

**NOTES ON THE IDENTITY OF *HEMIBAGRUS ELONGATUS*  
(GÜNTHER, 1864) AND OTHER EAST ASIAN SPECIES ALLIED  
TO *H. GUTTATUS* (LA CEPÈDE, 1803) (TELEOSTEI: BAGRIDAE)**

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**ABSTRACT.** - The identity of the bagrid catfish *Hemibagrus elongatus* (Günther, 1864) is clarified, and the holotype is redescribed and figured for the first time. The supposed type locality of the species (Singapore) is disputed and the type specimen is believed to have originated from China instead. The Chinese and Vietnamese species of *Hemibagrus* are also reviewed, and problems with their taxonomy and nomenclature discussed. *Hemibagrus guttatus* (La Cepède, 1803) is regarded here as a junior subjective synonym of *H. elongatus* (Günther, 1864).

**KEYWORDS.** - *Hemibagrus*, Bagridae, taxonomy, China, Singapore.

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**INTRODUCTION**

Over the last few years, the authors and their colleagues have been involved in a gradual revision of the bagrid catfishes of the genus *Hemibagrus* Bleeker, 1863, from Southeast Asia (see Kottelat et al., 1994; Kottelat & Lim, 1995; Ng & Ng, 1995; Dodson et al., 1995). As part of these studies, we examined the holotype of *Macrones elongatus* Günther, 1864, whose reported type locality is Singapore. Whilst this species has been mentioned in various literature, especially with regards to the Chinese and Singaporean ichthyofauna, the type has not been described in detail and has never been illustrated.

The present paper serves to figure and redescribe the type specimen in detail and is intended to give hints on the possible identity of the various *Hemibagrus* species reported from Chinese and Vietnamese waters.

## MATERIAL AND METHODS

The material reported here is deposited in the Natural History Museum, London (BMNH), the California Academy of Sciences, San Francisco (CAS) and Muséum national d'Histoire naturelle, Paris (MNHN). Measurements and counts were made from point to point and follow Ng & Ng (1995) with the following exceptions: the head length is measured from the tip of the snout to the posteriormost extremity of fleshy opercular flap. The length of the adipose-fin base is measured from the anteriormost point of origin to the posteriormost point of the adipose-fin base. Post-adipose distance is measured from the posteriormost point of the adipose-fin base to the posterior edge of the hypural complex.

The following additional measurements were made: predorsal, preanal, prepelvic and prepectoral lengths are those measured from the anterior point of SL to the anterior basis of the dorsal, anal, pelvic and pectoral fins respectively. Lengths of the dorsal- and anal-fin bases include the respective bases of the first and last rays and the distance between them. Pelvic- and pectoral-fin lengths are measured from the origin to the tip of the longest ray. Dorsal and pectoral spine lengths are measured from the base to the tip. Dorsal to adipose distance is measured from the base of the last dorsal-fin ray to the origin of the adipose fin. The length of the caudal peduncle is measured from base of the last anal-fin ray to the posterior edge of the hypural complex. Nasal-, maxillary- and mandibular-barbel lengths are measured from the base to the tip. Other additional measurements made are self-explanatory. The following abbreviations are used: SL, standard length and HL, head length.

## TAXONOMY

### *Hemibagrus elongatus* (Günther, 1864)

(Fig. 1)

*Macrones elongatus* Günther, 1864: 77.

*Mystus elongatus* – Fowler, 1938: 52; Alfred, 1966: 35; Jayaram, 1978: 225, fig. 2.

*Hemibagrus elongatus* – Mo, 1991: 132.

**Material examined.** - BMNH 1855.9.19:1099, holotype, 240.7 mm SL; "Singapore"; Haslar collection.

**Description.** - Head relatively flat; head length 24.9 %SL, dorsal head length (to base of occipital process) 22.7 %SL, dorsal head length (to tip of occipital process) 25.8 %SL; head depth 10.4 %SL; head width 16.3 %SL; eyes moderately large, horizontal diameter 14.4%HL; interorbital distance 28.9 %HL; dorsal surface of cranium slightly rugose; frontal fontanel reaching level of middle of eye, posterior fontanel reaching base of occipital process; no externally visible interneural bone between occipital process and dorsal basal bone; snout length 37.1 %HL; mouth gape 42.7 %HL.

