THE RAFFLES BULLETIN OF ZOOLOGY 2002 **50**(2): 459-464

GARRA TENGCHONGENSIS, A NEW CYPRINID SPECIES FROM THE UPPER IRRAWADDY RIVER BASIN IN YUNNAN, CHINA (PISCES: TELEOSTEI)

E Zhang and **Yi-Yu Chen**
Department of Ichthyology, Institute of Hydrobiology, Chinese Academy of Sciences, Wuhan 430072, Hubei province, P. R. China

ABSTRACT. – *Garra tengchongensis*, a new cyprinid species from the upper Irrawaddy River basin in Tengchong county, Yunnan province, China, is differentiated from all other Chinese and Southeast Asian *Garra* species except *G. kempi* by having a combination of the following characters: two pairs of barbels, no proboscis on snout, 12 circumpeduncular scales and 37-42 lateral line scales. *Garra tengchongensis* is distinguished from *G. kempi* in having a cylindrical anterior body, a deeper body, a smaller mental adhesive disc, a scaled breast and belly, and a blunt snout

KEY WORDS. – *Garra*, new species, Irrawaddy River basin, China.

INTRODUCTION

The tropical African and Asian hill-stream cyprinid genus *Garra* Hamilton, 1822 consists of approximately seventy described species, ranging from Borneo, China and Southern Asia through the Middle East, Arabian Peninsula and East Africa to West Africa. Most species of *Garra* occurs in swift-flowing water of rivers and mountain streams, where they commonly adhere to the surface of the underwater gravel and rocky substrates mainly by the mental adhesive disc modified from the lower lip and also by horizontally extended paired fins. So far, seventeen species have been recognized in Africa (Abebe, 1999); at least seven species in Arabian Peninsula (Krupp, 1983; Krupp & Schneider, 1989); approximate twenty species in India and adjacent countries (Talwar & Jhingran, 1992); twelve species in Southeast Asia (Kottelat, 1989, 1998, 2000, 2001a, b; Rainboth, 1996); eight species or subspecies in China (Zhang et al., 2000);

Garra kempi was originally described by Hora (1921) from the Siyom River (Brahmaputra River basin), below Damda, among the Abor Hills, India; it has since been recognized as valid (Menon, 1964; Talwar & Jhingran, 1992; Vishwanath, 1993). The known distribution of *G. kempi* includes China where it was found in the Yaluzangbu Jiang (Brahmaputra River) in Tibet (Wu et al., 1977; Wu & Wu, 1992; Zhang et al., 1995) and both the Longchuan Jiang and Daying Jiang (upper Irrawaddy River basin) in Yunnan (Chen et al., 1998; Chu & Cui, 1989). Our comparison of the Brahmaputra River basin material with the upper Irrawaddy River basin one in China revealed that two distinct species are involved. The subsequent study confirmed that *G. kempi* is actually represented by the Brahmaputra River basin form and that the upper Irrawaddy River basin form is therefore an undescribed species, herein named as *G. tengchongensis*.

MATERIALS AND METHODS

Measurements and counts were made on the left side of specimens whenever possible. All measurements were taken point to point with digital calipers and data recorded to tenths of a millimeter. Measurements follow those of Kottelat (2001b) with the addition of the following measurements: predorsal, prepectoral, prepelvic and preanal length. These lengths are the body lengths taken respectively from the snout tip to the dorsal- pectoral-, pelvic- and anal-fin origin. Other additional measurements include: disc width and length. Disc width is the distance taken between the bases of two maxillary barbels. Disc length is the distance measured from the anterior-mid point of the anterior margin to the most point of the posterior margin of the mental adhesive disc. Subunits of the head are presented as percentages of the head length. Head length itself and measurements of body parts are given as proportions of the standard length. Counts as well follow those of Kottelat (2001b) with the exception of the lateral line scales. The lateral line scales are counted from the anteriormost scale in contract with the shoulder girdle to the last one on the caudal fin. This count is different from that of Wu et al. (1977) and Kottelat (2001b) in that the scales on the caudal fin are included

The description is based on formalin-preserved specimens. The examined specimens are deposited in the collections of the Freshwater fish Museum of Institute of Hydrobiology (IHB) and Kunming institute of Zoology (KIZ), Chinese

Academy of Sciences. Abbreviations herein used are: HL, head length and SL, standard length.

