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ZOOGEOGRAPHY OF THE FISHES FROM INDOCHINESE INLAND WATERS WITH AN ANNOTATED CHECK-LIST

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CONTENTS

INTRODUCTION

According to an unpublished bibliography of Indochinese freshwater fishes that I completed, 930 native fish species are known to occur in the inland waters of the Indochinese Peninsula, certainly making it one of the areas with the most diverse ichthyofauna.

The study of this rich fish fauna is still in the discovery and survey stage and there is presently no up-to-date reference work for this area. There are few useful identification guides for the various countries: Smith (1945) for Thailand, Taki (1974) for the Mekong basin in Laos and Kottelat (1985) for the cyprinids of Kampuchea. Day (1875-78, 1888) is still the last complete reference to Burmese and Indian fishes; Jayaram (1981) presents a more recent compilation for India and Burma, but as far as Burma is concerned, the coverage cannot be satisfactory as the author had access only to material collected before 1940. Mohsin & Ambak's (1983) book on western Malaysian fishes suffers from several important flaws (see for example

Zakaria-Ismail, 1983) and appears to be merely a summary of the [few] specimens collected by the authors. At the border of our area, Weber & de Beaufort's (1913-1916) monographs on Cypriniformes and Siluriformes are still the major source of information on Indonesian freshwater fishes; Inger & Chin (1962) present a useful reference for Sabah. Chevey & Lemasson (1937) is the classical reference for fishes of the Red River basin; the recent book by Mai Dinh Yen (1978) on fishes of northern Viet Nam should replace it, but there are several drawbacks to a wider use of it: the nomenclature is outdated, it does not take into consideration works done in the Chinese Red River basin, it uses names first published (?) in government reports and which are not available and it has an almost confidential distribution (not to mention the language problems which is recurrent when working with South-East Asian litterature)(Kottelat, in opress). Systematic ichthyology in South China is now progressing at an accelerated pace and beside recently published books on fishes of Guangxi (Anon., 1981) and Hainan (Anon., 1986), a book on Yunnanese fishes is in press.

The present work is a tentative to summarize the available data on fish taxonomy and fish distribution in the Indochinese Peninsula. The relations of this fauna with its counterparts in adjacent waters will also be discussed.

It seemed to me of interest to produce a study of the state of the art of systematic ichthyology and zoogeography in South-East Asia at a time when some of the tighest borders of the world are opening again, even if it is only slightly. At a time when natural richness and diversity is vanishing quickly, especially in the tropical areas, there is an acute need for exchanging information, within and through all borders. The most basic need for exchanging biological information is a consistent nomenclature, which, of course, can only be reached by in-depth systematic research. It seems that the Oriental ichthyofauna is now attracting interest again and it appeared worth to survey the state of the art of our knowledge in fish systematics and distribution in this area. This is the best way to catalogue actual needs.

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GEOGRAPHICAL SCOPE AND TERMINOLOGY

The present discussion is centered on the fish fauna of the Malay Peninsula, the Mekong and Salween basins outside of China, the Chao Phraya and Mae Khlong basins in Thailand and coastal streams in the intervening areas. This is not a natural unit, but these limits are set by political conditions which prevent work in some adjacent basins. The adjacent basins in the Indochinese Peninsula (Red River, Irrawaddy) will be dealt with only in more general discussions.

In geographic and zoogeographic literature, this area has been known as Indochinese Peninsula, respectively Indochinese Subregion, since last century. According to Prashad (1929), this terminology has been introduced by Crosse & Fischer (1876:335) as province Indo-Chinoise'. In recent years, some biologists were unwilling to use the word Indochina, not for precise biological reasons, but because it is very similar to the former Indochine Française (a name first introduced in 1888 for the reunion of former French colonies and protectorates in South-East Asia: Cochinchina, Annam, Tonkin, Cambodia, Laos [from 1893] and Kouang-Tcheou-Wan territory [from 1900 to 1943]). Considering its unambiguous etymology (between India and China) and its long use in geographical, geological and biogeographical literature, by western as well as local scientists (e.g. Lekagul & McNeely, 1977; Gressitt,1970), I see every reason for using it, at least as a geographical term. It has the great advantage of clarity (the Peninsula between India and China) and conciseness (shorter than the vague 'mainland South-East Asia' or than the enumeration of included countries and parts of countries). Moreover, there has never been a proposal for a substitute name, or none which has been widely accepted.

Malay Peninsula is used for Western Malaysia and Peninsular Thailand south of the Isthmus of Kra.

Krupp (1987:233) found the term Oriental "somewhat misleading since it may refer to any region between the Middle East and Japan". He proposed the name Indoasiatic as a substitute; Indoa-

siatic should refer "to the 'Indian' parts of Asia: India, Indochina and Indonesia, thus covering exactly the area which is presently ascribed to the Oriental region". For various reasons, I can not follow him: 1) I found that there must be very important reasons for replacing the names of old concepts which have met a very wide and general usage; the Oriental Region (or Oriental Realm) is one of them; since its introduction by Wallace (1876) it has been widely used and accepted; 2) I do not find Oriental misleading; 3) introduction of an unnecessary replacement name is just likely to create misunderstanding; 4) it is not clear what is meant by the "Indian" part of Asia; apparently this only refers to the root Indo- in Indochina and Indonesia; 5) the Oriental Region also includes the Philippine Islands (and South China and Taiwan for most groups of plants and animals); 6) the Oriental Region does not include Indonesia east of Sulawesi; 7) there is already another replacement name for the Oriental Realm of Wallace: Blanford (1901) suggested to use Elwes (1873) Indo-Malaya, a name which has not been adopted (see comment by Mani,1974:700).

