

## THE ENDEMIC SULAWESI FISH GENUS *LAGUSIA* (TELEOSTEI: TERAPONTIDAE)

**Richard P. Vari**

Division of Fishes Smithsonian Institution, PO BOX 37012  
National Museum of Natural History, WG-14, MRC 159  
Washington, D.C. 20013-7012 USA  
Email: varir@si.edu

**Renny Kurnia Hadiaty**

Museum Zoologicum Bogoriense (MZB), Ichthyology Laboratory  
Zoology Division of Research Center for Biology, Indonesian Institute of Sciences (LIPI)  
Jl. Raya Bogor Km 46, Cibinong 16911, Indonesia  
Email: renny\_hadiaty@yahoo.com

**ABSTRACT.** — *Lagusia micracanthus*, originally described from three specimens collected in a river near Lagusi in southern Sulawesi, is redescribed in detail based on an extensive series of specimens ranging from small juveniles through adults, and its phylogenetic position is reevaluated. Information on life colouration, habitat, and ontogenetic transitions in dark pigmentation in small juveniles through adults is provided for the first time. Females of the species have ripe ovaries with large numbers of well-developed eggs by at least 56 mm SL and the species thus matures at one of the, if not the, smallest body sizes in the Terapontidae.

**KEY WORDS.** — *Datnia*, Sulawesi, life history, redescription

---

### INTRODUCTION

Bleeker (1860) described *Datnia micracanthus* based on three specimens collected at “Lagusi in fluviis” [= Lagusi, in rivers] of southwestern Celebes [= Sulawesi]. That author subsequently used the same limited sample (Bleeker, 1873, 1876) to redescribe the species in somewhat more detail and accompanied the 1876 publication with a drawing of a specimen. In his 1873 paper, Bleeker transferred the species to *Therapon* where it remained until 1931 when different authors undertook dramatically divergent actions concerning that species. Weber & de Beaufort (1931) following the classification of Weber (1894) retained the species as distinct and endemic to southern Sulawesi. Fowler (1931, 1934) alternatively proposed that *Therapon trimaculatus* of Macleay (1883) and *T. habbema* of Weber (1910) were junior synonyms of *Datnia micracanthus* (the *Therapon micracanthus* of Fowler, 1931, 1934). By way of that action, Fowler significantly extended the purported range of the species beyond southern Sulawesi to include much of southern New Guinea. Munro (1958) followed Fowler’s concept of a broadly distributed *T. micracanthus*, and transferred the species to *Papuservus*. A decade later, Munro (1967) recognised a distinct *Papuservus trimaculatus*, but did not comment on the status of the nominal species originally proposed as *Datnia micracanthus* that both Fowler (1931, 1934) and Munro (1958) considered conspecific with

*Papuservus trimaculatus*. Mees (1971) briefly commented on the separation of *Therapon trimaculatus* from what he termed *Therapon micracanthus*. In his phylogenetic analysis of the Terapontidae, Vari (1978) found that these two nominal species were not closely related and that the topology of the tree and available generic names necessitated the creation of a new genus, *Lagusia*, for *Datnia micracanthus*. That author also provided a redescription *L. micracanthus* based on a limited number of specimens.

Information in the various species-accounts during the last 15 decades was based on a few samples of *Lagusia micracanthus*, all of which consisted of adults or near adults. These limited samples made it impossible to describe the ontogenetic shifts in the species in detail and restricted the study of various phylogenetically significant character systems. Similarly, nothing was known about the life history of this species or the habitats that it occupies. Recent collecting activities in the Abbalu, Kasikebo, Patunuang, Bantimurung, Saripa, and Leang-Leang rivers and also Manjali Spring of southwestern Sulawesi yielded an excellent series of specimens of *Lagusia micracanthus*. These samples not only permit a detailed redescription of the species based on a size range from smaller juveniles to larger adults, but also provide the first information on life history, life colouration, and age at maturity for the species and yield additional information as to its phylogenetic relationships.

