, LOYALTY ISLANDS, Maré, Point Mackau (NW end of island), reef in 50 m, rotenone, P. Laboute and Y. Magnier, 21 November 1975.

PARATYPES. BPBM 8597, 45.0 mm SL, TUAMOTU ARCHIPELAGO, Tikahau, outside reef N of pass, 36.5 m, spear (specimen badly damaged by spear), J.E. Randall, 14 June 1957; BPBM 8437, 36.5 mm SL, Tuamotu Archipelago, Tikahau, outside reef in 33.5 m, spear, J.E. Randall, 15 June 1957; BPBM 9629, 2: 48.4–66.0 mm SL, PALAU ISLANDS, Ngemelis Islands, Bairakaseru Island, S end, vertical drop-off, 36.5 m, spear, J.E. Randall, 23 April 1970; BPBM 13998, 3: 36.7–47.5 mm SL, TUAMOTU ARCHIPELAGO, Rangiroa,

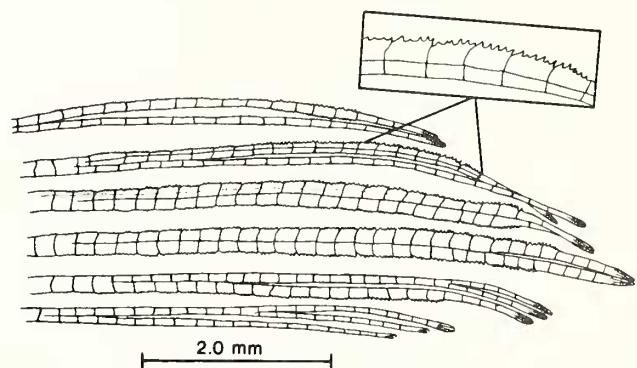


Figure 7. Pectoral fin rays of *Anthias smithvanizi* showing serrae along the edges of the outer part of the longest rays. Drawing by William F. Smith-Vaniz.

Figure 8. *Anthias smithyanizi*. A. Holotype, male, 58.2 mm SL, BPBM 15606, Solomon Islands. B. Paratype, female 43.3 mm SL, BPBM 19694, Solomon Islands.



Figure 9. *Anthias lori*, Lubbock and Randall, paratype, male, 41 mm SL, BPBM 13998, Tuamotu Archipelago.



outside reef 200 m E of Tiputa Pass, 60° slope of coral and sand, 30.5 m. quinaldine, J.E. Randall and D.B. Cannoy, 6 April 1971; ANSP 134017, 47.0 mm SL, collected with holotype; AMS I.18563-001, 33.5 mm SL, collected with holotype; BPBM 14026, 38.6 mm SL, Tuamotu Archipelago, Manihi, outside reef 400 m NW of pass, 27.5 m, spear, J.E. Randall, 11 April 1971; BPBM 14977, 53.6 mm SL, SOCIETY ISLANDS, Tetiaroa, outside reef off west side of Rimatuu Islet, 37–55 m, rotenone, J.E. Randall and R.M. McNair, 19 April 1973; LACM 35552-1, 48.2 mm SL, same data as preceding; USNM 215263, 40.0 mm SL, same data as preceding; WAM P25493-001, 32.7 mm SL, same data as preceding; BM(NH) 1976.9.30.2–3, 2: 50.1–51.5 mm SL, AMERICAN SAMOA, Tutuila, Larsen Bay, 55–60 m, caves at base of steep drop-off, quinaldine, R. Lubbock, 14 September 1975; BM(NH) 1976.9.30.5, 60.4 mm SL, same locality as preceding, quinaldine, R. Lubbock and R.C. Wass, 16 September 1975; BM(NH) 1976.9.30.4, 56.4 mm SL, Society Islands, Tahiti, Arue, 50 m, spear, R. Lubbock, 19 September 1975; BM(NH) 1976.9.30.6–

7, 2: 61.7–64.2 mm SL, PHILIPPINE ISLANDS, Luzon, Batangas Bay, 20 m, R. Lubbock from local aquarium fish collectors, 29 June 1976.

DIAGNOSIS. Dorsal soft rays 16 or 17 (rarely 17); pectoral rays 16 to 18 (rarely 16); lateral-line scales 49 to 52; circumduncular scales 25 to 28; no auxiliary scales; mandibles scaled; gill rakers 8 or 9 + 21–24; a row of small forward-projecting canine teeth on side of jaws; palatines with only a few rudimentary teeth anteriorly; posterior edge of orbit with fleshy papillae; three opercular spines; snout 3.6 to 4.1 in head; body depth 3.4 to 4.0 in SL; third dorsal spine of males prolonged; soft dorsal and anal fins scaled only at extreme base; colors of fresh specimens as in Figure 9.

DESCRIPTION. Dorsal rays X,16 (one of 16 paratypes with 17), last branched to base; anal rays III,7 (one of 16 paratypes with 8), last branched to base; pectoral rays 17 (six of 16 paratypes with 18 and one with 16); upper two and lowermost unbranched; pelvic rays I,5; principal caudal rays 15, the uppermost and lowermost unbranched; lateral-line scales 52



Figure 10. *Anthias dispar* (Herre), male, 54 mm SL, BPBM 16139, Solomon Islands.



Figure 11. *Anthias dispar* (Herre), female ?, 41 mm SL, BPBM 7556, Line Islands.



Figure 12. *Anthias ignitus*, holotype, male, 58.3 mm SL, BPBM 18858, Maldives Islands.

(49–52); scales above lateral line to origin of dorsal fin 5; scales below lateral line to origin of anal fin 14 (13–15); circumpeduncular scales 26 (25–28); gill rakers 9 + 22 (8–9 + 21–24); branchiostegal rays 7; vertebrae 26; predorsal bones 2.

Body elongate, the depth 3.36 (3.46–4.03) in SL, and moderately compressed, the width 2.0 (1.56–1.85) in depth; head length 3.54 (3.28–3.49) in SL; snout 4.1 (3.58–4.0) in head, the upper lip hypertrophied anteriorly, moderately pointed in males; diameter of orbit 3.54 (3.3–3.86) in head; the edge of the posterior half of orbit lined with fleshy papillae 20 (25 on

66-mm paratype, 32 on 41-mm paratype due to very small ones at upper and lower edges of eye that continue anterior to center of eye, especially those on lower edge); interorbital space convex, the bony width 3.93 (3.54–4.02) in head; least depth of caudal peduncle 2.09 (2.06–2.25) in head.