TAXONOMY

Garra tengchongensis, new species
(Figs. 1, 2b)

Garra kempi – Chu & Cui, 1989: 277 (Tengchong and Lianghe Counties, Yunnan, China); Chen, 1998: (Longchuan Jiang and Daying Jiang in Tengchong, Yunnan, China).

Material examined. – Holotype - IHB 92IV0242, 78.7 mm SL; from the Daying Jiang (upper Irrawaddy River basin) in Tengchong county, Yunnan, China; coll. Chen Yifeng, Apr.1992.

Paratypes. – IHB 90IV0240-41, 90IV0243, 90IV0237-39, 90IV0189-90, 8 specimens, 51.3-78.8 mm SL, KIZ 839420, 839439, 8310433, 830406, 839430, 5 ex. 64.2-70.8 mm SL, same data as the holotype.

Diagnosis. – *Garra tengchongensis* is distinguished from its congeners in Southeast Asia and China except *G. kempi* by having the following combination of characters: two pairs of barbels, no proboscis on snout, 37-42 lateral line scales and 12 circumpeduncular scales. *Garra tengchongensis* is differentiated from *G. kempi* in having a cylindrical anterior body (vs. depressed); body depth 20.4-24.6% of SL (vs. 17.1-19.5); a smaller mental adhesive disc with its length 36.1-42.5% of HL (vs. 42.9-50.0), its posterior margin not reaching vertical through posterior margin of eye (vs. reaching); a breast and belly scaled (vs. scaleless); a blunt snout (vs. broadly rounded).

Description. – Measurement and counts taken from fourteen specimens, 51.3-87.0 mm SL are given in Table 1. General body appearance and morphology of the mental adhesive disc are illustrated in Figs. 1 and 2b, respectively.

Body elongate, anteriorly cylindrical and posteriorly slightly compressed, dorsal profile slightly convex and ventral surface round from head to pelvic-fin origin. Head small, more or less depressed with a planar interorbital space; depth less than head length; width greater than height. Snout blunt, anteriorly with a few minute tubercles and laterally having a furrow extending obliquely from base of rostral barbels to lateral extremity of rostral fold. Mental adhesive disc elliptical, shorter than wide and narrower than head width through roots of maxillary barbels; anterior margin modified to form a transverse, crescent, fleshy fold of skin covered by numerous papillae, anteriorly separated from lower jaw by a deep groove and posteriorly bordered with a central callous pad; lateral and posterior margins free, papillose, surrounding central callous pad; posterior margin not reaching vertical through posterior margin of eye. Eye small, dorso-lateral, closer to posterior margin of operculum than to tip of snout. Two pairs of minute barbels; rostral ones anteroventrally located, shorter than eye diameter; maxillary ones at corner of mouth, slightly shorter than rostral ones. Lateral line complete, directed backward medially along caudal peduncle. Predorsal mid-line scales almost of same size as flank scales and not embedded beneath skin. Breast and belly scaled; sometimes breast scales embedded beneath skin. Air bladder bipartite, anterior chamber round and posterior chamber small, as long as anterior one. Pharyngeal teeth triserial, with slightly compressed and pointed tips.

Dorsal fin with a slightly concave distal margin, last simple ray longer than head length, origin nearer to snout tip than to caudal-fin base. Pectoral fin rhomb-shaped, not reaching halfway to pelvic-fin origin, shorter than head length. Pelvic fin rounded, reaching slightly beyond midway to anal-fin origin, shorter than head length, inserted vertically below base of 3-4 th branched dorsal-fin rays and nearer to pectoral-fin origin than to caudal-fin base; axillary scales long, reaching beyond base of last ray. Anal fin with a distally truncate margin; origin closer to pelvic-fin origin than to caudal-fin base. Anus located almost in midway from pelvic- to anal-fin origin. Caudal fin forked, its longest rays less than 1.5 times as long as its shortest rays.