Toponymy for Thailand and eastern Burma follows the official transcription on the 1501 S 1:250.000 series of topographic maps of Thailand, except for the Mekong (alternative spellings and names: Mékong, Mae Khong, Mae Nam Khong, Ménam Khong, Maekong, Lancantsang, Lancang-jiang) and Salween (Salouin, Salouen, Mae Nam Salawin, Nu-jiang), for which the usual English names and spellings have been retained for clarity.

CHECK-LIST

Myers (1949, 1951) distinguished freshwater fishes into primary, secondary and peripheral divisions according to their tolerance of salt water. Primary freshwater fishes are obligatory freshwater fishes which are physiologically unable to enter saltwater and are thus unable to cross seas. Secondary freshwater fishes live almost exclusively in freshwater but tolerate sea water. Peripheral freshwater fishes are those living in both fresh and salt waters, thus readily able to cross seas; they may be diadromous, sporadic, seasonal or permanent inhabitants of freshwaters.

These divisions are not absolute and do not apply strictly to whole taxonomic units. For example, Ostariophysi are mostly primary division freshwater fishes, but the catfish families Ariidae and Plotosidae and the subfamily Aspredininae of Aspredinidae (a South American family) are peripheral or marine; the East Asian cyprinid genus *Tribolodon* also occurs in salt waters. On the other hand, some species and genera of otherwise marine families occur only in freshwaters, far upstream from the sea (for example the Gobiidae *Rhinogobius chiengmaiensis, R. mekongianus,* etc.).

The following list includes all fishes which have been collected in inland waters of the Indochinese peninsula as defined above. As usual in similar listings, some arbitrary limits had to be set. The most ambiguous one is always the limit between fresh and marine waters. I thought it better to be too inclusive than too exclusive and I decided to include estuaries (but not plume waters). Songkhla Lake (Tale Sap) in Peninsular Thailand posed a specific problem with its different sub-basins whose salinity varies in space and time; using the topographical divisions of Sirimontaporn (1984), fishes of sub-basins IV, V and VI are included. In these sub-basins, the water is either fresh all the year or brackish in the dry season only.

The distribution in the various basins is recorded by the following abbreviations (Fig.1): **MA**, Malay Peninsula (Western Malaysia and Peninsular Thailand); **S**, Salween basin; **MK**, Mae Khlong basin; **CP**, Mae Nam Chao Praya basin; **ME**, Mekong basin; **SE**,coastal streams of South-East Thailand and Kampuchea; **A**, coastal streams of Annam. Distribution is not indicated if the species is euryhaline. Some special habitats are indicated as follow: **eur**, euryhaline (occasional immigrants, brackish waters, estuarines, etc.); **mon**, montane (range restricted to hill stream; **cave**, species restricted to subterranean waters. Our poor knowledge, or lack of knowledge, of the ecology of most species precludes a thorough listing of habitat preferences.

The reader is referred to Smith (1945), Weber & de Beaufort(1911-1962) and Day (1875-1878) for bibliographical references to original descriptions of species occuring in Thailand, Indonesia and India respectively. For all species not reported by these authors, I provide the reference to the original de-

scription; in the following list, these species are recognized by the reference to the page number of the original description [example: *Dasyatis laoensis* Roberts & Karnasuta, 1987 (p.162)]. For bibliographic information relating to Tirant (1885), I refer to the page number in the 1929 reprint edition (Chevey,1929). I decided to exclude the bibliographic references for species discussed in Smith, Weber & de Beaufort and Day in order to save place.

Unless otherwise acknowledged, the comments and informations on synonymy or distribution are mine.

Family CARCHARHINIDAE
See Compagno (1984) for a synopsis of the family.
Carcharhinus hemiodon (Valenciennes, in Müller & Henle,1839) **eur**
A single record from Saigon River at Thu-dau-mot by Tirant (1885 [1929:61]).
Carcharhinus leucas (Valenciennes, in Müller & Henle,1839) **eur**
Carcharhinus melanopterus (Quoy & Gaimard,1824) **eur**
Reported from freshwaters in Perak River by H.W. Smith (1931:281)
Rhizoprionodon acutus (Rüppel,1837) **eur**
Reported, as *Scoliodon palasorrah,* from freshwaters in Perak River by H.W. Smith (1936).
Scoliodon laticaudus Müller & Henle,1838 **eur**

Family PRISTIDAE
Pristis pristis Linnaeus,1758 **eur**

Family DASYATIDAE
Dasyatis laoensis Roberts & Karnasuta,1987 (p.162) **ME**
Himantura bleekeri (Blyth,1860) **eur**
A single record from Songkhla Lake by Hora (1924:464) needs confirmation
Himantura imbricata (Schneider,1801) **eur**
Himantura krempfi (Chabanaud,1923) (1923a:47) **ME, CP**
Himantura signifer Compagno & Roberts,1982 (p.333) **CP, MA**
Himantura uarnak (Fors[s]kal,1775) **eur**
Hypolophus sephen (Fors[s]kal,1775) **eur**

Family OSTEOGLOSSIDAE
Scleropages formosus (Müller & Schlegel,1844) **MA, SE, A**