Body slender, body depth at anus 13.0 %SL; predorsal length 33.9 %SL; distance between tip of occipital process and origin of dorsal fin 9.8 %SL. Dorsal fin base 12.1 %SL, dorsal spine length 13.3 %SL, length of dorsal fin 18.7 %SL; distance between end of dorsal fin base and beginning of adipose fin 4.7 %SL; length of adipose-fin base 39.3 %SL; maximum height of adipose fin 6.4 %SL; length of pectoral fin (both spines broken, serrated on inner edge) 16.0 %SL; length of anal fin base 12.3 %SL, length of longest anal ray (second branched) 12.2 %SL; length of pelvic fin 13.5 %SL; length of upper caudal-fin lobe 15.7 %SL, length of lower caudal-fin lobe 15.9% SL. Preanal length 66.9 %SL; prepelvic length

48.9 %SL; prepectoral length 22.6 %SL; distance between genital papilla and beginning of anal fin 10.1 %SL; distance between genital papilla and anus 2.5 %SL; depth of caudal peduncle 7.4 %SL; caudal-peduncle length 19.1 %SL.

Fin-ray counts: dorsal II,7 (8 serrae on spine); anal vi,10; pelvic i,5; pectoral I,10; caudal 8/9.

Gill rakers (outer side of anterior arch) 6+15=21. Branchiostegals 12. Vertebrae 27+26=53. Barbels long; nasal barbel reaches to anterior one-third of eye; maxillary barbel reaches to end of pectoral fin base or halfway between pectoral and pelvic fin base; outer mandibular barbel reaches to base of pectoral fin; inner mandibular barbel reaches to vertical of posterior margin of eye.

Preserved colour cream-white, no trace of black lateral stripe, no trace of natural coloration visible.

**Discussion.** - Günther (1864) described *Macrones elongatus* on the basis of one specimen supposedly from Singapore. Alfred (1966), in his synopsis of the Singapore fish, redescribed the species briefly and tentatively accepted it as part of the Singapore fauna. Koller (1927: 28) had, however, earlier recorded a species (whose identity has yet to be investigated) under this name from Hainan Island, China. Nichols (1943: 50) later suggested that *M. elongatus* might not belong to the Singaporean fauna, and treated *M. chinensis* Steindachner, 1883, as a junior synonym of *M. elongatus* Günther, 1864. Kottelat (1989: 14) also doubted the validity of the Singapore locality in his synopsis of the Indochinese fauna, and Lim & Ng (1990) and Ng & Lim (1997) do not include this species in their treatment of the Singaporean ichthyofauna. In recent years, some Chinese workers like Ni & Wu (1986: 174, fig. 98) have identified specimens from Hainan as *H. elongatus* and treated *Leiocassis hainanensis* Tchang, 1935, as a junior synonym.

Following the recent revision of bagrid systematics by Mo (1991: 132), *M. elongatus* is referred to the genus *Hemibagrus* Bleeker. Five species of *Hemibagrus* have been reported or recognized in Chinese waters, viz. *H. guttatus* (La Cepède, 1803), *H. macropterus* Bleeker, 1870, *H. pluriradiatus* (Vaillant, 1892), *H. elongatus* (Günther, 1864) and *H. wyckioides* (Fang & Chau, in Chau & Fang, 1949) (Koller, 1927; Nichols, 1943; Anonymous, 1976;