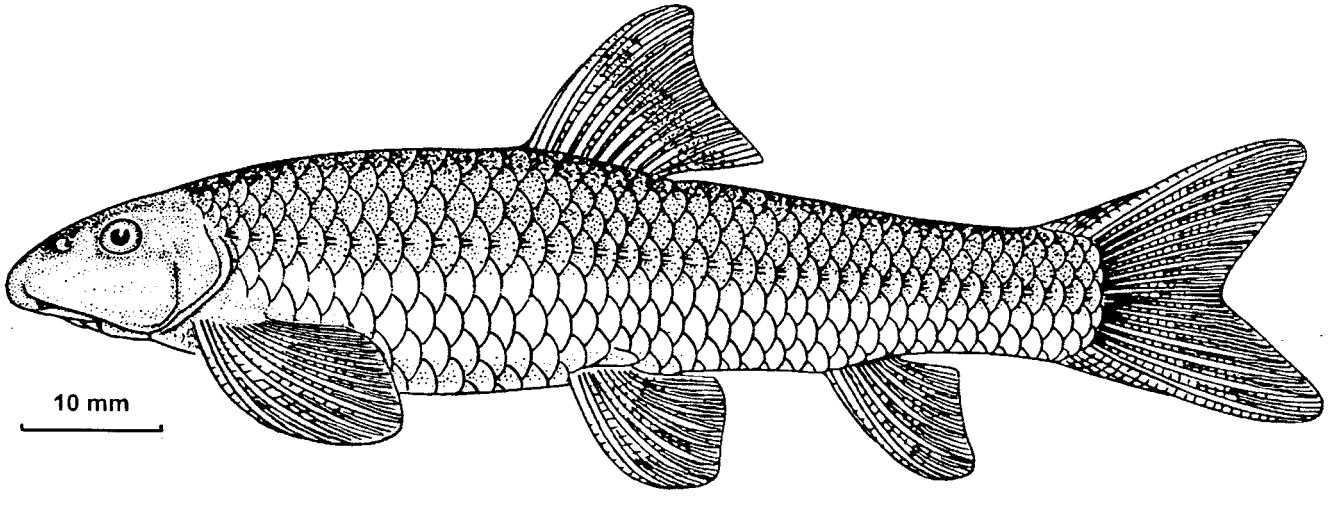

Fig. 1. *Garra tengchongensis*, holotype, IHB 92IV0242, 78.7 mm SL; China: Yunnan: Tengchong, lateral view.

Table 1. Count and measurement data of two Chinese *Garra* species: *G. tenchongensis*, new species, and *G. kempi.*

	G. tenchongensis (n=14)	*G. kempi* (n=11)
Dorsal-fin rays	iv, 8	iv, 7
Anal-fin rays	iii, 5	iii, 5
Pectoral-fin rays	i,12-14	i, 12-14
Pelvic-fin rays	i, 8	i, 7-8
Lateral line scales	37-38	40-42
Scales above lateral line	$3^1/_2$-4	$4^1/_2$
Scales below lateral line	3	$2^1/_2$-3
Predorsal scales	12-14	12
Circumpeduncular scales	12	12
Pharyngeal tooth rows	3	3
SL (mm)	51.3-87.0	52.0-82.30
Percentages of SL		
Body depth	20.4-24.6	17.1-19.5
Head length	20.2-25.3	22.1-26.9
Head depth	13.8-17.0	12.8-15.5
Head width	17.0-19.5	18.4-21.2
Dorsal-fin length	17.6-19.5	17.1-20.6
Pectoral-fin length	11.8-14.3	12.4-15.9
Pelvic-fin length	14.0-16.3	13.3-17.4
Anal-fin length	14.7-19.4	13.5-16.6
Length of caudal peduncle	14.8-17.1	16.3-20.1
Depth of caudal peduncle	12.0-13.2	10.6-12.4
Predorsal length	48.1-51.9	44.7-50.4
Prepectoral length	18.3-22.6	18.8-24.8
Prepelvic length	52.5-59.3	48.2-53.2
Preanal length	76.0-78.7	72.9-78.9
Percentages of HL		
Snout length	44.4-49.1	38.9-47.7
Eye diameter	17.0-23.3	14.5-19.3
Interorbital width	43.6-51.8	43.0-53.1
Disc length	36.1-42.5	42.9-50.0
Disc width	43.3-56.0	55.7-68.8

Coloration. – In formalin-preserved specimens, body brown dorsally and laterally, gray ventrally. Dorsal fin with a darkened midway membranes to form a band; other fins gray.

Distribution. – *Garra tengchongensis* is known from the upper Irrawaddy River basin in Yunnan Province, China (Fig. 3).