Family NOTOPTERIDAE
Notopterus blanci d'Aubenton,1965 (p.261) **ME**
Notopterus chitala (Hamilton,1822) **ME, CP, S, MK, MA**
This name is used for a very widely distributed species; topotypical material from India has a conspicuous colour pattern different from the one of Indochinese and Indonesian material, suggesting that at least two species might be involved.
Notopterus notopterus (Pallas,1769) **A, ME, CP, SE, S, MK, MA**

Family MEGALOPIDAE
Megalops cyprinoides (Broussonet,1782) **eur**

Family ANGUILLIDAE
Anguilla australis Richardson,1841 **eur**
Anguilla bicolor McClelland,1844 **eur**
Anguilla japonica Temminck & Schlegel,1847 **eur**
A single record from Hué by Chevey (1935:1423).

Family OPHICHTHIDAE
Ophichthus apicalis (Bennett,1916) **eur**
Ophichthus rutidoderma (Bleeker,1852) **eur**
Pisodonophis boro (Hamilton,1822) **eur**

Family CONGRIDAE
Muraenesox cinereus (Fors[s]kal,1775) **eur**

Family MURAENIDAE
Uropterygius marmoratus (Lacepède,1803) **eur**

Family CHIROCENTRIDAE
Chirocentrus dorab (Fors[s]kal,1775) **eur**

Family CLUPEIDAE
See Whitehead (1985) for a synopsis of the family.
Anodontostoma chacunda (Hamilton,1822) **eur**
Anodontostoma thailandiae Wongratana,1983 (p. 394) **eur**
Clupanodon thrissa Linnaeus,1758 **eur**
Clupeichthys aesarnensis Wongratana,1983 (p.388) **ME**
Clupeichthys perakensis (Herre,1936) (p.5) **MA**
Clupeoides borneensis Bleeker,1851 **eur?, ME, CP**
Corica laciniata Fowler,1935 **eur**
Escualosa thoracata (Valenciennes, in Cuvier & Valenciennes,1847) **eur**
Gonialosa modesta (Day,1869) **eur?, S**
Gonialosa whiteheadi Wongratana,1983 (p.394) **eur?, S**
Herklotsichthys dispilonotus (Bleeker,1852) **eur**
Hilsa kelee (Cuvier,1829) **eur?**
Nematalosa galatheae Nelson & Rothman,1973 (p. 158) **eur**
Nematalosa nasus (Bloch,1795) **eur**
Tenualosa macrura (Bleeker,1852) **eur**
Tenualosa reevesii (Richardson,1846) **eur**
Tenualosa thibeaudaui (Durand,1940) (p.6) **ME**
Tenualosa toli (Valenciennes, in Cuvier & Valenciennes,1847) **eur**

Family PRISTIGASTERIDAE
See Whitehead (1985) for a synopsis of the family.
Ilisha megaloptera (Swainson,1839) **eur**
Ilisha melastoma (Schneider,1801) **eur**
Opisthopterus tardoore (Cuvier,1829) **eur**

Family ENGRAULIDIDAE
Coilia dussumieri Valenciennes, in Cuvier & Valenciennes,1848 **eur**
Coilia lindmani Bleeker,1858 **ME, A, eur?**
Coilia macrognathos Bleeker,1852 **eur**
Coilia mystus (Linnaeus,1758) **eur**