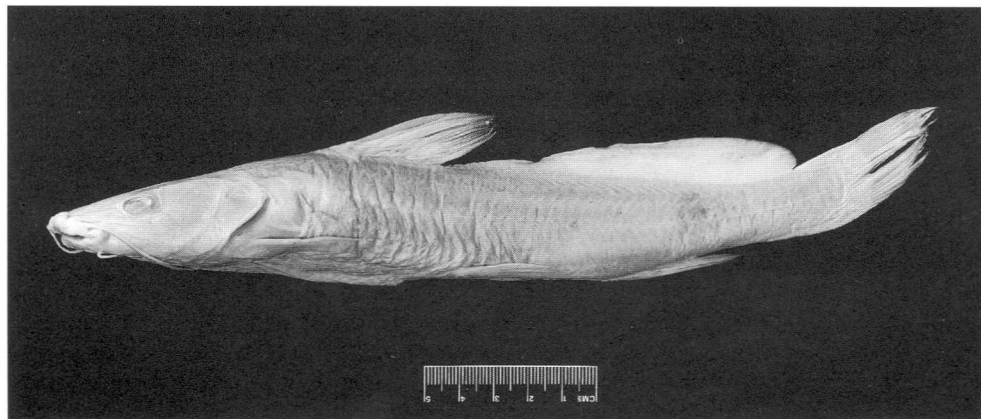


Fig. 1. *Hemibagrus guttatus*, holotype of *Macrones elongatus*, BMNH 1855.9.19:1099, 240.7 mm SL; lateral and dorsal view. Photograph courtesy of Darrell Siebert.

Chen, in Chu, 1984; Ni & Wu, 1986; Chen et al., 1987; Zheng, 1989; Chu & Chen, 1990; Gao, in Pan, 1990; Zhu, 1995: 148). A brief overview of the Chinese literature, however, shows that some inconsistency exists between the authors as to the number of species, their diagnostic characters, their distribution and their names. At this stage, it is not clear to us how many species of *Hemibagrus* actually occur in Chinese waters, and we believe that a careful study of a reasonable series of specimens from different localities will prove that several species are much less variable than previously reported. The following comments are intended to focus on some of these problems.

Most recent Chinese authors recognise three valid species in China (exclusive of the Mekong and Salween basins where conspicuously distinct species occur). They are usually called *H. macropterus*, *H. guttatus* and *H. pluriradiatus* (e.g., Gao, in Pan, 1990; Zhu, 1995).

In one of the most recent published account on these species, Gao (in Pan, 1990: 314, fig. 190) indicated that on the basis of the head proportions, degree of serration on the posterior margin of the dorsal spine and shape of the distal edge of the adipose fin, the specimens previously identified as *H. elongatus* by Koller (1927) and Nichols (1943) are in fact *H. guttatus*, whilst those identified by Ni & Wu (1986) as *H. elongatus* are actually *H. pluriradiatus*. We are not sure how Gao reached the former conclusion as both Koller and Nichols provided no information on the shape of the adipose fin, no clear information on the degree of the dorsal-spine serration (Koller merely stated that it was "strongly serrated") and no data on head proportions other than the head to standard length ratio. Gao also commented that as *H. elongatus* was described from Singapore, it seems the species is a Southeast Asian taxon and is doubtful that it is also present in China. In conclusion, the identities of the fish identified by Koller (1927: 28) and Nichols (1943: 50) as *H. elongatus* cannot be determined with confidence from their very brief diagnoses, although our examination of *Hemibagrus* specimens from Hainan Island (see below) suggests that Koller's and Nichol's *H. elongatus* might be *H. pluriradiatus*.

We agree with Gao (in Pan, 1990) that the fish figured as *H. elongatus* by Ni & Wu (1986: 174, fig. 98) from Hainan does not agree with the holotype of this species, being a proportionately shorter fish, and tentatively follow him in identifying it with *H. pluriradiatus*. We have examined both the holotype of *H. pluriradiatus* (MNHN 1892.48, 155.2 mm SL) as well as specimens of *Hemibagrus* from Hainan Island (CAS 139619, 2 ex., 104.8-168.8 mm SL) and, although not in very good condition, we found both to agree with Vaillant's description (1892: 128). Vaillant (1904: 462, pl. 23 fig. 2; here reproduced as Fig. 2) repeated this description, with an illustration which has apparently been overlooked by many subsequent authors. It must be added, however, that Gao's *H. pluriradiatus* apparently differs from Vaillant's material in having a deeper adipose fin with a conspicuously convex margin