## MATERIAL AND METHODS

Specimens reported on in this paper are deposited in Museum Zoologicum Bogoriense (MZB); National Museum of Natural History (USNM); and Zoological Reference Collection (ZRC) of the Raffles Museum of Biodiversity Research (RMBR). Abbreviations in the text are head length (HL) and standard length (SL). Values in parentheses indicate the number of examined specimens with a particular count with counts and measurements following Vari (1978).

## TAXONOMY

### *Lagusia* Vari, 1978

*Lagusia* Vari, 1978: 523.

**Type species.** — *Datnia micracanthus* Bleeker, 1860; by original designation.

**Diagnosis.** — The presence of stripes on the body in small to mid-sized specimens and the lack of a direct attachment of the extrinsic swimbladder muscle to the rear of the neurocranium serve in combination to delimit *Lagusia* from all other genera of the Terapontidae. *Lagusia* is furthermore delimited externally from other members of the family by the distinctive pattern of dark pigmentation on the caudal fin in mid- and large-sized specimens consisting of a dark basal bar continuous ventrally with a band of dark pigmentation extending along the ventral rays of the lower lobe of the caudal fin (Fig. 1).

**Phylogenetic placement.** — Vari (1978: Fig. 9) proposed that *Lagusia* was a relatively basal member of the Terapontidae (the Teraponidae of that study), but that hypothesis was complicated by the lack of cleared and stained preparations of the species. Dissections and examination of two cleared and stained specimens in this analysis have confirmed the presence in the genus of the characters supporting that placement of the genus within that phylogeny (see character summaries in Vari, 1978). Of particular note is the presence in the genus of the well developed extrinsic swimbladder muscle running anteriorly to the posttemporal, a feature synapomorphic for the family. The muscle in *Lagusia* is a simple mass with an attachment anteriorly to the posterior of the posttemporal common across the Terapontidae, but lacking the medial connective tissue attachment of the anterior part of the muscle and the posterior of the neurocranium present in the majority of genera of the Terapontidae. The absence of this medial connective tissue band is limited to five basal genera in the family, all of which interestingly are restricted to brackish and freshwaters of Australia, New Guinea and Sulawesi, contrary to the broader distribution of the rest of the Terapontidae, many species of which are broadly distributed in marine waters from East Africa to Fiji.

### *Lagusia micracanthus* (Bleeker, 1860)

(Figs. 1, 2)

*Datnia micracanthus*: Bleeker, 1860: 55 (original description; type locality: Celebes [= Sulawesi], Lagusi in fluviis [= Lagusi, in rivers]).

*Therapon (Datnia) micracanthus*: Bleeker, 1873: 388 (shift to genus *Therapon*; based on type series; Lagusi, in rivers)—Bleeker, 1873–1876: 117, pl. 62, Fig. 1 (Celebes, Lagusi in rivers).

*Therapon micracanthus*: Weber, 1894: 408, 434, 447 (Celebes: Amparang Fluss, südlich von Balangnipa; Fluss Minralang bei Tempe, Fluss Tjenrana bei Pampanua); Weber & de Beaufort, 1931: 153 (Celebes: same locations as Weber, 1894); Mees, 1971: 218 (meristics; comments on taxonomy of Fowler [1931, 1934] and species distribution).

*Terapon micracanthus*: Fowler, 1931: 342 (in part; prior citations of *Datnia micracanthus*; not synonymy of *Therapon trimaculatus* Macleay, and *Therapon habbemai* Weber, into *Terapon micracanthus*; not species description or cited occurrence of species in southern drainages of New Guinea); Fowler, 1934: 416 (in part; original record of *Datnia micracanthus*; not synonymy of *Therapon trimaculatus* Macleay, and *Therapon habbemai* Weber, into *Terapon micracanthus*; not occurrence in Goldie River, New Guinea; not cited maximum length).