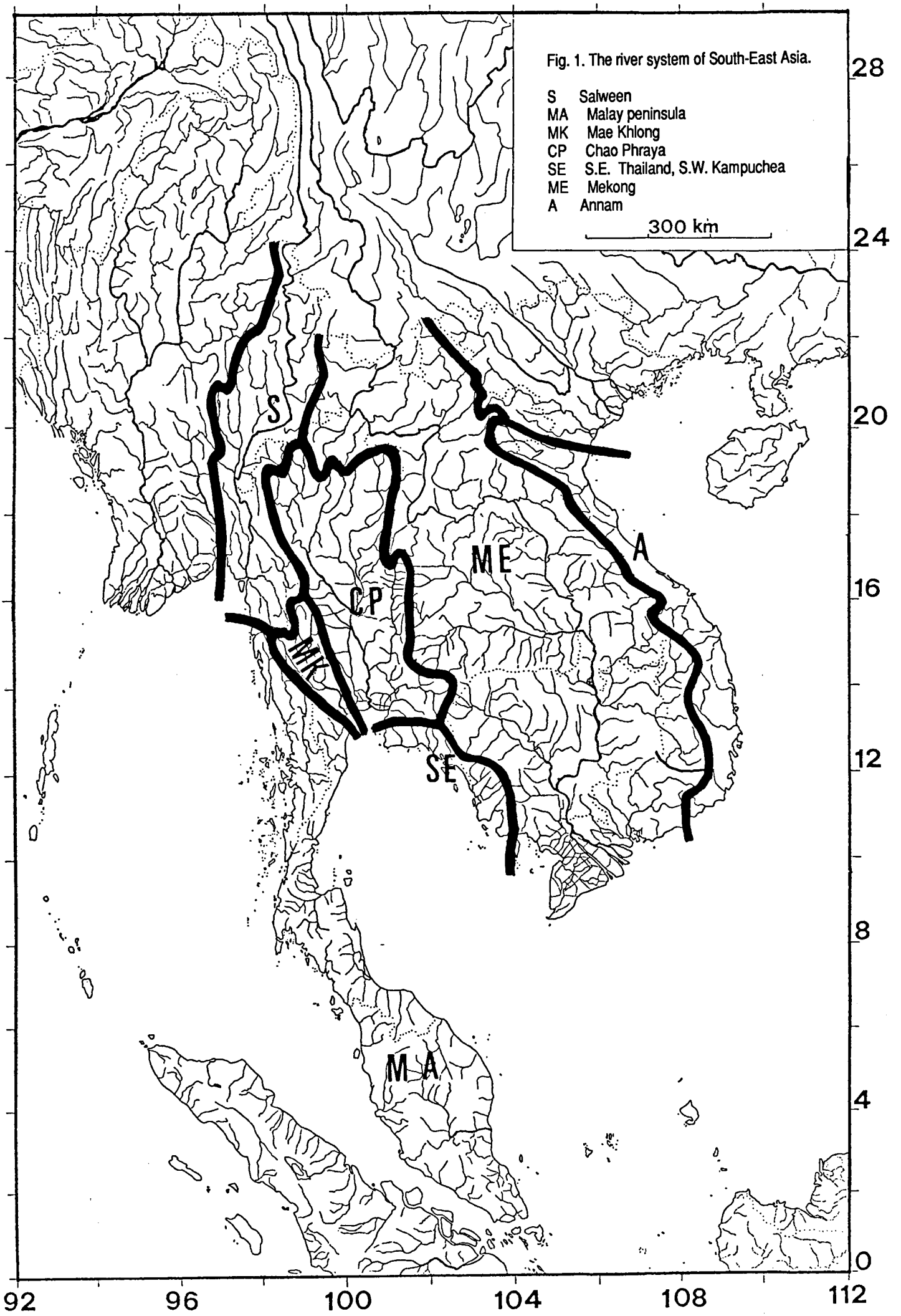

Fig. 1. The river system of South-East Asia.

S Salween
MA Malay peninsula
MK Mae Khlong
CP Chao Phraya
SE S.E. Thailand, S.W. Kampuchea
ME Mekong
A Annam

Coilia neglecta Whitehead,1968 (p.33) **eur**
Coilia ramcarati (Hamilton,1822) **eur**
Coilia rebentischi Bleeker,1849 **eur**
Lycothrissa crocodilus (Bleeker,1851) **eur?**
Setipinna breviceps (Cantor,1850) **eur**
Setipinna melanochir (Bleeker,1849) **eur**
Setipinna taty (Valenciennes, in Cuvier & Valenciennes, 1848) **eur**
Stolephorus baganensis Hardenberg,1931 (p.107) **eur**
Stolephorus commersonii Lacepède,1803 **eur**
Stolephorus dubiosus Wongratana,1983 (p.400) **eur?, MA, CP**
Stolephorus indicus (van Hasselt,1823) **eur**
Stolephorus insularis Hardenberg,1933 (p.260) **eur**
Stolephorus tri (Bleeker,1852) **eur**
Thryssa dussumieri (Valenciennes, in Cuvier & Valenciennes, 1848) **eur**
Thryssa hamiltoni (Gray,1835) **eur**
Thryssa mystax (Bloch, in Schneider,1801) **eur**
Thryssa setirostris (Broussonet,1782) **eur**