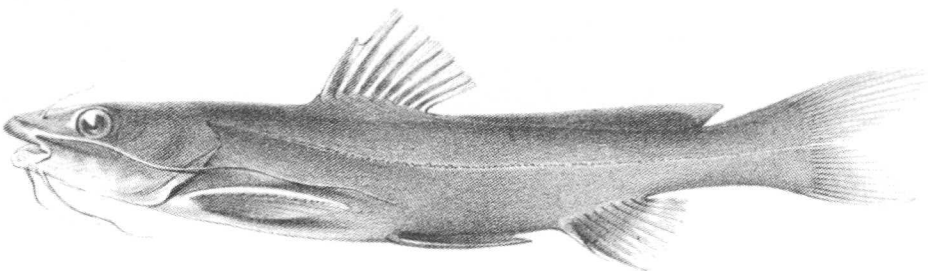


Fig. 2. *Hemibagrus pluriradiatus*, holotype, 155.6 mm SL, from Vaillant (1904: pl. 23 fig. 2).

and contiguous with dorsal-fin base (vs. shallow, with a straight margin and not contiguous) and a differently shaped deeper body (5.5-7.1 times in SL, vs. about 8 [Vaillant's figure shows the fish deeper bodied than the actual specimen is]). Similarly, the *H. pluriradiatus* of Chu & Chen (1990: 165) does not resemble Vaillant's species as currently understood. Without having access to a larger series of specimens from throughout northern Vietnam, southern China and Hainan Island, it is difficult to determine the degree of intraspecific variation present as well as to ascertain the actual identity of Gao's *H. pluriradiatus*.

*Hemibagrus guttatus* (sensu Chen, in Chu, 1984: 412, fig. 280; Chu & Chen, 1990: 164, fig. 168; Ni & Wu, 1986: 172, fig. 97; Gao, in Pan, 1990: 314, fig. 190; Anonymous, 1988: 146) resembles *H. elongatus* as defined here with regards to almost all the characters described. It would thus appear that *H. elongatus* s. str. is actually conspecific with *H. guttatus*, a species originally described as *Pimelodus guttatus* by La Cèpède (1803: 96, pl. 5 fig. 1) solely on the basis of a "Chinese painting" (actually a Japanese one; see Bauchot & Daget, 1996: 236). As it is not easy to get access to La Cèpède's, we reproduce here his original drawing (Fig. 3). The identity of the illustrated specimen is not very obvious but it does seem that the fish usually called *H. guttatus* is the species most closely agreeing with La Cèpède's figure in having the mottled body, the moderately long adipose fin contiguous with the dorsal fin, and a dorsal fin origin which is about midway between the snout tip and anal fin origin. For the moment, we do not see any reason for not treating *H. elongatus* (Günther, 1864) as a junior synonym of *H. guttatus* (La Cèpède, 1803).

*Macrones chinensis* Steindachner, 1883, sometimes listed as a synonym of *H. elongatus*, seems to agree with the *H. guttatus* of Gao (in Pan, 1990) [the original description of the species appeared in 1883 in the form of an abstract and that the description of the species, usually referred to as the original one in the literature in fact appeared a year later in 1884 (Steindachner, 1884: 1111, pl. 8)]. Jayaram (1978) considered *H. elongatus* and *H. chinensis* to be distinct species, but the differences he quoted are either artefacts of poor preservation, or are non-existent when the type of *H. elongatus* is compared with Steindachner's description and figures.

The type specimen of *H. elongatus* is unlikely to have originated from Singapore. Previous and recent studies of the Singaporean fauna has never recorded the presence of such a fish (see Alfred, 1966; Lim & Ng, 1990; Ng & Lim, 1997). Although Ng & Lim (1997) include