*Papuservus micracanthus*: Munro, 1958: 170 (in part; not synonymy of *Therapon trimaculatus* Macleay, and of *Therapon habbemai* Weber, into *Papuservus micracanthus*; not cited occurrence in Goldie, Lorentz, Mimika, and Fly Rivers of New Guinea).



Fig. 1. *Lagusia micracanthus*; Indonesia, Sulawesi, South Sulawesi. Top: MZB 17913, 25.9 mm SL; Sungai Saripa, Samanggi village, Simbang District, (04°02'34.3"S, 119°42'10.9"E); Center: MZB 17915, 59.8 mm SL; Sungai Leang-leang, Kalabirang village, Bantimurung District (04°58'18.2"S, 119°40'53.4"E); Bottom: MZB 17912, 74.0 mm SL; Sungai Patunuang, Samanggi village, Simbang District (05°02'33"S, 119°42'25"E).

*Lagusia micracanthus*: Vari, 1978: 247, Fig. 42 (redescription based on syntypes; southern peninsula of Sulawesi; transfer to *Lagusia*)—Kottelat et al., 1993: 107, pl. 51 (meristics; Sulawesi).

**Diagnosis.** — As for the genus.

**Description.** — Dorsal-fin spines 11 (1, very small individual), 12 (4), or 13 (18). Dorsal-fin rays 9 (17) or 10 (4). Anal-fin spines 3 (23). Anal-fin rays 7 (1), 8 (15), or 9 (6). Pectoral-fin rays 14 (5) or 15 (16). Pelvic-fin with one spine and 5 (22) rays.

Lateral-line scales to hypural flexion 39 (4), 40 (7), 41 (5), 42 (3), 43 (2), or 44 (1). Lateral line arched from origin to middle of caudal peduncle and straight from that point to terminus on caudal fin. Scale-rows above lateral line to base of sheath along base of dorsal fin 5 (15) or 6 (7). Scale-rows below lateral line to base of sheath along anal fin 10 (6), 11 (10), or 12 (7). Caudal fin with 4 to 6 pored scales located beyond hypural joint; number of such scales increasing with body size. Sheet of smaller scales extending from rear of body scales across caudal-fin rays; proportion of fin covered by scales increasing with body size. Only basal portion of caudal fin covered by scales in smallest examined specimens (ca. 25 mm SL) but approximately two-thirds of dorsal and ventral fin-rays covered by scales in largest examined specimens and with shorter middle rays overlapped by fewer series of scales. Sheath at base of spinous portion of dorsal fin formed by 1 row of scales. Scale series proceed posteriorly onto base of rayed portion of fin as series of 2 or 3 continuous scale rows that terminate at base of second or third dorsal-fin ray. Portion of sheath situated posterior of that point limited to separate series of scales on membranes between adjoining rays. Sheath at base of anal fin formed of 2 or 3 series of scales; 3 series of scales, when present, limited to posterior reaches of continuous portion of sheath. Continuous sheath extends across base of spines and anterior rays to between bases of fourth and fifth fin rays. Fin membranes posterior of that point in larger specimens covered with discrete series of up to 3 scales between adjacent rays. Predorsal scales to occiput 10 (6), 11 (10) or 12 (6). Cheek scales in 3 or 4 rows. Gill rakers on first arch 4–5+1+15–16. Vertebrae 10+15.

Reaching 115 mm SL (Weber & de Beaufort, 1931: 154). Greatest body depth 36.8–41.1% of SL. Distance from dorsal-fin origin to snout 43.0–46.5% of SL. Head length 31.2–36.2% of SL. Length of base of dorsal fin 48.2–52.0% of SL. Length of base of anal fin 15.8–21.2% of SL. Snout length 32.3–37.0%



Fig. 2. Life colouration of *Lagusia micracanthus*, 50.5 mm SL, Sungai Kasikabo, Kalabirang village, Maros District.

of HL, with snout proportionally shorter in smaller specimens. Eye width 28.8–33.9% of HL, with eye proportionally larger in smaller specimens. Length of postorbital portion of head 37.4–41.0% of HL. Jaw length 27.9–30.8% of HL. Length of longest dorsal-fin spine 15.7–19.8% of SL. Length of longest dorsal-fin ray 14.0–18.8% of SL. Length of longest anal-fin spine 12.0–16.6% of SL. Length of longest anal-fin ray 14.8–18.4% of SL. Length of pelvic fin 24.8–31.0% of SL. Length of pectoral fin 19.9–24.8% of SL.