Etymology. – Named for the locality of type specimens.

DISCUSSION

Garra kempi has so far been reported from both India and China. It was described by Hora (1921), Menon (1964), and Talwar & Jhingran (1992) from the Siyom River (Brahmaputra River basin), Abor Hills, Assam (now Arunachal Pradesh) and by Vishwanath (1993) from the Leimarkhong stream and tributaries of the Tuival River (Chindwinn River basin) Manipur, India. In China, Wu et al. (1977) recorded *G. kempi* from the Yaluzangbu Jiang (the main Brahmaputra River before it enters into India) in Chayu county, Tibet. Wu & Wu (1992) and Zhang et al. (1995), following the identification by Wu et al. (1977), subsequently reported *G. kempi* in Tibet again. Our examination of eleven specimens (including six of these used by Wu et al.) from the Yaluzangbu Jiang in Chayu and Motou counties of Tibet proved that the Chinese specimens have more lateral line scales, 40-42 instead of 38-40 reported by both Menon (1964) and Talwar & Jhingran (1991) for the Indian specimens. The

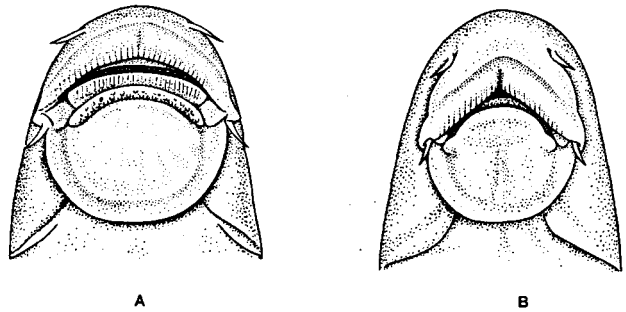

Fig. 2. A: *Garra kempi*, IHB 73VII0064, 86.8 mm SL; China: Tibet: Chayu. B: *Garra tengchongensis*, holotype, IHB 92IV0242, 78.7 mm SL; China: Yunnan: Tengchong, ventral view of head.

number is similar to the observation of Wu & Wu (1992) and Zhang et al. (1995), but different from that of Wu et al. (1977) who recorded 38-39 lateral line scales for *G. kempi*. This difference could be better explained by utilization of different methods to count the lateral line scales. In fact, scales on the caudal fin were excluded by Wu et al. (1977) from the lateral line scales but included by both Wu & Wu (1992) and Zhang et al. (1995) and in the present study as well. Therefore, the number of lateral line scales reported by Wu et al. (1977) for *G. kempi* from China is fewer than it really has. Nevertheless, we agree with Wu et al. (1977) that the Chinese specimens are conspecific with the Indian ones.

Garra tengchongensis has two pairs of barbels, no proboscis on snout, 37-42 lateral line scales and 12 circumpeduncular scales, a combination which distinguishes it from all other *Garra* species except *G. kempi* in China and Southeast Asia. *Garra tengchongensis* is differentiated from *G. kempi* in having a cylindrical anterior body (vs. depressed) ; body depth 20.4-24.6% of SL (vs. 17.1-19.5); a scaled breast and belly (vs. scaleless); a smaller mental adhesive disc with its length 36.1-42.5% of HL (vs. 42.9-50.0) and its posterior margin not reaching vertical through posterior margin of eye (vs. reaching); a blunt snout (vs. broadly rounded).