Mouth oblique and moderately large, the maxilla reaching posterior to a vertical at rear edge of pupil; posterior end of maxilla rounded, the greatest depth 1.9 in orbit of holotype. Dentition very similar to that of *A. smithvanizi*, the teeth along side of upper jaw 20 or 23 in holotype (22 or 25 in largest para-

Table 7. Proportional measurements of type specimens of *Anthias lori* expressed as a percentage of the standard length.

| | Holotype | | Paratypes | | | |
|--------------------------------|----------------|---------------|---------------|---------------|---------------|--------------|
| | MNHN 1976-1 | BPBM 13998 | BPBM 13998 | BPBM 13998 | BPBM 14977 | BPBM 9629 |
| Standard length (mm) | 52.9 | 36.7 | 41.0 | 47.5 | 53.6 | 66.0 |
| Depth of body | 29.8 | 24.8 | 25.6 | 26.6 | 26.2 | 28.9 |
| Width of body | 14.9 | 16.5 | 15.6 | 14.9 | 15.0 | 15.6 |
| Head length | 28.3 | 29.7 | 30.2 | 29.6 | 28.7 | 30.5 |
| Snout length | 6.9 | 8.3 | 8.0 | 7.4 | 7.4 | 8.1 |
| Diameter of orbit | 8.0 | 9.0 | 8.5 | 8.5 | 8.0 | 7.9 |
| Bony interorbital width | 7.2 | 8.0 | 8.3 | 7.9 | 7.4 | 7.6 |
| Length of maxilla | 13.3 | 15.0 | 14.7 | 14.2 | 13.9 | 15.2 |
| Least depth of caudal peduncle | 13.5 | 13.9 | 13.4 | 13.4 | 13.9 | 14.1 |
| Length of caudal peduncle | 23.4 | 23.4 | 22.9 | 23.4 | 23.0 | 22.4 |
| Predorsal length | 30.3 | 31.9 | 31.1 | 29.8 | 30.4 | 30.9 |
| Preanal length | 58.9 | 57.2 | 57.0 | 56.8 | 56.3 | 58.3 |
| Prepelvic length | 30.2 | 31.7 | 31.7 | 31.1 | 32.2 | 32.9 |
| Length of first dorsal spine | 5.5 | 4.6 | 4.5 | — | 5.6 | 5.7 |
| Length of third dorsal spine | 13.2 | 12.3 | 15.8 | 18.1 | 16.5 | 25.8 |
| Length of tenth dorsal spine | 11.3 | 10.9 | 10.3 | 10.6 | 10.6 | 11.2 |
| Length of longest dorsal ray | 14.7 | 15.2 | 14.4 | 14.6 | 15.0 | 15.4 |
| Length of dorsal fin base | 56.4 | 57.2 | 56.1 | 54.2 | 55.8 | 56.0 |
| Length of first anal spine | 7.0 | 7.6 | 6.6 | 6.4 | 6.1 | 7.6 |
| Length of second anal spine | 11.1 | 11.4 | 11.0 | 10.5 | 10.4 | 10.9 |
| Length of third anal spine | 12.1 | 12.2 | 12.5 | 11.7 | 12.1 | 13.3 |
| Length of longest anal ray | 21.4 | 20.4 | 20.0 | 20.2 | 22.8 | 24.1 |
| Length of anal fin base | 20.8 | 21.3 | 21.4 | 21.7 | 21.6 | 21.6 |
| Length of pectoral fin | 29.6 | 30.8 | 28.6 | 28.5 | 30.1 | 29.8 |
| Length of pelvic spine | 14.2 | 14.9 | 13.6 | 14.3 | 14.5 | 14.7 |
| Length of pelvic fin | 25.0 | 25.1 | 26.8 | 29.8 | 29.9 | 36.1 |
| Length of caudal fin | 46.3 | 35.2 | 37.9 | 58.8 | 47.4 | 45.5 |
| Caudal concavity | 33.8 | 24.0 | 25.4 | 45.7 | 35.2 | 34.8 |

type) and about 27 in lower jaw (26 in largest paratype); vomer with even fewer teeth than *A. smithvanizi*, and palatines with only a few rudimentary teeth anteriorly. Tongue pointed, the upper surface with scattered tiny papillae; inner surface of thickened anterior upper lip plicate. Gill membranes free from isthmus. Gill rakers slender, the longest longer than gill filaments, 1.6 in orbit of holotype.

Opercle with three flattened spines as in *A. smithvanizi*. Lower margin and rounded corner of preopercle smooth; upper margin with 27 serrae on holotype on one side, 30 on other (serrae tending to increase with size from 14 on a 24-mm specimen to 22 on a 39-mm specimen, 24 to 26 on 48-mm specimens, and 29 on 66-mm specimen).

Nostrils, pores of head and scales as in *A. smithvanizi*.

Origin of dorsal fin slightly posterior to upper end of gill opening (over second lateral-line scale); third or fourth dorsal spines the longest, apparently depending on sex, the third spine prolonged on males, 2.14 (1.18–1.91) in head (longer on larger males); fourth spine only slightly longer than third on females (fourth of a 36.7-mm specimen 2.34 in head); a cirrus from interspinous membrane behind tip of each dorsal spine, but not notably prolonged on third dorsal spine of males; longest dorsal soft ray (tenth or eleventh) 1.93 (1.91–2.1) in head; origin of anal fin in line with base of third dorsal soft ray; third anal spine 2.35 (2.29–2.53) in head; longest anal soft ray (fourth or fifth) 1.32 (1.26–1.51) in head; caudal fin lunate, the lobes more elongate in males, the caudal concavity 2.96 (2.19–4.17) in SL; pectoral fins long, extending nearly to or beyond a vertical at origin of anal fin, the longest ray (ninth or tenth) 3.38 (3.24–3.51) in SL; edges of distal part of longest pectoral rays serrate; pelvic fins of females reaching slightly beyond anus, of males to or well beyond origin of anal fin, the length of fin 3.73 (2.77–3.99) in SL.

Color in alcohol: uniformly pale with no dark markings. Life color of holotype not recorded. Color of 41-mm paratype (a small male) when fresh: pinkish tan dorsally shading to whitish ventrally with a lavender cast; edges of many scales yellow and of others dull violet on side of body and dorsally below anterior portion of dorsal fin, thus forming a reticular pattern; a series of five red blotches on back between lateral line and base of dorsal fin, the first four nearly quadrangular in shape, the first (poorly defined) beneath bases of seventh and eighth dorsal spines, the second below last two spines and associated membranes, the third below second to fourth (nearly fifth) dorsal soft rays, the fourth below seventh to ninth soft rays, and the last a smaller semicircular spot below eleventh to thirteenth rays; a broad longitudinal red band, narrowly edged in lavender, posteriorly on body covering most of upper half of caudal peduncle and extending forward to beneath twelfth dorsal soft ray; thickened anterior part of upper lip yellow, the side of lip lavender; tip of lower jaw pink shading to lavender on side of lower lip; dorsal, anal, and paired fins nearly colorless, the dorsal with spine tips lavender and ray tips light blue, with a broad basal zone of light blue and a broader outer zone of dull yellow in spinous portion and dull orange on soft portion; anal fin faintly light bluish with faint yellowish spots; caudal fin with lobes broadly reddish mixed with yellowish with a narrow upper and lower margin of

lavender; central and posterior margin of fin colorless; pectoral fins whitish; pelvic fins clear with a faint tinge of yellow; iris violet with an inner rim of light yellow.

A color slide of the female form of the species was lost; the color was recalled as not being very different from the male. Females also have the series of quadrangular red blotches along the back.