Body compressed laterally, more so in smaller individuals; moderately deep, more so in gravid females. Dorsal profile of body more arched than ventral profile. Dorsal profile of head slightly convex from margin of upper lip to vertical through anterior margin of orbit and then nearly straight to rear of head. Dorsal profile of body convex from rear of supraoccipital spine to dorsal-fin origin and then slightly less convex from that point to beginning of caudal peduncle. Ventral profile of head nearly straight to isthmus. Ventral profile of body gently to distinctly convex to anus; convexity more pronounced in larger individuals, particularly in gravid females.

Jaws equal in length or upper jaw slightly longer than lower jaw. Gape slightly oblique. Maxilla reaching to vertical through anterior margin of orbit. Teeth in each jaw recurved with outer series enlarged. Cleared and stained specimens of approximately 60 mm SL with three rows of teeth in medial region of upper jaw and four rows proximate to symphysis of lower jaw. Inner tooth rows less extensive posteriorly, with outer row of teeth in both jaws extending distinctly beyond posterior limit of inner tooth rows.

Nostrils on each side well separated, with posterior nostril located proximate to anterior margin of orbit. Margin of preopercle serrate with serrations most pronounced along posteroventral angle and posterior border. Serrations proportionally larger in smaller specimens. Lower opercular spine longer and stronger than upper spine, not extending beyond margin of opercular lobe. Posttemporal largely covered with scales, with smooth exposed posterior margin. Cleithrum exposed and slightly serrate posteriorly, with scales over lateral surface of posterior portion of ossification. Supracleithrum covered by scales.

Margin of spinous dorsal fin arched. Spines robust, with first spine very short, fifth to eighth spines longest. Following spines decrease gradually in length to penultimate spine, with ultimate spine slightly longer than penultimate spine. Longest dorsal-fin spine shorter than longest dorsal-fin ray in specimens of all sizes, but with length disparity more pronounced in smaller individuals. Posterior margin of rayed dorsal fin slightly convex. Anal-fin spines, particularly second spine, robust. Second spine longest but only three-quarters length of longest anal-fin ray in larger individuals and approximately one-half length of that ray in smallest examined individuals. Distal margin of rayed portion of anal fin ranging between slightly and distinctly convex. Pectoral fin asymmetrically pointed; fourth and fifth rays longest. Pelvic fin pointed. Medial branch of first pelvic-fin ray longest, extending distally beyond margin of remainder of fin to varying degrees in all but smallest specimens. Tip of pelvic fin extends to beyond anal-fin origin in specimens of up to approximately 70



mm SL, proportionally shorter and falling short of anus in larger examined individuals.

**Colouration in life.** — Based on series of photographs of adults in aquaria shortly after capture (Fig. 2). Brown and black pigmentation as in preserved specimens. Overall colouration of head and body silvery and darker dorsally. Silvery colouration intense on portion of head posterior, ventral, and anteroventral of orbit and on portion of snout ventral of dark stripe along snout. Iris intensely silver coloured. Body with silvery colouration most intense ventral to lateral line. Yellowish colouration present on basal and central portions of dorsal and ventral lobes of caudal fin, spinous and to lesser degree rayed parts of dorsal fin, spinous and rayed portions of anal fin, and middle and distal portion of pelvic fin.

**Colouration in preservative.** — Overall dark pigmentation pattern highly variable ontogenetically and described in the following for each available major size group and divided between head, body and fins (Fig. 1).