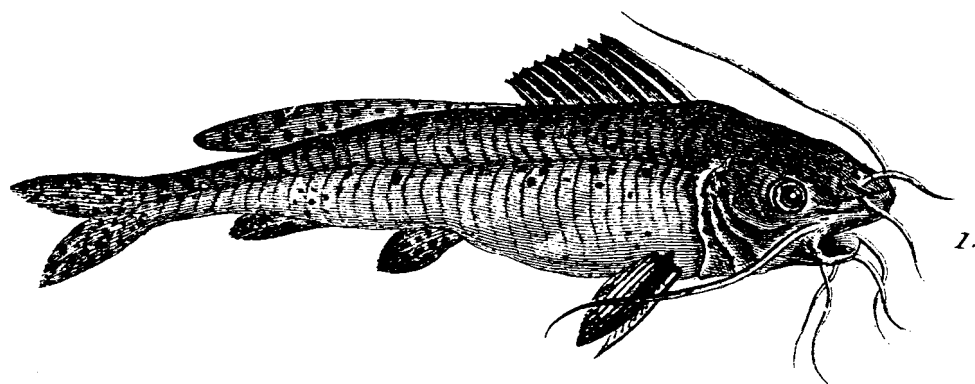


Fig. 3. *Hemibagrus guttatus*. Original illustration of *Pimelodus guttatus* from La Cèpède (1803: pl. 5 fig. 1).

*H. elongatus* in their list of substantiated records of the freshwater fishes of Singapore, we believe that this is an error. On the Sunda Shelf, there is no known *Hemibagrus* species which has a very long adipose-fin base which spans the postdorsal length as in *H. elongatus*, with the possible exception of *H. olyroides* (Roberts, 1989) from Borneo, which is a very different looking species. The exact provenance of the type specimen of *H. elongatus* cannot be determined at present, but it probably came from somewhere in China. It is also prudent to note that many species of Chinese fish were brought into Singapore for food, aquaculture or accidentally (see Alfred, 1966; Ng et al., 1993; Ng & Lim, 1997) and it seems possible that the type specimen of *H. elongatus* came to Singapore by this route (although we have no evidence or information that live fish were already imported to Singapore at that time).

Anonymous (1981) reports two species from Guangxi in China, *H. guttatus* and *H. elongatus*. His *H. elongatus* is possibly the *H. macropterus* of most Chinese authors. Judging from the published illustrations (including the original description by Bleeker, 1870: 258, pl.), *H. macropterus* seems to be a variable species, although we suspect that a direct comparison of material from different parts of its range may prove that more than one species is involved. Mai (1978: 250) has also reported *Hemibagrus elongatus* from northern Vietnam. Unfortunately, we are unable to read Mai's text, but from his figure, with its slender body, shallow adipose not contiguous with dorsal-fin base, this fish has similarities with *H. pluriradiatus* as illustrated by Vaillant (1904; see Fig. 2); Mai includes Vaillant's description of *H. pluriradiatus* in his synonymy of *H. elongatus* but without any comment. Mai (1978: 252) recognizes two subspecies, *H. e. elongatus* and *H. e. hongus* Mai, 1978, commenting that some specimens from the Red River had slightly more anal fin rays and warranted a new taxon. Actually, the identity of *H. pluriradiatus* s. str. cannot be solved without access to well preserved samples from the Red River basin. The value of the shape and size of the adipose fin as a diagnostic character needs to be checked. Awaiting this, we tentatively treat it as a valid species.

The other species of *Hemibagrus* recorded from northern Vietnam are *H. vietnamicus* Mai, 1978, and *H. centralus* Mai, 1978. Judging from the illustrations, there seems to be little doubt that *H. centralus* is either the same as or very closely related to *H. guttatus* of Chinese authors. With its more dorsal eye, *H. vietnamicus* could well be an available name for the fishes which had been reported from Yunnan and Hainan as *H. pluriradiatus* (Chu & Chen, 1990; Gao, in Pan, 1990; see above) if distinct. The fish reported as *H. chinensis* by Chevey & Lemasson (1937: 113, pl. 34 fig. 77) seems to be *H. guttatus*.

*Aoria amemiyae* Kimura (1934: 166, pl. 5 fig. 2) is a name which has seldom appeared in Chinese literature and we checked its possible identity. The illustration in Kimura shows a fish related to or identical with *H. macropterus*. Kimura used two different spellings for the species name, *amemiyae* on pages 12 and 166 and *amemiyai* on plate 5. Both spellings are available according to ICZN: *amemiyae* under art. 31(a)(i) [and examples], *amemiyai* under art. 31(a)(ii). As first revisers (ICZN art. 24(c)), we retain the spelling *amemiyai* as the correct original spelling.

In conclusion, we consider that *H. elongatus* is a junior synonym of *H. guttatus*, but it is clear that more work is needed before hoping to clear the systematics of this genus in Vietnam and China. An exploration of the literature is very unlikely to lead to any sensible result. A revision of this genus can only be achieved by direct comparison of well preserved samples of specimens from different localities and sizes.