REMARKS. *A. lori* was briefly described by Lubbock and Randall in Fourmanoir and Laboute (1976); a full description is given above. The holotype, collected by Pierre Laboute and Yves Magnier in the Loyalty Islands, was sent to us by Pierre Fourmanoir. We have collected paratypes in the Tuamotu Archipelago, Society Islands, Samoa Islands, Palau Islands, and the Philippine Islands. The senior author has observed the species in 20 m off the island of Manado Tua, north of Manado, Celebes. Bruce A. Carlson photographed an individual of this species in 40 m on a drop-off at the east side of the entrance to Suva Harbor, Fiji Islands.

The senior author and Gerald R. Allen collected three small specimens of *A. lori* (BPBM 19300, 23.8–29.8 mm SL) at Ambon, Molucca Islands, Indonesia on 24 January 1975. The fish were taken with rotenone on a steep drop-off with caves in 24–33 m off a point just NW of the village of Silale on the SE side of Ambon Bay near the entrance to the bay. An accurate lateral-line scale count was possible for only one specimen (49 pored scales); another, however, seems to have 48 scales, which would be the lowest count of the species. Because of the poor condition of the specimens, they are not designated as paratypes.

A. lori is very similar in its mode of life to *A. smithvanizi*.

ETYMOLOGY. Named *lori*, a noun in apposition, after the daughter of the senior author; the illustrated specimen was collected on her birthday.

Anthias dispar

Figures 10 and 11, Tables 1–4

Mirolabrichthys dispar Herre 1955, p. 224 (type locality, Gizo Island, Solomon Islands); Heemstra 1973, p. 208 (New Georgia); Burgess and Axelrod 1975, pp. 1472, 1473, 1476, figs. 147–149, 154 (New Hebrides).

DIAGNOSIS. Dorsal soft rays 16 to 18 (usually 17); anal soft rays 7 to 8 (rarely 8); pectoral rays 18 to 20 (rarely 18); lateral-line scales 55 to 63; circumpeduncular scales 32 to 35; no auxiliary scales; mandibles scaled; side of snout (including region of nostrils) naked; a row of small slender canine teeth along sides of jaws, angled forward (except those anteriorly which are vertical); villiform teeth in a few rows anteriorly in jaws, absent along side of lower jaw but present as a single inner row on side of upper jaw; stout canine teeth in jaws as described for the genus; gill rakers 9–12 + 22–26; one predorsal bone; no papillae on edge of orbit; two opercular spines; snout not very long, 3.1 to 4.2 in head; depth of body 2.7 to 3.2 in SL; soft dorsal and anal fins scaled only basally; origin of dorsal fin slightly anterior to upper end of gill opening; first dorsal spine short; second dorsal spine the longest, but not prolonged; sec-

ond pelvic ray slightly prolonged in females, very elongate in males, reaching beyond base of anal fin; no dorsal or anal soft rays prolonged; caudal lobes slightly produced, more so in males than females; preopercular serrae 7 to 16.

Color of females in life: yellow-orange dorsally shading to whitish ventrally with a tinge of lavender; a horizontal orange band on snout continuing faintly from lower eye toward pectoral base; dorsal fin red (more intensely anteriorly) with a narrow lavender margin; caudal fin yellow, becoming orange red on posterior margin and tips of lobes; remaining fins whitish with lavender tinge. Color of males in life: upper head and anterior body to a diagonal at about base of third dorsal spine heliotrope; back posterior to this demarcation yellow, shading to lavender on caudal peduncle; lower half of head and body lavender; an orange band from snout tip to eye and an orange-yellow band from lower eye to edge of operculum at level of upper pectoral base; dorsal fin red (deep red anteriorly) with a lavender margin and a violet line at base (more evident on soft portion of fin); caudal fin orange-red, shading distally to pink, the upper and lower margins and tips of caudal lobes lavender; remaining fins pale lavender.

REMARKS. *A. dispar* is known in the literature only from Herre's six type specimens (holotype and five paratypes catalogued under number UW 10628, School of Fisheries, University of Washington; the holotype measures 49 mm SL) from Gizo, Solomon Islands, three specimens reported by Heemstra (1973) from New Georgia, Solomon Islands, (now in the U.S. National Museum of Natural History), and five specimens reported by Katayama (1979) from Ishigaki, Ryukyu Islands. We have collected *A. dispar* in the Solomon Islands (Florida Island and Alite Reef), Bismarck Archipelago (New Britain and Admiralty Islands), American Samoa (Tutuila), Marshall Islands (Kwajalein and Majuro), Line Islands (Fanning), and Indonesia (Ambon) in the depth range of 1 to 15 m. These specimens have been deposited in the Bishop Museum and British Museum (Natural History); in addition, the Bishop Museum has a specimen from Fiji collected by Bruce A. Carlson. This species does not appear to range as far eastward in Oceania as French Polynesia, a region extensively collected by us, and it is not known from the Indian Ocean.

The largest specimen, BPBM 17509, 64 mm SL, was collected in American Samoa.

***Anthias ignitus* new species**

Figure 12, Tables 1–4, 8

HOLOTYPE. BPBM 18858, male, 58.3 mm SL, MALDIVE ISLANDS, North Male Atoll, Villingili, lagoon reef, 25 m, spear, J.E. Randall, 16 March 1975.

PARATYPES. AMS I.19219-001, 50.2 mm SL; BM(NH) 1976.9.30.8, 59.4 mm SL; CAS 37888, 47.8 mm SL; LACM 35905-1, 57.9 mm SL; USNM 216494, 49.1 mm SL; MALDIVE ISLANDS, all collected with holotype; BM(NH) 1977.5.11.5–6, 2: 55.5–70.3 mm SL, ANDAMAN SEA, Similan Islands, N tips of Similan Island, 18 m, *Millepora*, quinaldine, R. Lubbock and N. Polunin, 11 March 1977.

DIAGNOSIS. Dorsal soft rays 16 or 17 (usually 16); pectoral

rays 19 to 20 (usually 20); lateral-line scales 53 to 58; circum-peduncular scales 29 to 33; no auxiliary scales; mandibles scaled; gill rakers 11 or 12 + 22–25; a row of moderate forward-projecting canine teeth on side of jaws; five to six rows of teeth on palatines at widest place; no papillae on edge of orbit; three opercular spines; snout 3.8 to 4.5 in head; body depth 2.8 to 3.0 in SL; no prolonged dorsal spines in males; soft dorsal and anal fins naked except extreme base of posterior part of dorsal fin; colors of fresh male as in Figure 12.

DESCRIPTION. Dorsal rays X,16 (16 or 17, three paratypes with 17); anal rays III,7; pectoral rays 20 (19 or 20; one paratype with 19), upper two and occasionally lower unbranched; pelvic rays I,5; principal caudal rays 15, upper and lower unbranched; lateral-line scales 55 (53–58); scales above lateral line to origin of dorsal fin 8 (8–9); scales below lateral line to origin of anal fin 22 (22–25); circum-peduncular scales 31 (29–33); gill rakers 11 + 24 (11–12 + 22–25); branchiostegal rays 7; vertebrae 26; predorsal bones 1.