Head in specimens of approximately 16 mm SL with scattered melanophores. Dark pigmentation concentrated into anterior-tapering stripe anterior to orbit. Dorsal portion of preopercle, distal portion of maxilla, and region dorsal and posterior to orbit with higher concentrations of dark pigmentation. Specimens of approximately 25 mm SL with head pigmentation darkest dorsally and dorsolaterally. Other portions of head lacking any pronounced dark pigmentation other than for dark median band starting at symphysis of lower jaw and extending varying distances towards isthmus. Dark pigmentation more irregular below midlateral portion of eye. Dark stripe anterior to orbit in smaller specimens obscured by overall darker pigmentation of head in individuals of 25 mm SL. Specimens in range of 50–65 mm SL with dorsal and dorsolateral portions of head, snout and upper lip dark with remainder of head largely unpigmented with abrupt boundary between those regions. Ventral most portion of dark region under orbit distinctly darker and forming horizontal stripe extending from posterior limit of maxilla to anterior margin of preopercle and



Fig. 3. Sungai Patunuang, Samanggi village, Simbang District (05°03'50"S, 119°42'30"E) showing the typical habitat for *Lagusia micracanthus*.

in some specimens extending onto that bone. Larger specimens (approximately 75 mm and larger) with overall colouration of head similar to just described pattern, but with stripe under eye very distinct and continuous anteriorly with dark pigmentation along dorsal margin of premaxilla and maxilla. Dark pigmentation patches form in combination irregular stripe from middle of upper jaw nearly to anterior margin of opercle.

Body in specimen of approximately 16 mm SL with five longitudinal stripes distributed from ventral surface of abdomen to immediately ventral of base of dorsal fin. Stripes crossed by five slightly anteriorly-concave, vertical bars broader than stripes and of irregular intensity. Anterior most bar located dorsal to gill opening, second bar under anterior portion of spinous dorsal fin, third bar under posterior section of spinous dorsal fin, fourth bar under rayed dorsal fin, and fifth bar across caudal peduncle. Pigmentation on body darkest where bars and stripes cross. Dark vertical bar of pigmentation crosses base of eight middle rays of caudal fin. Specimens of approximately 25 mm SL with stripes darker than in smaller individuals, with midlateral stripe and two stripes on dorsolateral portion of body darkest. Vertical bars narrower and darker than those in smaller individuals but somewhat masked by darker overall pigmentation of body. Vertical patch of pigmentation at base of caudal fin more pronounced and gently anteriorly concave. Specimens of approximately 50–65 mm SL with body dusky to dark above horizontal through base of pectoral fin with three dark stripes obvious in region between horizontal through supracleithrum and dorsal limit of body. Stripes somewhat irregular and variably obvious. Some individuals with indication of faint fourth stripe along lateral surface of abdomen. Dark pigmentation at rear of caudal peduncle more extensive than in smaller individuals. Pigmentation patch distinctly concave and continuous posteroventrally with horizontal band of dark pigmentation running along lower lobe of caudal fin. Largest examined specimens (75