Although the present problem with Chinese and Vietnamese *Hemibagrus* is somewhat complicated by the lack of salient external characters of the various species, a nominal species based on just an old drawing, and wrong locality data for another species, we perceive the situation described above as not unusual with regards to what we now know about many other groups of East Asian fishes. The situation is even more dramatic now that most aquatic biodiversity is under acute environmental stress (see Kottelat & Whitten, 1996). As a result of such taxonomic confusion, much of the existing biodiversity is overlooked and under risk of becoming extinct unnoticed.

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#### LITERATURE CITED

- Alfred, E. R., 1966. The fresh-water fishes of Singapore. *Zool. Verh.*, **78**: 1-68, 8 pls.
- Anonymous, 1976. *Fishes of the Changjiang River*. Science Press, Beijing, 278 pp., 56 pls.
- Anonymous, 1981. *Freshwater fishes of Guangxi*. Guangxi Peoples' Press, Nanning, 257 pp.
- Anonymous (ed.), 1986. *The freshwater and estuaries fishes of Hainan Island*. Guangdong Science & Technology Press, Guangzhou, 372 pp.
- Bauchot, M.-L. & J. Daget, 1996. Un bicentenaire: le transfert à Paris du Cabinet du Stathouder. Son importance pour l'ichthyologie. *Cybium*, **20**: 219-250.
- Bleeker, P., 1870. Description et figure d'une espèce inédite de *Hemibagrus* de Chine. *Versl. Akad. Amsterdam*, (2) **4**: 257-258, 1 pl.
- Chen J., T. Xu, S. Fang, S. Song & X. Wang, 1987. *Fishes in Qinling Mountain Area*. Science Press, Beijing, 260 pp.
- Chevey, P. & J. Lemasson, 1937. Contribution l'étude des poissons des eaux douces tonkinoises. *Notes Inst. Océanogr. Indochine*, **33**: 1-183, 2+44 pls.
- Chu X. L. & Y. R. Chen (eds.), 1990. *The fishes of Yunnan, China. Part II*. Science Press, Beijing, 313 pp.
- Chu Y. T. (ed.), 1984. *The fishes of Fujian province (Part I)*. Fujian Science & Technology Press, Fujian, 528 pp.
- Dodson, J. J., F. Colombani & P. K. L. Ng, 1995. Phylogeographic structure in mitochondrial DNA of a south-east Asian freshwater fish, *Hemibagrus nemurus* (Siluroidei; Bagridae) and Pleistocene sea-level changes on the Sunda Shelf. *Mol. Ecol.*, **4**: 331-346.
- Günther, A., 1864. *Catalogue of the fishes in the British Museum. Vol. 5*. British Museum, London, xxii+455 pp.
- Huang H. J., P. Q. Le & X. F. Yu, 1988. *The freshwater fishes of China in coloured illustrations. Vol. 2*.
- Jayaram, K. C., 1978. Contributions to the study of bagrid fishes 14. The systematic position of the species of *Mystus Scopoli* known from China. *Proc. Indian Acad. Sci., Ser. B.*, **87**: 221-228.
- Kimura, S., 1934. Description of the fishes collected from the Yangtze-Kiang, China, by the late Dr. K. Kishinouye and his party in 1927-1929. *J. Shanghai Sci. Inst. Soc., Sect. 3*, **1**: 1-247, 6 pls.
- Koller, O., 1927. Fische von der Insel Hai-nan. *Ann. Naturhist. Mus. Wien*, **41**: 25-49, pl. 1.