Body somewhat elongate, the depth 2.87 (2.53–2.97) in SL; body moderately compressed, the width 2.23 (2.05–2.54) in depth; head length 3.15 (3.03–3.24) in SL; snout 3.87 (3.62–4.47) in head; front of upper lip of males thickened, somewhat pointed, and freely movable dorsoventrally; diameter of orbit 4.28 (3.56–4.43) in head; posterior edge of orbit without fleshy papillae; interorbital space convex, the bony width 4.23 (3.81–4.40) in head; least depth of caudal peduncle 2.28 (2.23–2.39) in head.

Mouth oblique and moderately large, the maxilla reaching to or posterior to a vertical at rear edge of pupil; mouth terminal except on large males where it is slightly inferior due to hypertrophy of upper lip; posterior end of maxilla rounded, the greatest depth 1.38 in orbit of holotype; no supplemental maxillary bone. Dentition generally as for *A. bartlettorum*; palatines with three to six irregular rows of villiform teeth at broadest place; tongue pointed, the upper surface with scattered very small papillae. Gill membranes free from isthmus. Gill rakers slender and long (largest 1.10 in orbit of holotype), notably longer than gill filaments (longest gill filament of first gill arch of holotype contained 1.50 in longest raker).

Opercle with three flattened spines, the central one the largest and most posterior, the upper slightly anterior to lower; two lower spines acute, the upper obtuse and indistinct; distance between tips of two lower spines about half the distance between central and upper spines; lower margin of preopercle smooth; rounded corner and upper margin serrate (14 serrae on holotype).

Anterior nostril in a short membranous tube (higher dorso-posteriorly) directly anterior to middle of eye about half the distance from edge of orbit to edge of groove separating upper lip from rest of snout; posterior nostril diagonally upward and posterior to anterior nostril, with little or no rim, and large, the greatest diameter of opening about equal to distance between nostrils, 5.78 in orbit of holotype.

Scales ctenoid; no auxiliary scales on body; head scaled except mandibles, throat and gill membranes, lips, extreme front of snout, and a broad zone on side of snout anterior to eye that includes nostrils in its upper part; dorsal and anal fins naked except extreme base of posterior part of dorsal fin; caudal fin

with small scales more than three-fourths distance to posterior margin; pectoral fins with small scales on basal third or more of fin; pelvic fins basally with small scales on rays.

Lateral line a smooth curve following contour of back, the last pored scale slightly anterior to end of hypural plate. Some pores of cephalic lateralis system obscured by scales. Prominent are a pore in front of anterior nostril, one between nostrils, one medial to nostrils, two close together in interorbital space above front of eye, a series near edge of orbit around posterior half of eye, five or six on suborbital and preorbital region ante-

rior to a vertical through center of eye, and six in a mandibular series beginning at lower margin of preopercle (last two on chin close together).

Origin of dorsal fin on a vertical through posterior margin of preopercle; first dorsal spine short, 12.19 (5.13–11.8) in head; no marked prolongation of dorsal spines, the longest 2.28 in head; longest dorsal soft ray 2.25 (1.98–2.31) in head; third anal spine 3.56 (3.68–4.32) in head; longest anal soft ray 2.07 (2.03–2.31) in head; caudal fin lunate, the lobes somewhat filamentous, the caudal concavity 4.29 (2.97–4.50) in SL; pec-

Table 8. Proportional measurements of type specimens of *Anthias ignitus* expressed as a percentage of the standard length.

| | Holotype | | Paratypes | | |
|--------------------------------|---------------|--------------|----------------|--------------------|-----------------------|
| | BPBM 18858 | CAS 37888 | USNM 216494 | AMS 1.19219-001 | BM(NH) 1976.9.30.8 |
| Standard length (mm) | 58.3 | 47.8 | 49.1 | 50.2 | 59.4 |
| Depth of body | 34.8 | 35.6 | 35.0 | 33.7 | 34.2 |
| Width of body | 15.6 | 15.1 | 13.8 | 15.3 | 16.2 |
| Head length | 31.7 | 32.6 | 33.0 | 31.5 | 31.3 |
| Snout length | 8.2 | 7.3 | 8.6 | 7.6 | 7.6 |
| Diameter of orbit | 7.4 | 9.0 | 8.8 | 8.8 | 7.7 |
| Bony interorbital width | 7.5 | 7.5 | 7.5 | 7.8 | 7.6 |
| Length of maxilla | 16.3 | 15.7 | 14.9 | 15.7 | 15.5 |
| Least depth of caudal peduncle | 13.9 | 14.6 | 13.8 | 14.1 | 14.0 |
| Length of caudal peduncle | 13.7 | 16.9 | 14.9 | 16.3 | 14.8 |
| Predorsal length | 23.3 | 27.1 | 27.1 | 25.1 | 24.7 |
| Preanal length | 64.0 | 64.6 | 67.2 | 64.9 | 65.0 |
| Prepelvic length | 35.7 | 34.3 | 36.7 | 36.7 | 34.7 |
| Length of first dorsal spine | 2.6 | 3.3 | 4.5 | 3.6 | 6.1 |
| Length of second dorsal spine | 9.6 | 9.2 | 12.4 | 12.4 | 9.5 |
| Length of third dorsal spine | 11.7 | 13.8 | 11.4 | 12.9 | 13.5 |
| Length of tenth dorsal spine | 13.9 | 12.8 | 14.1 | 13.1 | 13.5 |
| Length of longest dorsal ray | 14.1 | 16.5 | 14.3 | 14.9 | 14.0 |
| Length of dorsal fin base | 65.4 | 63.2 | 62.3 | 63.1 | 62.8 |
| Length of first anal spine | 2.2 | 3.8 | 2.2 | 3.0 | 1.3 |
| Length of second anal spine | 6.0 | 7.1 | 5.7 | 5.4 | 5.2 |
| Length of third anal spine | 8.9 | 8.6 | 8.1 | 8.0 | 7.4 |
| Length of longest anal ray | 15.3 | 15.3 | 14.3 | 15.5 | 14.6 |
| Length of anal fin base | 18.0 | 16.5 | 16.5 | 16.1 | 15.3 |
| Length of pectoral fin | 27.8 | 32.0 | 29.7 | 31.1 | 26.4 |
| Length of pelvic spine | 11.8 | 13.4 | 13.4 | 13.7 | 14.3 |
| Length of pelvic fin | 39.3 | 32.4 | 34.4 | 41.4 | 51.7 |
| Length of caudal fin | 35.5 | 38.3 | 34.8 | 35.9 | 41.1 |
| Caudal concavity | 23.3 | 25.1 | 22.2 | 23.4 | 27.1 |

toral fin length 3.60 (3.13–3.99) in SL; pelvic fins rather long, 2.54 (1.65–3.09) in SL, reaching well beyond spinous portion of anal fin in four largest Maldive specimens and in larger Andaman Sea specimen.