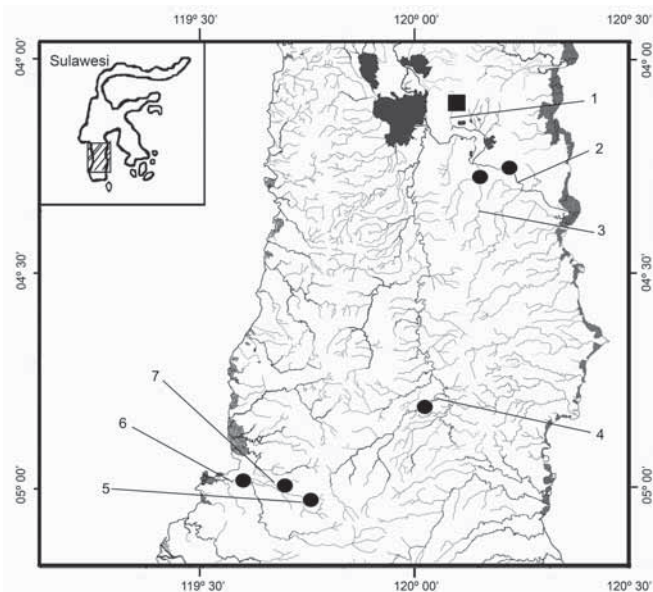


Fig. 4. Map of southwestern Sulawesi showing localities from which *Lagusia micracanthus* was collected. Some symbols represent more than one locality or lot of specimens (■ – type locality; ● – other localities). Localities: 1) river near Lagusi; 2) Cendrana River; 3) Amparang River; 4) Menralang River; 5) Samanggi River; 6) Maros River; 7) Bantimurung. Insert shows location of detailed map.

mm SL and larger) without any indication of stripes and bars present on body in smaller individuals, and darker overall than at earlier life states. Pigmentation notably darker on lateral and dorsolateral surfaces of body with indications of reticulate pattern in those regions. Bar of dark pigmentation at base of caudal fin present, but not as obvious as in smaller specimens.

Specimens of approximately 16 mm SL with distal portion of spinous dorsal fin dusky, but otherwise primarily hyaline. Basal portions of rayed dorsal fin with patches of dark pigmentation continuous with dorsal portions of fourth and fifth dark vertical bars on body. Basal portion of anal fin with batch of dark pigmentation; remainder of fin hyaline other than for scattered dark chromatophores. Pelvic fin with few scattered dark chromatophores on dorsal surface, but remainder of fin hyaline. Pectoral fin hyaline. Specimens of approximately 25 mm SL with scattered dark chromatophores and irregular patches of dark basal pigmentation on spinous dorsal fin. Rayed dorsal fin with patches of dark pigmentation on middle of anterior rays and at base of posterior rays. Anterior rays of anal fin with irregular patch of dark pigmentation. Pectoral fin hyaline. Pelvic fin with dark pigmentation on lateral portion of dorsal surface but otherwise hyaline. Individuals of approximately 50–65 mm SL with membranes of spinous dorsal fin dusky and variable patches of dusky pigmentation and basal darker spots on rayed dorsal fin. Anal fin with band of dusky pigmentation extending from base of anterior rays to middle portion of middle rays. Pectoral and pelvic fins without pronounced pigmentation. Caudal fin with second vertical band of less intensely pigmented dark pigmentation paralleling, but distinctly separated from, dark band at rear of caudal peduncle. Band of dark pigmentation angling from posterior margin of bar at rear of caudal peduncle for varying distances across lower lobe of caudal fin and sometimes reaching to posterior margin of fin. Remainder of fin covered to degrees by variably-shaped and extensive dusky patches. Largest examined specimens (75 mm SL and larger) with spinous portion of dorsal fin dusky and rays of rayed dorsal outlined with dark chromatophores. Caudal fin with dark stripe extending along ventral lobe. Irregular vertical dark pigmentation forming one or two bars continuous ventrally with ventral stripe. Second bar followed posteriorly by irregular dark mottling. Anal fin with dusky pigmentation extending distally from basal portions onto center of fin. Pectoral and pelvic fins with rays variably outlined by small dark chromatophores.

**Life history.** — The two specimens prepared as cleared and stained skeletons (55.8–55.9 mm SL) proved to be mature females with large numbers of small white eggs. As such the species matures at the smallest known size within the Terapontidae (Vari, 1978). One of the specimens had a stomach full on insect larvae.

**Habitat.** — *Lagusia micracanthus* was collected in the small to large-sized clear-water rivers over substrates ranging from gravels to large stones (Fig. 3). The species was typically observed swimming rapidly in groups between such stones.

**Common names.** — Bale tjonki (at Tempe Lake area, Celebes [= Sulawesi], Weber & de Beaufort, 1931: 154) and Pirik (at Bantimurung Bulusaraung National Park, South Sulawesi).

**Distribution.** — *Lagusia micracanthus* is known from a river in vicinity of Lagusi and the Amparang, Bantimurung, Cendrana, Leang-leang, Maros, Menralang, Samanggi, Saripa rivers. The species is also found in the Manjali Spring. All of these localities are located in Selatan Province, Sulawesi (Fig. 4).