Family CHANIDAE
Chanos chanos (Fors[s]kal,1775) **eur**

Family CYPRINIDAE
Acanthorhodeus deignani Smith,1945 **ME**
Known from Upper Middle Mekong in Laos and Red River basin in Viet Nam (Holcik,1971:29).
Albulichthys albuloides (Bleeker,1855) **ME, CP, MK**
Albulichthys krempfi Pellegrin & Chevey,1927 (p.304) is a synonym (Kottelat,1985a:956).
Amblypharyngodon atkinsoni (Blyth,1860) **S**
Amblyrhynchichthys truncatus (Bleeker,1851) **ME, CP, MA**
Aristichthys nobilis (Richardson,1844) (**MA** introduced)
Aspidoparia morar (Hamilton,1822) **S**
Balantiocheilos melanopterus (Bleeker,1851) **CP, ME, MA**
Thai fisheries officers consider this species as extinct in Thailand.
Bangana almorae (Chaudhuri,1912) (p.438) **S**
Bangana devdevi (Hora,1936) (p.324) **S**
Labeo devdevi Hora,1936 was proposed for the Burmese and Thai fish formerly identified as *L. dyocheilus* (Hamilton,1822) by Mukerji (1936:55). Hora (1936: 324) did not indicate types or type-locality. His material is the same as used by Mukerji, which are thus syntypes.
Bangana pierrei (Sauvage,1880) (p.233) **ME, CP**
Discussed in Kottelat (1984c:802). *Osteochilus tatumi* Fowler, 1937, *Labeo lippus* Fowler,1935, *L. cheveyi* Fowler,1937 and *L. behri* Fowler,1937 are possibly synonyms. The genus is in need of a critical revision.
Barbichthys laevis (Valenciennes, in Cuvier & Valenciennes,1842) **MA**
The genus has been revised by Banarescu (1980); see also Kottelat (1984c).
Barbichthys nitidus (Sauvage,1878) (1878b:241) **ME, CP, MK**
Barbodes altus (Günther, 1868) **ME, CP**
Generic nomenclature follows Rainboth (1981).
Barbodes balleroides (Valenciennes, in Cuvier & Valenciennes, 1842) **ME, CP, MA**
Barbus bramoides Valenciennes, in Cuvier & Valenciennes, 1842 is a synonym (Fang,1943:400).
Barbodes foxi (Fowler,1937) **ME**
Barbodes gonionotus (Bleeker,1850) **ME, CP, SE, MK, MA**
Including *Puntius viehoeveri* Fowler,1943 (p.26). Intensively cultivated in South East Asia.
Barbodes jolamarki (Smith,1934) **CP**
Barbodes schwanenfeldii (Bleeker,1853) **ME, CP, MK, MA**
Barbodes strigatus (Boulenger,1894) (p.247)
A single record (Herre & Myers,1937:64), apparently erroneous, the species being otherwise known from North Borneo only.
Barilius barnoides Vinciguerra, 1890 (p.307) **S**
See discussion in Kottelat (1984c:796). *Danio monsiensis* Yang & Huang, in Wu et al.,1964 (p.56) is a synonym. Fowler (1958) coined the name *B. shanensis* to replace *B. ornatus* of Boulenger (1893), preoccupied by Sauvage (1883). However, Boulenger clearly indicated that the author of the name *B. ornatus* was Sauvage. Additionally, Boulenger did not describe this species; he merely listed localities and specimens. As Boulenger did not gave a description, Fowler's reference to that paper does not make the name *B. shanensis* available.
Barilius bernatziki Koumans,1937 **MA**
Barilius huahinensis Fowler,1934 **MA**
Barilius koratensis Smith,1931 **ME, CP**
Barilius nanensis Smith,1945 and *Danio (Allodanio) ponticulus* Smith,1945 are tentative synonyms.
Barilius ornatus Sauvage,1883 **CP**
Barilius infrafasciatus Fowler,1934 is a synonym (Kottelat, 1984c:794).
Barilius pulchellus Smith,1931 **ME, CP**
Barilius bhuddae Fowler,1934 and *B. pellegrini* Fang, 1938 (p.587) are synonyms (Chu,1984:97; Kottelat,1984c:796). *Daniops nammuensis* Yen,1978 (p. 123) and *D. macropterus* Yen,1978 (p.124) from Lai Chau on the upper Black River in Viet Nam, quite close to the divide with Mekong, are probably synonyms.
Brachydanio albolineatus (Blyth,1860) **ME, S, SE, MA, MK**
Danio pulcher Smith,1931 and *Danio (Brachydanio) tweediei* Brittan,1956 (p.41) apparently are synonyms.
Brachydanio jayarami (Barman,1985) (p.31) **S**
Brachydanio kerri (Smith,1931) **MA**
Brachydanio nigrofasciatus (Day,1869) **S**
Brachydanio shanensis (Hora,1928) **S**
Brachydanio sondhii (Hora & Mukerji,1934) (1934a:128) **S**
Carassius auratus (Linnaeus,1758) (**A introduced**)
Catla catla (Hamilton,1822) (**MA introduced**)
Catlocarpio siamensis Boulenger,1898 **CP, ME**
Chagunius bayleyi Rainboth,1986 (p.10) **S**
Chanodichthys flavipinnis (Tirant,1883) (p.98) **A**
Chela caeruleostigmata (Smith,1931) **CP, ME**
Chela mouhoti Smith,1945 is a synonym (Banarescu,1971a: 17).
Chela laubuca (Hamilton,1822) **S, MA, MK, CP, ME, SE, A**
Clupea huae Tirant,1883 (p.98) and *Laubuca siamensis* Fowler, 1939 are synonyms (Kottelat,1987a:12; Banarescu,1971a:16)
Chela maassi (Weber & de Beaufort,1912) **MA**
Cirrhinus chinensis Günther,1868 **CP, ME**
The species is redescribed by Banarescu (1972a:

254). The genus is badly in need of a critical revision. *Osteochilus prosemion* Fowler,1934 and *Labeo stigmapleura* Fowler,1937 are tentatively considered as synonyms. Banarescu (1983:14) considered *O. prosemion* as a subspecies of *C. mrigala* without providing evidences. *Leuciscus molitorella* Valenciennes, in Cuvier & Valenciennes,1844 is presently a nomen dubium; it might be a senior synonym of the present species. A Chinese species identified as *C. molitorella* has been released in Singapore and Malaysia (Herre & Myers,1937:59; Mohsin & Ambak, 1983:106).

Cirrhinus jullieni Sauvage,1878 **ME**
The species commonly identified as *C. jullieni* in fisheries litterature is *Henicorhynchus siamensis* Sauvage,1881 (Kottelat,1984c:803).

Cirrhinus macrosemion (Fowler,1935) **ME, MK, CP?**
Osteochilus spilopleura Fowler,1935 is apparently a synonym; Banarescu (1983:16) treated it as a synonym of *C. jullieni* but did not provide evidences.

Cirrhinus microlepis Sauvage,1878 **ME, CP**
Cirrhina aurata Sauvage,1878 and *Labeo pruol* Tirant,1885 (1929:154) are synonyms and *Labeo (Labeo) aurovittatus* Sauvage,1878 (1878b:239) is a tentative synonym (Kottelat, 1984c:797,802; 1987a:14).