Color in alcohol: light brown with no dark markings. Color of male holotype when fresh (from transparency): head and body orange, becoming reddish-orange dorsally; orange of ventral part of body suffused with lavender, especially just below pectoral fin; head light yellow ventrally; an orange stripe margined with lavender from tip of snout through lower part of eye to edge of operculum immediately anterior to upper pectoral fin base; a small red spot at pectoral fin base; iris orange and lavender ventrally, greenish dorsally; dorsal fin primarily bright red with violet distal margin; base of dorsal fin yellow from about third soft ray backwards, the extent of yellow increasing posteriorly (basal quarter of eleventh, basal half of fourteenth, and basal five-sixths of sixteenth soft rays yellow); anal fin lavender hyaline; caudal fin orange basally shading to red on lobes, becoming yellow centroposteriorly, with narrow violet upper and lower margins; pectoral fins orange-yellow; pelvic fins yellow, shading to lavender distally on filament. Color of female paratype (55.6 mm SL) similar but significantly less intense.

REMARKS. Known only from six specimens speared in the lagoon of North Male Atoll, Maldive Islands, and two specimens from the Similan Islands, Andaman Sea.

A. ignitus is most closely related to *A. dispar*, differing in lower though overlapping dorsal ray and scale counts, higher average number of upper-limb gill rakers, higher number of palatine teeth rows, and in color.

ETYMOLOGY. Named *ignitus* in reference to its flame-like hues.

Anthias bicolor

Figures 13 and 14, Tables 1–4

Anthias bicolor Randall 1979, p. 6, figs. 2 and 3 (type locality, Oahu, Hawaiian Islands).

DIAGNOSIS. Dorsal soft rays 16 to 18 (usually 17); anal soft rays 7 or 8 (rarely 8); pectoral rays 19 to 21 (rarely 21); lateral-line scales 57 to 64; circumpeduncular scales 31 to 33; no auxiliary scales; mandibles naked, snout with a naked zone anterior to eye containing nostrils; a row of small slender canine teeth along sides of jaws, those posteriorly inclined slightly forward; an inner band of villiform teeth in upper jaw and anteriorly in lower jaw; stout canines as described for the genus; vomerine teeth enlarged; gill rakers 11–12 + 26–29; one predorsal bone; no papillae on edge of orbit; three opercular spines; snout 3.4 to 4.3 in head; depth of body 2.7 to 3.0 in SL; soft portions of dorsal and anal fins scaled basally; origin of dorsal fin anterior to a vertical at upper end of gill opening; third dorsal spine prolonged in adult females, and second and third dorsal spines very prolonged in males, the tips fleshy; pelvic and caudal lobes filamentous, particularly in males.

Color in life: upper half of body yellow-orange, lower half lavender pink; males with tips of second and third dorsal spines yellow.

REMARKS. *A. bicolor* is the widest ranging species of the

subgenus. Randall (1979) reported specimens from the Hawaiian Islands (the only member of the subgenus at this locality), Marshall Islands, Loyalty Islands, New Guinea, Maldive Islands, and Mauritius in the depth range of 18 to 68 m.

The junior author collected two specimens [BM(NH) 1977.1.21.4–5, 39.9–42.3 mm SL] at Apo Island off Negros Oriental, Philippine Islands, in 45 m on 24 June 1976.

The largest specimen, BPBM 10173, 111 mm SL, was collected in Hawaii.

Anthias bartlettorum new species

Figures 15 and 16, Tables 1–4, 9

HOLOTYPE. BPBM 17981, male, 54.2 mm SL, MARSHALL ISLANDS, Kwajalein, outer reef off E nubuj Islet at southern end of atoll, upper end of 60° to 70° drop-off, 8 to 10 m, spear and quinaldine, J.E. Randall, 10 December 1974.

PARATYPES. AMS I.19218-001, 42.8 mm SL, MARSHALL ISLANDS, collected with holotype; BPBM 20449, 40.7 mm SL, collected with holotype; BM(NH) 1976.9.30.1, 47.7 mm SL, collected with holotype; CAS 37889, 40.3 mm SL, collected with holotype; USNM 216495, 52.4 mm SL, collected with holotype; BPBM 19969, 2: 53–61.4 mm SL, Marshall Islands, Kwajalein, 100 m NW of small boat passage at S end of atoll (just SE of E nubuj Islet), steep outer reef slope, 10 m, spear, J.E. Randall, 7 April 1976; LACM 35906-1, 51.8 mm SL, same data as preceding; MNHN 1976-125, 58.0 mm SL, same data as preceding.

DIAGNOSIS. Dorsal soft rays 17 or 18 (rarely 18); pectoral rays 20 or 21 (rarely 20); lateral-line scales 54 to 58; circumpeduncular scales 29 to 32; no auxiliary scales; mandibles naked; gill rakers 10 or 11 + 23–26; a row of moderate forward-projecting canine teeth on side of jaws; three to five rows of teeth on palatines at widest place; no papillae on edge of orbit; three opercular spines; snout 3.7 to 4.4 in head; body depth 2.9 to 3.1 in SL; second dorsal spine of males prolonged; dorsal and anal fins not scaled; colors of fresh specimens as in Figures 15 and 16.

DESCRIPTION. Dorsal rays X, 17 (17 or 18, only one fish with 18); anal rays III, 7; pectoral rays 21 (one paratype with 20 on one side), upper two unbranched; pelvic rays I, 5; principal caudal rays 15, upper and lower unbranched; lateral-line scales 55 (54–58); scales above lateral line to origin of dorsal fin 8 (8–9); scales below lateral line to origin of anal fin 23 (21–25); circumpeduncular scales 30 (29–32); gill rakers 11 + 23 (10–11 + 24–26); branchiostegal rays 7; vertebrae 26; predorsal bones 1 or 2.

Body somewhat elongate, the depth 2.93 (2.88–3.05) in SL; body moderately compressed, the width 2.20 (2.04–2.16) in depth; head length 3.27 (3.08–3.19) in SL; snout 4.03 (3.67–4.43) in head; front of upper lip of males thickened, somewhat pointed, and freely movable dorsoventrally; diameter of orbit 3.86 (3.30–3.64) in head; posterior edge of orbit without fleshy papillae; interorbital space convex, the bony width 3.86 (4.00–4.23) in head; least depth of caudal peduncle 2.27 (2.32–2.38) in head.

Mouth oblique and moderately large, the maxilla reaching to



Figure 13. *Anthias bicolor* Randall, male, 99.2 mm SL, BPBM 10146. Hawaiian Islands.



Figure 14. *Anthias bicolor* Randall, female, 83.5 mm SL, BPBM 10173, Hawaiian Islands.

or posterior to a vertical at rear edge of pupil; mouth terminal except on large males where it is slightly inferior due to hypertrophy of upper lip; posterior end of maxilla rounded, the greatest depth 1.4 in orbit of holotype; no supplemental maxillary bone. Upper jaw with a band of villiform teeth, the band broader anteriorly, the teeth at the front enlarged; two large canine teeth anteriorly on each side of upper jaw (one laterally at front of jaw, perpendicular in jaw and not curved, and a smaller slightly curved one that lies nearly flat at posterior edge of the anterior band of villiform teeth); an outer row of enlarged teeth (15 on holotype) on side of jaw, the more posterior ones inclined forward and outward; lower jaw with a patch of villiform teeth anteriorly, the front ones enlarged; two large curved canine teeth on each side of lower jaw (one laterally at front of jaw, inclined outward, and the other about one-third back in jaw, curved slightly posteriorly); a row of moderate canines (11 to 13 on holotype) on side of jaw posterior to second large canine; vomer with small teeth; palatines with a patch of villiform teeth in three to five irregular rows at broadest place; tongue pointed, the upper surface with scattered very small pa-

pillae. Gill membranes free from isthmus. Gill rakers slender and long (largest 1.3 in orbit of holotype), notably longer than gill filaments (longest gill filament of first gill arch of holotype contained 1.5 in longest raker).