**Material examined.** — All specimens collected in Indonesia, Sulawesi Selatan Province, Maros Regency (lots from which meristic and morphometric data taken indicated by asterisk): MZB 17911, 6 ex., 52.9–121 mm SL, Sungai Kasikabo, Kalabirang village, Maros District (05°00'57.9"S, 119°40'54.1"E), coll. Harun, 9 Jun.2006; MZB 17912, 6 ex., 15.9–84.5 mm SL, Sungai Patunuang, Samanggi village, Simbang District (5°02'33"S, 119°42'25"E), coll. Harun, 12 Jun.2006; MZB 17913, 2 ex., 25.9–73.0 mm SL, Sungai Saripa, Samanggi village, Simbang District (04°02'34.3"S, 119°42'10.9"E), coll. Harun, 11 Jun.2006; MZB 17914, 5 ex., 40.4–64.5 mm SL, Sungai Kasikebo (05°00'57.9"S, 119°40'54.1"E), coll. Harun, 15 Jun.2006; MZB 17915\*, 11 ex., 24.6–61.7 mm SL, Sungai Leang-leang, Kalabirang village, Bantimurung District, (04°58'18.2"S, 119°40'53.4"E), coll. R. K. Hadiaty & A. Mun'im, 20 Jul.2006; MZB 17916, 1 ex., 24.8 mm SL, Sungai Abbalu, Camba village, Camba district (04°52'30"S, 119°55'00"E), coll. R. K. Hadiaty & A. Mun'im, 17 Aug.2007; MZB 17917, 1 ex., 26.4 mm SL, Sungai Patunuang, Samanggi village, Simbang District (05°03'50"S, 119°42'30"E), coll. R. K. Hadiaty & A. Mun'im, 21 Aug.2007; MZB 17918, 1 ex., 50.5 mm SL, Sungai Kasikabo, upper big waterfall, Taman Wisata Alam Bantimurung, Maros District (05°00'57.9"S, 119°40'54.1"E), coll. R. K. Hadiaty & A. Mun'im, 9 Jul.2007; MZB 17919, 1 ex., 40.5 mm SL, Manjali Spring, Panaikang village, Minasatene District (05°02'17.0"S, 119°41'51.8"E), coll. R. K. Hadiaty & A. Mun'im, 21 Jul.2007; MZB 17920\*, 5 ex., 41.3–71.2 mm SL, Sungai Kasikebo, Taman Wisata Alam Bantimurung, Maros District (05°00'57.9"S, 119°40'54.1"E), coll. R. K. Hadiaty & A. Mun'im, 23 Jul.2007; USNM 400839\*, 7 ex., 42.3–123 mm SL, same locality, coll. Harun, 9 Jun.2006. ZRC 52362. 2, 83–84.5 mm SL, Sungai Saripa, Samanggi village, Simbang District (04°02'34.3"S, 119°42'10.9"E), coll. Harun, 11 Jun.2006.

## ACKNOWLEDGEMENTS

The specimens that served as the basis for this paper were collected during the Research Center for Biology Karst Project in 2006 and 2007 and by the International Expedition of South and South East Sulawesi lead by Dr. Louis Deharveng. We thank the karst team of the Research Center for Biology led by Prof. Dr. Yayuk R Suhardjono, Ir. Ristiyanti R Marwoto MSi and other team members for their continued collaboration during the last five years, Thanks are due to the head and staffs of Bantimurung-Bulusaraung National Park for permission to collect and assistance during field trips. Abdul Mun'im, Harun and Rafi assisted in the field. Research associated with the project was support by the Herbert R. and Evelyn Axelrod Chair in Systematic Ichthyology in the Division of Fishes, National Museum of Natural History of the Smithsonian Institution. Fig. 1 was prepared by T. Britt Griswold and Figs. 2–4. by RKH.