Cirrhinus mrigala (Hamilton,1822) **S**

Cirrhinus reba (Hamilton,1822) **CP?, MA?**
Records of Günther (1868:74), Smith (1931:186; 1945: 270), Fowler (1934a: 115) and Duncker (1904: 176) need confirmation. Most might refer to *Henicorhynchus siamensis.*

Cosmochilus harmandi Sauvage,1878 **ME, CP**
Papillocheilus ayuthiae Smith,1945 and *C. pellegrini* Durand, 1940 (p.10) are synonyms (Kottelat,1984c:799).

Crossocheilus burmanicus Hora,1936 (p.324) **S**
Hora (1936) used *burmanicus* on p.319 and *burmanicas* on p. 324. As first reviser, I assume that the second spelling is a typographic error and I retain *burmanicus* as the correct spelling. Banarescu (1986:153) described *C. horai,* considering that *C. burmanicus* was not available. This is not correct. Hora clearly proposed the name for the 'Assamese' form of *C. latius* sensu Mukerji (1934:52) and thus the name is available; Hora did not designate type specimens, but as he mentions material reported by Vinciguerra (1890:280), Hora (1921:183), Hora & Mukerji (1935:389) and Mukerji (1932:283; 1934:52), these are syntypes.

Crossocheilus caudiguttatus Fowler,1934 **CP**

Crossocheilus cobitis (Bleeker,1853) **MA, ME?**
The genus is in need of a critical revision. *Crossocheilus pseudobagroides* Duncker,1904 (p.176) and *Epalzeorhynchos kalliurus* Smith,1945 are possibly synonyms (Banarescu, 1986:149).

Crossocheilus langei Bleeker,1860 **MA**

Crossocheilus oblongus Kuhl & van Hasselt, in van Hasselt, 1823 **MA, CP**
Epalzeorhynchos stigmaeus is considered as a subspecies by Banarescu (1986:144).

Crossocheilus reticulatus (Fowler,1934) **ME, CP, MK**
Crossocheilus tchangi Fowler,1935, *C. reticulatus* Fowler, 1935 (nec Fowler,1934) and *Tylognathus coatesi* Fowler,1937 are apparently synonyms (Banarescu,1986:145-147).

Crossocheilus siamensis (Smith,1931) **MA, ME**

Ctenopharyngodon idellus (Valenciennes, in Cuvier & Valenciennes,1844) **(MA, Introduced)**

Cyclocheilichthys apogon (Valenciennes, in Cuvier & Valenciennes,1842) **A, ME, CP, SE, MK**

Cyclocheilichthys armatus (Valenciennes, in Cuvier & Valenciennes,1842) **ME, CP, MK, SE, MA**

Cyclocheilichthys enoplos Bleeker,1850 **CP, ME**
Cyclocheilichthys dumerili Sauvage,1881 (p.163) and *Barbus enoploides* Tirant,1885 (1929:157) are synonyms (Kottelat, 1984c:800; 1987a:9).

Cyclocheilichthys furcatus Sontirat,1985 (p.43) **ME**

Cyclocheilichthys heteronema (Bleeker,1853) **MA**

Cyclocheilichthys lagleri Sontirat,1985 (p.45) **CP**

Cyclocheilichthys repasson (Bleeker,1853) **ME, CP, MK, SE, MA**

Cyprinion burmanicus (Vinciguerra,1890) **S, CP, ME, mon**
See Howes (1982:331) for generic position. *Scaphiodontopsis acanthopterus* Fowler,1934 and *Onychostoma macracanthus* Pellegrin & Chevey, 1936 (1936a: 24) apparently are synonyms. The genus is in need of a critical revision. See also Banarescu (1980).

Cyprinus carpio Linnaeus,1758 **(CP, ME, MA, A, Introduced)**

Cyprinus intha Annandale, 1918 (p.47) **S, ME?**

Danio aequipinnatus (M'Clelland,1839) **S, ME, MA, mon**
A genus in great need of a critical revision. The type species of *Danio, Cyprinus dangila* Hamilton,1822, seems to have great affinities with *Brachydanio rerio* (Hamilton,1822). Tentative synonyms: *Leuciscus lineolatus* Blyth,1858, *Perilampus affinis* Blyth,1860, *Danio browni* Regan,1907 (p.305) and *Danio strigillifer* Myers,1924 (p.1).

Danio annandalei Chaudhuri,1908 (p.125) **S, ME, CP, mon**
Tentative synonyms: *Parabarilius laoensis* Pellegrin & Fang, 1940 (p.118) and *Daniops myersi* Smith,1945 (see also Kottelat, 1982c:525).

Danio kakhienensis Anderson,1878 (p.868) **S**

Danio regina Fowler,1934 **MA**

Danio spinosus Day,1869 **S**

Eirmotus octozona Schultz,1959 (p.11) **CP?**
Originally described from Central Thailand, this species has since only been reported from Borneo. The original report, based on aquarium material, is believed to be erroneous (Kottelat,1982a).

Epalzeorhynchos bicolor (Smith,1931) **CP**

Epalzeorhynchos frenatus (Fowler,1934) **CP, ME**
Labeo erythrura Fowler,1937 is a synonym according to Sontirat (1980:698).

Epalzeorhynchos kalopterus (Bleeker,1851) **MA**

Epalzeorhynchos munensis (Smith,1934) **ME**

Esomus ahli Hora & Mukerji,1928 (p.47) **S**

Esomus altus (Blyth,1860) **S**

Esomus caudiocellatus Ahl,1924 (p.43) **S?, MA?**
This species is known only from the types which were aquarium specimens without locality information.