Opercle with three flattened spines, the central one the largest and most posterior, the upper slightly anterior to lower; two lower spines acute, the upper obtuse and indistinct; distance between tips of two lower spines about one-third to one-quarter the distance between central and upper spines; lower margin of preopercle smooth; rounded corner and upper margin serrate (19 serrae on holotype).

Anterior nostril a short membranous tube (higher dorsoposteriorly), directly anterior to middle of eye about half the distance from edge of orbit to edge of groove separating upper lip from rest of snout; posterior nostril diagonally upward and posterior to anterior nostril, with little or no rim, and large, the greatest diameter of opening about equal to distance between nostrils, 7.2 in orbit of holotype.

Scales ctenoid, no auxiliary scales on body; head scaled except mandibles, throat and gill membranes, lips, extreme front

of snout, and a broad zone on side of snout anterior to center of eye that includes nostrils in its upper part; dorsal and anal fins naked, caudal fin with small scales more than three-fourths distance to posterior margin; pectoral fins with small scales on basal third or more of fin; pelvic fins with small scales near base.

Lateral line a smooth curve following contour of back, the last pored scale slightly anterior to end of hypural plate. Some pores of cephalic lateralis system obscured by scales. Prominent are a pore in front of anterior nostril, one between nostrils,

a series near edge of orbit around posterior half of eye extending into suborbital and preorbital region, and a mandibular series beginning at end of lower margin of preopercle.

Origin of dorsal fin nearer a vertical at upper end of preopercular margin than upper end of gill opening; second dorsal spine of females 5.81–6.67 in SL; second dorsal spine of males prolonged, 2.95 (2.68–3.57) in SL; longest dorsal soft ray 1.80 (1.89–2.44) in head; third anal spine 3.02 (3.15–3.47) in head; longest anal soft ray 1.75 (1.86–2.16) in head; caudal fin lunate, the lobes filamentous, the caudal concavity 7.13 (6.29–

Table 9. Proportional measurements of type specimens of *Anthias bartlettorum* expressed as a percentage of the standard length.

| | Holotype | | Paratypes | | |
|--------------------------------|---------------|--------------|---------------|-----------------------|----------------|
| | BPBM 17981 | CAS 37889 | BPBM 20449 | BM(NH) 1976.9.30.1 | USNM 216495 |
| Standard length (mm) | 54.2 | 40.3 | 40.7 | 47.7 | 52.4 |
| Depth of body | 34.1 | 34.7 | 33.7 | 34.6 | 32.8 |
| Width of body | 15.5 | 16.1 | 16.5 | 16.8 | 15.3 |
| Head length | 30.6 | 32.5 | 32.4 | 32.3 | 31.3 |
| Snout length | 7.6 | 7.4 | 7.4 | 8.8 | 7.1 |
| Diameter of orbit | 7.9 | 9.2 | 9.8 | 9.0 | 8.6 |
| Bony interorbital width | 7.9 | 7.7 | 8.1 | 8.0 | 7.8 |
| Length of maxilla | 16.6 | 15.4 | 15.7 | 16.4 | 16.8 |
| Least depth of caudal peduncle | 13.5 | 14.1 | 14.0 | 13.6 | 13.8 |
| Length of caudal peduncle | 13.5 | 13.9 | 13.0 | 13.2 | 13.1 |
| Predorsal length | 24.7 | 26.6 | 26.8 | 7.9 | 24.8 |
| Preanal length | 64.2 | 66.7 | 64.1 | 64.4 | 66.2 |
| Prepelvic length | 33.9 | 37.2 | 34.9 | 37.7 | 36.5 |
| Length of first dorsal spine | 8.9 | 5.7 | 6.9 | 8.2 | 6.7 |
| Length of second dorsal spine | 33.9 | 17.1 | 15.0 | 37.3 | 17.2 |
| Length of third dorsal spine | 8.5 | 9.4 | 10.1 | 9.2 | 8.4 |
| Length of tenth dorsal spine | 12.0 | 11.7 | 11.5 | 12.2 | 11.5 |
| Length of longest dorsal ray | 17.0 | 15.9 | 13.3 | 17.2 | 13.5 |
| Length of dorsal fin base | 64.6 | 63.8 | 64.6 | 64.4 | 62.2 |
| Length of first anal spine | 4.1 | 3.7 | 3.7 | 3.6 | 3.4 |
| Length of second anal spine | 7.6 | 8.9 | 8.1 | 7.5 | 7.8 |
| Length of third anal spine | 10.1 | 9.4 | 9.3 | 9.6 | 9.9 |
| Length of longest anal ray | 17.5 | 15.4 | 15.5 | 17.4 | 14.5 |
| Length of anal fin base | 17.9 | 18.1 | 17.0 | 18.0 | 16.2 |
| Length of pectoral fin | 29.0 | 31.8 | 31.0 | 30.0 | 28.1 |
| Length of pelvic spine | 15.9 | 14.4 | 15.5 | 14.3 | 14.3 |
| Length of pelvic fin | 34.1 | 28.8 | 29.7 | 41.5 | 26.5 |
| Length of caudal fin | 42.8 | 36.7 | 38.6 | 47.0 | 36.1 |
| Caudal concavity | 28.8 | 22.6 | 23.6 | 21.1 | 24.1 |

8.33) in SL; pectoral fin length 3.45 (3.14–3.56) in SL; pelvic fins long in males, 2.93 (2.33–2.70) in SL, reaching beyond spinous portion of anal fin; pelvic fins shorter in females, 3.37–3.77 in SL, reaching beyond anus but not to anal fin origin.

Color in alcohol: pale with no dark markings. Color of male holotype when fresh (from transparency): body mainly lavender, becoming lighter ventrally; upper part of body posterior to third or fourth dorsal spines increasingly bright yellow until, at caudal peduncle, the dorsal half is yellow; a short yellow bar over dorsal half of body below eighth and ninth dorsal spines; head lavender, shading to reddish dorsally and pale yellowish ventrally; dusky orange band from tip of snout through lower part of eye, then passing obliquely downward onto preoperculum, fainter posteriorly; iris dusky orange; dorsal fin anterior to fourth or fifth spines lavender with exception of yellow distal half of second spine, remainder bright yellow; anal fin pale lavender with a broad reddish margin on anterior part of fin to fourth soft ray; caudal fin bright yellow, less intense towards concavity, with violet upper and lower margins; pectoral fins hyaline; pelvic fins pale lavender with a broad reddish anterior margin.