- Kottelat, M., 1989. Zoogeography of the fishes from Indochinese inland waters with an annotated check-list. *Bull. Zool. Mus. Univ. Amsterdam*, **12**: 1-54.
- Kottelat, M. & K. K. P. Lim, 1995. *Hemibagrus hoevenii*, a valid species of Sundaic catfish (Teleostei: Bagridae). *Malay. Nat. J.*, **49**: 41-47.
- Kottelat, M., K. K. P. Lim & P. K. L. Ng, 1994. *Bagrus hoevenii* Bleeker, 1846 (currently *Hemibagrus hoevenii*; Osteichthyes, Siluriformes): proposed designation of a neotype. *Bull. Zool. Nom.*, **51**: 320-322.
- Kottelat, M. & A. J. Whitten, 1996. Freshwater biodiversity in Asia with special reference to fish. *World Bank Techn. Pap.*, **343**: ix + 59 pp.
- La Cèpède, [E.], 1798-1803. *Histoire naturelle des poissons*. Paris. 1 (1798): 8+cxlvii+532 pp., 25 pls., 2 (1800): lxiv+632 pp., 20 pls., 3 (1801): lxvi+558 pp., 34 pls., 4 (1802): xlv+728 pp., 16 pls., 5 (1803): xlviii+803 pp., 21 pls.
- Lim, K. K. P. & P. K. L. Ng, 1990. *A guide to the freshwater fishes of Singapore*. Singapore Science Centre, 160 pp.
- Mai, D. Y., 1978. *Din loai ca nuoc ngot cac tinh phia bac Viet Nam*. Nha Xuat Ban Khoa Hoc Va Ky Thuat, Hanoi, 339 pp.
- Mo, T., 1991. *Anatomy, relationships and systematics of the Bagridae (Teleostei: Siluroidei) with a hypothesis of siluroid phylogeny*. Koeltz, Koenigstein, vii+216 pp., 63 pls.
- Ng, P. K. L., L. M. Chou & T. J. Lam, 1993. The status and impact of introduced freshwater animals in Singapore. *Biol. Cons.*, **64**: 19-24.
- Ng, P. K. L. & K. K. P. Lim, 1997. The freshwater fishes of Singapore. *J. Singapore Natn. Acad. Sci.*, **22-24**: 109-124.
- Ng, P. K. L. & H. H. Ng, 1995. *Hemibagrus gracilis*, a new species of large riverine catfish (Teleostei: Bagridae) from Peninsular Malaysia. *Raffles Bull. Zool.*, **43**: 133-142.
- Nichols, J. T., 1943. The fresh-water fishes of China. Vol. 9 in R. Tyler (ed.), *Natural history of Central Asia*. American Mus. Nat. Hist., New York, xxxvi+322 pp., 10 pls.
- Pan J.-H. (ed.), 1990. *The freshwater fishes of Guangdong Province*. Guangdong Science & Technology Press, Guangdong, 589 pp.
- Roberts, T. R., 1989. The Freshwater Fishes of Western Borneo (Kalimantan Barat, Indonesia). *Mem. Calif. Acad. Sci.*, **14**: 1-210.
- Steindachner, F., 1883. [... Steindachner überreicht eine ichthyologische Abhandlung unter dem Titel: "Ichthyologische Beiträge" (XIII)]. *Anz. Akad. Wiss. Wien, Math.-Naturwiss. Cl.*, **20**: 194-197.
- Steindachner, F., 1884. Ichthyologische Beiträge (XIII). I. Beiträge zur Kenntniss der Fische Australiens. II. *Caranx africanus* n. sp. III. *Macrones chinensis* n. sp. *Sitzber. Akad. Wiss. Wien*, 1. Abt., **81**: 1065-1114, pls. 1-8.
- Tchang T. L., 1935. Two new catfishes from South China. *Bull. Fan Mem. Inst. Biol., Zool.*, **6**: 174-177.
- Vaillant, L., 1892. Sur quelques poissons rapportés du Haut-Tonkin, par M. Pavie. *Bull. Soc. Philom. Paris*, (8)**4**: 125-127.
- Vaillant, L., 1904. Poissons recueillis par M. A. Pavie en Indo-Chine. Pp. 459-470, pl. 23, in: A. Pavie, *Mission Pavie en Indochine 1879-1895*. Etudes diverses. Vol. 3. Leroux, Paris, xxi+549 pp., 26 pls.
- Zheng C. Y. (ed.), 1989. *Fishes of the Zhujiang River*. Science Press, Beijing, 438 pp.
- Zhu S. Q., 1995. *Synopsis of freshwater fishes of China*. Jiangsu Science & Technology Publishing House, Nanjing, 549 pp.