Garra tengchongensis is only known from the upper Irrawaddy River basin in Yunnan, China, where three other *Garra* species, viz., *G gravelyi* (Annandale), *G. orientalis* Nichols, and *G. qiaojiensis* Wu & Yao, have been reported by Chinese authors (Chu & Cui, 1987, 1989; Chen, 1998). *Garra qiaojiensis* was first described by Wu et al. (1977) based on a single 172 mm SL specimen from the Longchuan Jiang (upper Irrawaddy River basin) in Yunnan, China; more detailed description was provided by Chu & Cui (1989) and Chen (1998). *Garra qiaojiensis* differs from *G. tengchongensis* in having a proboscis on snout and 34-36 lateral line scales. *Garra orientalis* was originally described by Nichols (1925) from Yenping (Nanping), Fukien (Fujian) province, China and it has so far been considered by Chinese authors as a valid species extensively known from the upper Irrawaddy, upper Mekong, Red and Min Jiang and Pearl & River basins as well as Hainan island (Chu & Chen, 1989; Zhang et al., 2000). However, *G. orientalis* was considered by Menon (1964) as a synonym of *G. nasuta*, a widely distributed species with a range extending from Assam of India to southern China and northern Vietnam. Kottelat (2000) recently indicated that the material from the Salween, Chao Phraya, Mekong and Red River basins is distinct from the material from Assam illustrated by Menon (1964: pl.13 figs. 11-12) and at least three or four species are involved; he described the Mekong River basin material as a new species *Garra cyrano*, while assigning the Salween River basin one to *Garra salweenica* Hora & Mukerji, 1934, and the Chao Phraya River basin one to *Garra fuliginosa* Fowler, 1934. The Red River basin material was assigned by the same author to *G. bourreti* Pellegrin, 1928, with *G. orientalis* retained for the South east Chinese one (Kottelat, 2001a). Unavailable for the Irrawaddy River basin material, Kottelat (2000, 2001a) made no mention of its assignment. Nevertheless, the Chinese material identified as '*G. orientalis*' from the upper Irrawaddy River basin is distinguished from *G. tengchongensis* in having 32-34 lateral line scales (vs. 37-38), 16 circumpeduncular scales (vs. 12), a trilobed proboscis on snout (vs. absent) and a anus located immediately anterior to anal-fin origin (vs. in midway between pelvic- and anal-fin origin). *Garra gravelyi*, as already described by Menon (1964) and Talwar & Jhingran (1991), differs from *G. tengchongensis* by having 32-34 lateral line scales (vs. 37-38) and a snout with a transverse groove at tip (vs. absent).

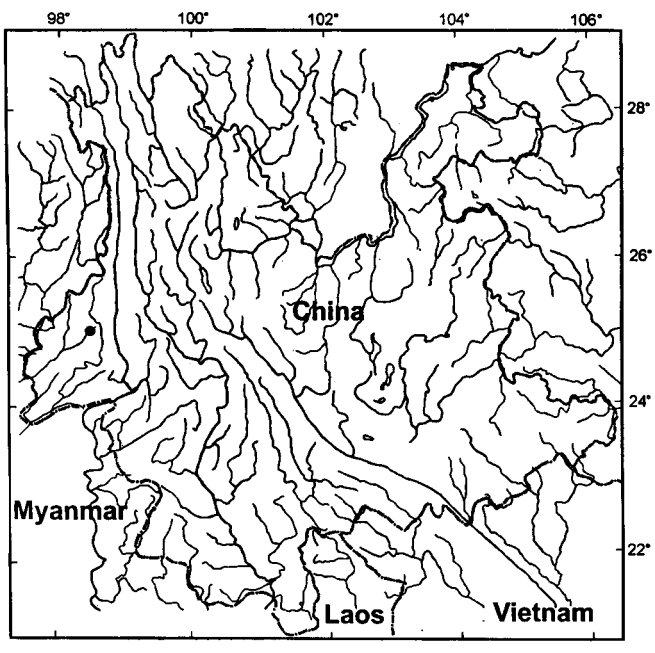

Fig. 3. Distribution of *Garra tengchongensis* in China (•).

As well as *G. graveyli*, there are other three valid species, i.e., *G. imberbis*, *G. notata* and *G. salweenica*, presently known from the Salween River basin in Myanmar (Menon, 1964; Kottelat, 1989, 2000). *Garra imberbis*, as described by Menon (1964), is distinguished from *G. tengchongensis* in having no barbel (vs. two pairs), 44-45 lateral line scales (vs. 37-38), and 16 predorsal scales (vs. 12). According to Menon (1964) and Talwar & Jhingran (1991), *G. notata* is differentiated from *G. tengchongensis* in having 33-34 lateral line scales (vs. 37-38), a scaleless breast and belly (vs. scaled), and a series of black spots at the base of the branched dorsal-fin rays (vs. absent). Based on the description and illustration by Kottelat (2000), *G. salweenica* is different from *G. tengchongensis* in having 29-36 lateral line scales (vs. 37-38), a black mark at tip of upper (and sometimes the lower) caudal-fin lobe (vs. absent), and a series of distinct black spots at base of median dorsal-fin rays (vs. absent).