Color of 40.7-mm-SL female paratype (BPBM 20449) when fresh (from transparency): upper two-fifths of head and body bright yellow; rest of body abruptly lavender, becoming lighter over abdomen and thorax; postorbital part of head lavender just below dorsal yellow zone, soon shading to whitish ventrally; a dusky orange band from tip of snout through lower part of eye, then passing obliquely downward onto preoperculum, fainter posteriorly; iris dusky orange; dorsal fin yellow, with exception of first and second spines and tips of other spines, which are lavender; anal fin pale lavender; caudal fin yellow, less intense toward concavity, with violet upper and lower margins; pectoral fins hyaline; pelvic fins pale lavender.

REMARKS. This species is known only from the atoll of Kwajalein in the Marshall Islands, though doubtless it will turn up elsewhere in Oceania.

ETYMOLOGY. Named *bartlettorum* in honor of Nathan and Patricia Bartlett, formerly of Kwajalein, Marshall Islands, whose underwater photos of this fish first revealed its existence.

Anthias regalis new species

Figures 17 and 18, Tables 1-4, 10

HOLOTYPE. BPBM 11686, male, 55.2 mm SL, MARQUESAS ISLANDS, Fatu Hiva, just NE of Matahuma Point, rocky bottom with some live coral, 12.5 m, quinaldine, J.E. Randall, 18 April 1971.

PARATYPES. BPBM 11811, 8: 38.8–62.3 mm SL, MARQUESAS ISLANDS, Fatu Hiva, just off point at N end of Hanau Bay, bottom mainly rock, 28–30.5 m, rotenone, J.E. Randall, D.B. Connoy, and R.M. McNair, 21 April 1971; AMS I.19220-001, 42.1 mm SL, same data as preceding; CAS 37887, 60.6 mm SL, same data as preceding; LACM 35903-1, 44.5 mm SL, same data as preceding; MNHN 1976-124, 46.3 mm SL; same data as preceding; USNM 216496, 47.3 mm SL, same data as preceding; BPBM 11026, 5: 23.9–52.3 mm SL, Marquesas Islands, Ua Pou, S side of Vaeho Bay off entrance to

large cave, 0–10 m, rotenone, J.E. Randall, D.B. Cannoy, G.S. Haywood, and J.D. Bryant, 29 April 1971; BPBM 12442, 9: 24.1–48.3 mm SL, Marquesas Islands, Ua Huka, S side of Takatai, rocky area near sand, 27–30 m, rotenone, J.E. Randall, J.R. Haywood, and R.M. McNair, 7 May 1971; BPBM 12751, 58.6 mm SL, Marquesas Islands, Nuku Hiva, W side of Sentinelle de l'Est, steep rocky slope, no sand, quinaldine, J.E. Randall and D.B. Cannoy, 17 May 1971; BM(NH) 1976.9.30.11, 52.0 mm SL, same data as preceding.

DIAGNOSIS. Dorsal soft rays 17 or 18 (usually 17); pectoral rays 21 or 22 (rarely 22); lateral-line scales 56 to 62; circum-peduncular scales 32 to 36; no auxiliary scales; mandibles naked; gill rakers 10–12 + 24–28; a row of moderate forward-projecting canine teeth on side of jaws; two rows of teeth on palatines at widest place; no papillae on edge of orbit; three opercular spines; snout 3.5 to 4.8 in head; body depth 2.6 to 3.1 in SL; second dorsal spine prolonged in adult females, greatly prolonged in males; dorsal and anal fins not scaled; colors of fresh specimens as in Figures 17 and 18.

DESCRIPTION. Dorsal rays X, 17 (17 or 18, usually 17); anal rays III, 7; pectoral rays 21 (21 or 22, rarely 22), upper two and occasionally lower unbranched; pelvic rays I, 5; principal caudal rays 15, upper and lower unbranched; lateral-line scales 57 (56–62); scales above lateral line to origin of dorsal fin 9 (9–11); scales below lateral line to origin of anal fin 27 (26–31); circum-peduncular scales 34 (32–36); gill rakers 11 + 25 (10–12 + 24–28); branchiostegal rays 7; vertebrae 26; predorsal bones 1.

Body somewhat elongate, the depth 2.87 (2.56–3.10) in SL; body moderately compressed, the width 2.50 (2.01–2.53) in depth; head length 3.32 (2.94–3.16) in SL, snout 4.36 (3.52–4.79) in head, the front of upper lip of males thickened, pointed, freely movable dorsoventrally, and relatively long (0.3 in orbit of holotype); diameter of orbit 3.67 (2.87–4.05) in head; posterior edge of orbit without fleshy papillae; interorbital space convex, the bony width 3.96 (3.85–4.37) in head; least depth of caudal peduncle 2.28 (2.26–2.93) in head.

Mouth oblique and moderately large, the maxilla reaching to or posterior to a vertical at rear edge of pupil; mouth terminal except on large males where it is slightly inferior due to hypertrophy of upper lip; posterior end of maxilla rounded, the greatest depth 1.5 in orbit of holotype; no supplemental maxillary bone. Dentition generally as for *A. bartlettorum*, but only two irregular rows of villiform teeth on palatines at broadest place; tongue pointed, the upper surface with scattered very small papillae. Gill membranes free from isthmus. Gill rakers slender and long (largest 1.45 in orbit of holotype), notably longer than gill filaments (longest gill filament of first arch of holotype contained 1.41 in longest raker).

Opercle with three flattened spines, the central one the largest and most posterior, the upper slightly anterior to lower; two lower spines acute, the upper obtuse and indistinct; distance between tips of two lower spines about two-thirds the distance between central and upper spines; lower margin of preopercle smooth; rounded corner and upper margin serrate (19 serrae on holotype; serrae increase in number with size; only 8 on 24.1-mm paratype and 20 on 62.3-mm paratype). The 24.1-mm paratype has two enlarged serrae at the corner of preopercle,

Figure 15. *Anthias bartlettorum*, holotype, male, 54.2 mm SL, BPBM 17981, Marshall Islands.



Figure 16. *Anthias bartlettorum*, paratype, female, 40.7 mm SL, BPBM 20449, Marshall Islands.



especially the lowermost, which extends slightly beyond posterior margin of operculum; one large spine on interopercle; this fish is clearly transforming from the prejuvenile stage.

Anterior nostril in a short membranous tube (higher dorso-posteriorly) directly anterior in middle of eye about half the distance from edge of orbit to edge of groove separating upper lip from rest of snout; posterior nostril diagonally upward and posterior to anterior nostril, with little or no rim, and large, the greatest diameter of opening about equal to distance between nostrils, 6.43 in orbit of holotype.

Scales ctenoid; no auxiliary scales on body; head scaled except mandibles, throat and gill membranes, lips, extreme front of snout, and a broad zone on side of snout anterior to center of eye that includes nostrils in its upper part; small juveniles clearly show five diagonal rows of scales on cheek between orbit and corner of preopercle (plus a single scale as a sixth row just

above upper posterior corner of maxilla); in larger individuals, small scales develop between the orbit and the larger scales and near the margin of the preopercle becoming progressively larger; dorsal and anal fins naked; caudal fin with small scales more than three-fourths distance to posterior margin; pectoral fins with small scales on basal third or more of fin; pelvic fins with small scales basally along rays.