Esomus longimana (Lunel,1881) (p.296) **ME, SE, CP, MA**
Esomus goddardi Fowler,1937 is apparently a synonym.

Esomus malayensis Ahl,1924 (p.43) **MA?**

This species is known only from the types which were aquarium specimens. Ahl (1924:43) gives the following type locality: "Malayische Halbinsel oder Archipel ?".

Esomus metallicus Ahl,1924 **ME, CP, SE, MK, MA**

Garra cambodgiensis (Tirant,1884) (p.170) **ME, CP, SE, MK, MA**
Garra taeniata Smith,1931, *G. spinosa* Fowler,1934, *G. taeniatops* Fowler,1935 and *G. parvifilum* Fowler,1939 are tentative synonyms (Kottelat,1987a:10).

Garra fasciacauda Fowler,1937 **ME**

Garra gravelyi (Annandale,1919) (p.133) **S**

Garra imberbis (Vinciguerra,1890) (p.277) **S, ME, mon**

Garra nasuta (M'Clelland,1838) **S, CP, ME, MA?**
Several species very similar are considered synonyms by Menon (1964): *Gonorhynchus caudatus* M'Clelland, 1839, *Garra orientalis* Nichols, 1925 (1925b: 4), *Discognathus bourreti* Pellegrin,1928 (p. 340), *Garra fuliginosa* Fowler,1934 and *Garra salweenica* Hora & Mukerji,1934 (1934b:365). *Discolabeo fisheri* Fowler,1937 appears closely related too. A critical revision of the genus is needed.

Garra notata (Blyth,1860) **S**

Hampala dispar Smith,1934 **ME**

Hampala macrolepidota Kuhl & van Hasselt, in van Hasselt,1823 **ME, CP, SE, MK, MA**

Hemiculter krempfi Pellegrin & Chevey,1938 (p.18) **A**

Hemiculter leucisculus (Basilewsky,1855) (p.238) **A**
Squaliobarbus annamiticus Tirant, 1883 (p.97) is a synonym (Kottelat,1987a:17).

Henicorhynchus lineatus (Smith,1945) **ME**

Henicorhynchus siamensis (Sauvage,1881) (p.164) **ME, CP, A?**
The genus is badly in need of a critical revision. Kottelat (1984c:802) considered that the following taxa are potential synonyms: *Tylognathus siamensis* de Beaufort, 1927 (p.5), *T. brunneus* Fowler,1934, *T. caudimaculatus* Fowler,1934, *T entmema* Fowler,1934, *Cirrhinus marginipinnis* Fowler,1937, *C sauvagei* Fang,1942 (p.168), *Crossocheilus thai* Fowler,1944 (p.49) and *H. lobatus* Smith,1945. *Cyclocheilichthys kontumensis* Chevey,1934 (p.32) might be related too. The fish usually identified as *Cirrhinus jullieni* in Thai fisheries litterature is the present species.

Hypophthalmichthys molitrix Valenciennes, in Cuvier & Valenciennes,1844 **(MA Introduced)**

Inlecypris auropurpureus (Annandale,1918) (p.51) **S**
Endemic in Inlé Lake, Burma. Howes (1980b:171) erected a new genus for this species originally described in *Barilius*.

Labeo angra (Hamilton,1822) **S**

Labeo calbasu (Hamilton,1822) **S**

Labeo chrysophekadion (Bleeker,1850) **ME, CP, MK, MA**
See Reid (1985:288) for discussion of the generic position. *Rohita sima* Sauvage,1878, *R. pectoralis* Sauvage,1878 and *R. barbatula* Sauvage,1878 are synonyms (Kottelat,1984c:806,807).

Labeo curchius (Hamilton,1822) **S**

Labeo dyocheilus (M'Clelland,1839) **S, ME, CP**
Osteochilus sondhii Hora & Mukerji,1934 (1934b:359) is based on two species; its holotype is *L. dyocheilus* (Karnasuta, 1982:202). *Osteochilus ochrus* Fowler,1935 is a synonym (Karnasuta,1982:199).

Labeo gonius (Hamilton,1822) **S**

Labeo indramontri Smith,1945 **CP**
Probably not valid, but its status cannot be cleared before Asian *Labeo* are revised.

Labeo rohita (Hamilton,1822) **(MA Introduced)**

Labeo sinkleri Fowler,1934 **CP**

Labiobarbus burmanicus (Day,1878) **S, MA?, MK?**
A genus in great need of revision. The records from Tapi River by Smith (1945:222) and Mae Khlong by Johnsen (1963:149) need confirmation.

Labiobarbus fasciatus (Bleeker,1853) **MA, ME?**

Labiobarbus festivus (Heckel,1843) **MA**

Labiobarbus kuhlii (Valenciennes, in Cuvier & Valenciennes,1842) **CP**

Labiobarbus leptocheilus (Valenciennes, in Cuvier & Valenciennes, 1842) **ME, CP, SE, MK, MA**

Labiobarbus lineatus Sauvage,1878 **ME, CP, SE, MA**

Labiobarbus ocellatus (Heckel,1843) **MA**

Labiobarbus siamensis (Sauvage,1881) **ME, CP, SE, MA**

Labiobarbus spilopleura (Smith,1934) **ME, CP**

Labiobarbus sumatranus (Bleeker,1852) **MA**

Leptobarbus hoeveni (Bleeker,1851) **A, ME, CP, MK, SE, MA**
Filirasbora rubripinna Fowler,1937 is a tentative synonym.