Besides *G. imberbis* and *G. salweenica,* seven other valid species are so far known from the Mekong River basin, namely *G. cambodgiensis, G. cyrano, G. fasciacauda, G. fuliginosa,* G. *imberba, G. mirofrontis* and *G. theunensis* (see Chui & Cui, 1987; Rainboth, 1996; Kottelat, 1998, 1999, 2000, 2001a, b). *Garra tengchongensis* has 37-38 lateral line scales instead of 48-52 found in both *G. imberba* and *G.*

theunensis and 29-36 in the remaining species. *Garra imberba*, first described by Garman (1912) from the upper Yangtze River, is a nonbarbeled species different from *G. imberbis*. But all Chinese authors mistook the name *imberba* as a variant of the name *imberbis*, therefore using *G. pingi* to replace *G. imberba*. This mistake has already corrected by Kottelat (1998), who considered G. *imberba* is a valid name for the nonbarbled *Garra* species from the upper Yangtze River, with *G. pingi* of the Chinese literatures synonymized with it. *Garra imberba* has been documented from the upper Mekong River basin as well as the upper Yangtze River. *Garra tengchongensis* is further different from *G. imberba* in having two pairs of barbels (vs. absent), 12 circumpeduncular scales (vs. 16) and a anus located almost in midway from pelvic- to anal-fin origin (vs. far away from anal-fin origin). It is further differentiated from other congeners in the Mekong River basin by lacking: a black mid-lateral stripe on body in *G. cambodgiensis*; a long and slender proboscis on snout and six faint stripes on posterior part of brown to black body in *G. cyrano*; a distinct black submarginal stripe along each caudal-fin lobe and a mid-lateral stripe on body in *G. fasciacauda*; a proboscis on snout and a black blotch on caudal-fin base in *G. fuliginosa*; a small, forward pointed process on dorsal head, distally bifurcated with a large conical tubercle at each end in *G. mirofrontis*; the color pattern in G. *theunensis* that the body and fins are plain dark brown, sometimes with 6-8 narrow longitudinal stripes more or less distinct.

ACKNOWLEDGMENTS

We are grateful to two reviewers, M. Kottelat and W. J. Rainboth, for their critical comments on this manuscript. Our sincere thanks are also given to P. -Q. Yue, Institute of Hydrobiology, Chinese Academy of Sciences for her valuable suggestions during the preparation of this manuscript, and to both J. -X. Yang and Y. -R. Chen, Kunming Institute of Zoology, Chinese Academy of Sciences, for helping us in examining specimens. Technical assistance by M. -J. Cai is greatly appreciated for drawing the pictures. The project is supported by a grant for Chinese National Natural Sciences Fund No. 49832010 and also partially for Chinese National Natural Sciences Fund No. 39870124.

LITERATURE CITED

Abebe, G., 1999. *Systematic studies of the African species of the genus Garra (Pisces: Cyprinidae)*. Unpublished Ph. D. thesis. The American Museum of Natural History, New York. 384 pp.

Chen, Y. -R., 1998. Labeoninae. In: Chen, Y. -Y. (ed.)., [*The fishes of the Hengduan mountain region*]. Science Press, Beijing. Pp.168-183. [in Chinese]

Chu, X. -L. & G. -H. Cui, 1987. Taxonomic revision of Chinese cyprinid fishes of the genus *Garra* Hamilton. *Acta Zootaxonomica Sinica*, **12**(1): 93-100. [in Chinese]

Chu, X. -L. & G. -H. Cui, 1989. Labeoniae. In: Chu, X. -L. & Y. -R. Chen (eds.), [*The fishes of Yunnan, China. Volume 1, Cyprinidae*]. Science Press, Beijing. Pp. 229-285. [in Chinese]

Fowler, H. W., 1937. Zoological results of the third De Schauensee Siamese Expedition. Part VIII,-Fishes obtained in 1936. *Proceedings of the Academy of Natural Sciences of Philadelphia*, **89**: 125-264.

Hora, S. L., 1921. Indian cyprinoid fishes belonging to the genus *Garra*, with notes on related species from other countries. *Records of the Indian Museum*, **22**: 633-687.

Hora, S. L. & D. D. Mukerji, 1934. Notes on fishes in the Indian Museum. XXIII. On a collection of fish from the S. Shan States, Burma. *Records of the Indian Museum*, **36**: 353-370.