**LITERATURE CITED**

- Bleeker, P., 1860. Dertiende bijdrage tot de kennis der vischfauna van Celebes (visschen van Bonthain, Badjoa, Sindjai, Lagoesi en Pompenoea). *Acta Societatis Regiae Scientiarum Indo-Neerlandicae*, **8**(7): 1–60.
- Bleeker, P., 1873. Révision des espèces insulindiennes du genre *Therapon*. *Nederlandsch Tijdschrift voor de Dierkunde*, **4**: 372–393.
- Bleeker, P., 1871–1876. Atlas ichthyologique des Indes Orientales Néerlandaises publiés sous les auspices du Gouvernement colonial néerlandais. Percoides I, Priacanthiformes, Serraniformes, Grammistiformes, Percaeformes, Datniaeformes. *Atlas ichthyologique des Indes Orientales Néerlandaises*, Tome **VII**: 1–126.
- Bleeker, P., 1875–1876. Atlas ichthyologique des Indes Orientales Néerlandaises publiés sous les auspices du Gouvernement colonial néerlandais. *Atlas ichthyologique des Indes Orientales Néerlandaises*, **8**.
- Fowler, H. W., 1931. Contribution to the biology of the Philippine Archipelago and adjacent regions. The fishes of the families Pseudochromidae, Lobotidae, Pempheridae, Priacanthidae, Lutjanidae, Pomadasyidae, and Teraponidae, collected by the United States Bureau of Fisheries steamer “Albatross,” chiefly in Philippine seas and adjacent waters. *Bulletin of the United States National Museum*, **100**(11): 1–388.
- Fowler, H. W., 1934. The fishes of Oceania. Supplement 2. *Memoirs of the Bernice P. Bishop Museum*, **11**(6): 385–466.
- Kottelat, M., A. J. Whitten, S. N. Kartikasari & A. Wirjoatmodjo, 1993. *Freshwater Fishes of Western Indonesia and Sulawesi*. Periplus Editions, Indonesia. 881 pp., 84 pls.
- Macleay, W. 1883. Contribution to a knowledge of the fishes of New Guinea, no. 4. *Proceedings of the Linnean Society of New South Wales*, **8**(2): 252–180.
- Mees, G. F., 1971. Revisional notes on some species of the genus *Therapon* (Pisces, Theraponidae). *Zoologische Mededelingen*, **45**(20): 197–224.
- Munro, I. S. R., 1958. The fishes of the New Guinea region. A check-list of the fishes of New Guinea incorporating records of species collected by the Fisheries Survey Vessel “Fairwind” during the years 1949 to 1950. *Territory of Papua and New Guinea, Fisheries Bulletin*, **1**: 97–369.
- Munro, I. S. R., 1967. *The Fishes of New Guinea*. Department of Agriculture, Stock and Fisheries, Port Moresby. 650 pp., 78 pls.
- Vari, R. P., 1978. The *Terapon* perches (Percoidei, Teraponidae). A cladistic analysis and taxonomic revision. *Bulletin of the American Museum of Natural History*, **159**(5): 175–340.
- Weber, M., 1894. Die Süßwasser-Fische des Indeschen Archipels, nebst Bemerkungen über den Ursprung des Fauna von Celebes. *Zoologische Ergebnisse einer Reise in Niederländisch Ost-Indien*, **3**(2): 269–476, pls. 17–22.
- Weber, M. 1910. Neue fische aus Niederländisch Süd-Neu-Guinea. *Notes from the Leyden Museum*, **32**: 225–240.
- Weber, M. & L. F. de Beaufort, 1931. *The Fishes of the Indo-Australian Archipelago. VI. Perciformes (Continued). Families: Serranidae, Theraponidae, Sillanginidae, Emmelichthyidae, Bathclupeidae, Coryphaenidae, Carangidae, Rachycentridae, Pomatomidae, Lactariidae, Menidae, Leiognathidae, Mullidae*. E. J. Brill Ltd., Leiden. 448 pp.