Lateral line a smooth curve following contour of back, the last pored scale slightly anterior to end of hypural plate. Some pores of cephalic lateralis system obscured by scales. Prominent are a pore in front of anterior nostril, one between nostrils, one medial to nostrils, two close together in interorbital space above front of eye, a series near edge of orbit around posterior half of eye, about 12 scattered pores between upper margin of opercle and posterior margin of eye, six on suborbital and pre-orbital region anterior to a vertical through center of eye, and



Figure 17. *Anthias regalis*, holotype, male, 55.2 mm SL, BPBM 11686, Marquesas Islands.



Figure 18. *Anthias regalis*, paratype, female, 37 mm SL, BPBM 12442, Marquesas Islands.

six in a mandibular series beginning at end of lower margin of preopercle (last two on chin close together).

Origin of dorsal fin on a vertical through posterior margin of preopercle; second dorsal spine prolonged in adult females, the length 7.04–10.99 in SL for females, much more prolonged in males, 3.13 (2.58–3.52) in SL; longest dorsal soft ray 2.01 (1.82–2.16) in head; third anal spine 3.14 (3.14–3.58) in head; longest anal soft ray 1.57 (1.56–1.95) in head; caudal fin lunate, the lobes filamentous, the caudal concavity 6.71 (4.54–7.63) in SL; pectoral fin length 3.42 (3.11–3.60) in SL; pelvic fins long, 1.98 (1.93–3.70) in SL, reaching to between anus and anal fin origin in smaller females, to spinous portion of anal fin in larger females, and well beyond spinous portion of anal fin in males.

Color of adults and large juveniles in alcohol: pale with no dark markings (23.9- and 24.1-mm specimens each have a dark

spot in spinous dorsal fin; upper half of body of former darker than lower half). Color of male holotype when fresh (from transparency): dorsal part of head and body anterior to a diagonal from base of approximately ninth dorsal spine to upper pectoral base orange-yellow; remainder of head and body heliotrope, lighter ventrally, with a suffusion of red dorsally and posteriorly; body scales in anterior heliotrope region with light centers; a faint pinkish-orange band with lavender edges from tip of snout through lower part of eye onto preopercle immediately anterior to pectoral fin base (diagonal postorbital part of band broader and fainter); iris pinkish brown; dorsal fin pale lavender with violet distal margin on soft portion; anal fin lavender hyaline with light blue distal margin on anterior half of soft portion; caudal fin reddish basally, becoming yellowish posteriorly, with violet upper and lower margins and red filaments; paired fins pale lavender, the pelvics with a light blue anterior

margin. A color photo of a living male taken underwater by the senior author displays brighter and more contrasting colors of heliotrope and orange-yellow than Figure 17. Color of a 37-mm female when fresh (from transparency): golden orange-yellow, shading to reddish-orange anteriorly on head, to pale lavender ventrally on head, thorax, and abdomen, and suffused with red posteriorly; an orange-red band from tip of snout to lower eye continuing as a broader diagonal orange band edged in lav-

ender onto preopercle, ending at level of upper pectoral base; iris golden; dorsal fin yellowish basally, shading to light red outwardly; anal fin light orangish; caudal fin red, becoming yellowish centroposteriorly; pectoral fins pale pinkish with a large light reddish triangle at base; pelvic fins pale lavender.

REMARKS. Known only from the Marquesas Islands where it is abundant in its rocky bottom habitat at depths of less than 10 to at least 30 m.

Table 10. Proportional measurements of type specimens of *Anthias regalis* expressed as a percentage of the standard length.

| | Holotype | | Paratypes | | |
|--------------------------------|---------------|---------------|---------------|----------------|---------------|
| | BPBM 11686 | BPBM 12442 | BPBM 12442 | USNM 216496 | BPBM 12751 |
| Standard length (mm) | 55.2 | 24.1 | 36.7 | 47.3 | 58.6 |
| Depth of body | 34.8 | 39.0 | 33.2 | 32.3 | 35.2 |
| Width of body | 13.9 | 15.4 | 15.8 | 16.1 | 15.9 |
| Head length | 30.1 | 34.0 | 32.7 | 33.2 | 31.6 |
| Snout length | 6.9 | 7.1 | 9.3 | 7.6 | 7.3 |
| Diameter of orbit | 8.2 | 11.2 | 11.4 | 9.7 | 7.8 |
| Bony interorbital width | 7.6 | 8.7 | 8.2 | 7.6 | 8.2 |
| Length of maxilla | 15.2 | 14.9 | 15.5 | 15.6 | 16.7 |
| Least depth of caudal peduncle | 13.2 | 11.6 | 12.8 | 13.1 | 14.0 |
| Length of caudal peduncle | 15.6 | 14.1 | 14.2 | 12.7 | 14.3 |
| Predorsal length | 24.1 | 31.1 | 28.9 | 26.8 | 24.4 |
| Preanal length | 62.7 | 63.9 | 64.3 | 67.9 | 67.6 |
| Prepelvic length | 33.5 | 36.5 | 33.2 | 37.6 | 38.9 |
| Length of first dorsal spine | 7.8 | 4.6 | 4.1 | 5.3 | 8.9 |
| Length of second dorsal spine | 31.9 | 9.1 | 14.2 | 13.3 | 38.7 |
| Length of third dorsal spine | 11.2 | 12.4 | 11.4 | 12.9 | 10.6 |
| Length of tenth dorsal spine | 10.1 | 10.8 | 11.4 | 11.0 | 10.6 |
| Length of longest dorsal ray | 15.0 | 15.8 | 15.5 | 15.4 | 17.4 |
| Length of dorsal fin base | 63.9 | 63.1 | 62.9 | 62.2 | 63.0 |
| Length of first anal spine | 2.9 | 7.1 | 3.5 | 3.8 | 3.1 |
| Length of second anal spine | 7.8 | 14.9 | 9.5 | 9.1 | 7.8 |
| Length of third anal spine | 9.6 | 9.5 | 10.4 | 9.7 | 9.6 |
| Length of longest anal ray | 19.2 | 17.4 | 18.8 | 18.4 | 20.3 |
| Length of anal fin base | 16.8 | 19.1 | 18.3 | 18.4 | 16.6 |
| Length of pectoral fin | 29.2 | 30.3 | 32.2 | 30.9 | 27.8 |
| Length of pelvic spine | 14.9 | 16.6 | 14.7 | 14.0 | 13.8 |
| Length of pelvic fin | 50.5 | 27.0 | 28.1 | 31.9 | 51.9 |
| Length of caudal fin | 51.1 | 34.0 | 37.9 | 36.4 | 52.0 |
| Caudal concavity | 36.2 | 12.0 | 22.6 | 23.3 | 38.9 |

ETYMOLOGY. Named *regalis* in reference to the majestic colors displayed by both sexes.

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