Krupp, F., 1983. Fishes of Saudi Arabia: freshwater fishes of Saudi Arabia and adjacent regions of the Arabian Peninsula. *Fauna of Saudi Arabia*, **5**: 568-636.

Krupp, F. & W. Schneider. 1989. The fishes of the Jordan River basin and Azraq Oasis. *Fauna of Saudi Arabia*, **10**: 347-416.

Kottelat, M., 1989. Zoogeography of the fishes from Indochinese inland waters with an annotated check-list. *Bulletin Zoölogisch Museum Universiteit van Amsterdam*, **12**: 1-55.

Kottelat, M., 1998. Fishes of the Nam Theun and Xe Bangfai basins, Laos, with diagnoses of twenty-two new species (Teleostei: Cyprinidae, Baltoridae, Cobitidae, Coiidae and Odontobutidae). *Ichthyological Exploration of Freshwaters*, **9**: 1-128.

Kottelat, M., 2000. Diagnoses of a new genus and 64 new species of fishes form Laos (Teleostei: Cyprinidae, Balitoridae, Bagridae, Syngnathidae, Chauhuriidae and Tetraodontidae). *Journal of South Asian Natural History*, **5** (1): 37-82.

Kottelat, M., 2001a. *Freshwater fishes of northern Vietnam*. Report prepared for the world Bank, as part of the project Freshwater Biodiversity Overlay to Support the Vietnam national Hydropower Study. World Bank, Washington. 122 pp.

Kottelat, M., 2001b. *Fishes of Laos*. Wildlife Heritage Trust Publications, Colombo. 196 pp.

Mai, D. Y., 1978. [*Identification of freshwater fishes of north provinces of Viet Nam*]. Scientific & Technology Publisher, Ha Noi. 339 pp. [in Vietnamese]

Menon, A. G. K., 1964. Monograph of the cyprinid fishes of the genus *Garra*, Hamilton. *Memoirs of the Indian Museum*, **14**(4):173-260.

Nichols, J. T., 1925. Some Chinese fresh-water fishes, 11. Certain apparently undescribed carps from Fukien. *American Museum Novitates*: 1-7.

Rainboth, W. J., 1996. *Fishes of the Cambodian Mekong*. FAO, Rome. 265 pp.

Roberts, T. R., 1990. *Garra allostoma*, a new species of cyprinid fish from highlands of the Niger basin in Cameroun. *Revue.d' hydrobiologie Tropicale.*, **23** (2): 161-169.

Smith, H. M., 1931. Descriptions of new genera and species of Siamese fishes. *Proceedings of the United States National Museum*, **79**: 1-48.

Vishwanath, W., 1993. On a collection of fishes of the genus *Garra* Hamilton forn Manipur, India, with description of a new species. *Journal of Freshwater Biology*, **5**(1): 59-68.

Talwar, P. K. & A. G. Jhingran, 1992. *Inland fishes of India and adjacent countries, volume 1*. Oxford & IBH Publishing Co., New Delhi, Bombay, Calcutta. 541 pp.

Tchang, T. -L., 1929. Description de cyprinidés nouveaux de Chine. *Bulletin du Muséum national d'Histoire Naturelle, Pairs*, **1**: 239-243.

Wu, H. -W., R. -D. Lin & Q. -X. Chen, 1977. Barbinae. In: Wu, H.-W. (ed.), [*The cyprinid fishes of China, Volume 2*]. People's Press, Shanghai. Pp. 229-394. [in Chinese]

Wu, Y. -F. & C. -Z. Wu, 1992. [*The fishes of the Qinghai-Xizang plateau*]. Sichuan Publishing House of Science & Technology, Chengdu. 599 pp. [in Chinese]

Zhang, C. -G., B. Cai & T. -Q. Xu, 1995. [*Fishes and Fish Resources in Xizang, China*]. Chinese Agriculture Press, Beijing. 162 pp. [in Chinese]

Zhang, E, P. -Q. Yue & J. -X.. Chen, 2000. Labeoninae. In: Yue, P. -Q., (ed.), [*Fauna Sinica (Osteichthyes: Cypriniformes III)*]. Science Press, Beijing. Pp. 172-272. [in Chinese]