Lobocheilos bo (Popta,1904) **ME, CP, MA**
A genus in need of revision. Kottelat (1985b:265) hypothesized that there are only two species in most of Indochina: *L. melanotaenia* and *L. rhabdoura*. The genus is presently being revised and awaiting definitive results, I retain the various taxa.

Lobocheilos cheveyi Smith,1945 **ME**

Lobocheilos cornutus Smith,1945 **MA**

Lobocheilos cryptopogopon (Fowler,1935) **CP, ME**

Lobocheilos davisi (Fowler,1937) **ME**

Lobocheilos delacouri (Pellegrin & Fang,1940) (p.112) **ME**

Lobocheilos fowleri (Pellegrin & Chevey,1936) (1936b:222) **ME**

Lobocheilos gracilis (Fowler,1937) **CP**

Lobocheilos melanotaenia (Fowler,1935) **CP, ME**

Lobocheilos nigrovittatus Smith,1945 **CP**

Lobocheilos quadrilineatus (Fowler,1935) **MA, MK, CP**

Lobocheilos rhabdoura (Fowler,1934) **ME, CP, MA**

Lobocheilos thavili Smith,1945 **CP**

Lobocheilos trangensis (Fowler,1939) **MA**

Longiculter siahi Fowler,1937 **CP**
Kottelat (1985b:263) reports the genus from Kampuchea, from a single specimen which might represent a second, unnamed species.

Luciosoma bleekeri Steindachner,1879 **CP, MK, ME**

Luciosoma setigerum (Valenciennes, in Cuvier & Valenciennes,1842) **MA, MK, CP**

Luciosoma trinema (Bleeker,1852) **MA**

Macrochirichthys macrochirus (Valenciennes, in Cuvier & Valenciennes,1844) **CP, ME, MK, MA**

Mekongina erythrospila Fowler,1937 **ME**

Microrasbora erythromicron Annandale,1918 (p.51) **S**
Endemic to Inlé Lake, Burma.

Microrasbora rubescens Annandale,1918 (p.50) **S**
Endemic to Inlé Lake, Burma. The genus is being revised. Two undescribed species are known, one from

Burma (Irrawaddy basin) and one from Peninsular Thailand.

Mylopharyngodon piceus (Richardson,1846) **(MA, introduced)**

Mystacoleucus argenteus (Day,1888) **S**

Mystacoleucus atridorsalis Fowler,1937 **ME**

Mystacoleucus chilopterus Fowler,1935 **CP, MK, MA**
Redescribed by Zakaria-Ismail (1985:36).

Mystacoleucus greenwayi Pellegrin & Fang,1940 (p.114) **ME**
Mystacoleucus lepturus Huang,1979 (p.419) is a synonym (Kottelat, in prep.).

Mystacoleucus marginatus (Valenciennes, in Cuvier & Valenciennes, 1842) **ME, CP, MK, SE, MA**
Puntius siamensis Sauvage,1883 (p.152) is a synonym (Kottelat, 1984c:805; in prep.).

Neobarynotus microlepis (Bleeker,1851) **MA, ME**

Neolissochilus blanci (Pellegrin & Fang,1940) (p.115) **ME**
Rainboth (1985) provided a name for this genus formerly known under the uncorrect names *Lissochilus* or *Acrossocheilus*. He listed the included nominal species, but did not consider the alpha-taxonomy. A revision of the genus is needed.

Neolissochilus blythi (Day,1869) **S**

Neolissochilus dukai (Day,1878) **S, CP?, MA?, ME?**

Neolissochilus hendersoni (Herre,1940) (p.10) **MA**

Neolissochilus hexastichus (M'Clelland,1839) **S**

Neolissochilus nigrovittatus (Boulenger,1893) (p.201) **S**

Neolissochilus paucisquamatus (Smith,1945) **MA**

Neolissochilus soroides (Duncker,1904) (p.178) **MA**

Neolissochilus stevensonii (Day,1870) **S**

Neolissochilus stracheyi (Day,1871) **S**

Neolissochilus sumatranus (Weber & de Beaufort,1916) **MA**
Including *Lissochilus hutchinsoni* Fowler,1934 (Rainboth, 1985:30).

Neolissochilus tweediei (Herre & Myers,1937) (p.61) **MA**

Neolissochilus vittatus (Smith,1945) **S**

Onychostoma gerlachi (Peters,1880) (p.1034) **ME, A**
Nomenclature tentatively follows Banarescu (1971b: 243). Chinese authors usually place the species in *Varicorhinus;* this is a genus of African cyprinids obviously distinct. The Mekong basin record is by Taki (1975a:143).

Opsarichthys bidens Günther,1873 (p.249) **ME?**
Record based on material from Xien Khouang, Laos (BMNH 1933.8.4:1-5). Xien Khouang is close to the divide between Mekong and Red River basins and there are no precise informations alowing to decide in which basin these specimens have been collected.

Oreichthys cosuatis (Hamilton,1822) **S, CP, MA, SE**
Oreichthys parvus Smith,1933 and *Puntius roloffi* Klausewitz, 1957 (1957a:193) have been considered synonyms (Hora,1937:321; Kottelat,1982c:527). Considering the range of the species, additional material is needed in order to confirm this synonymy. *Puntius masyai* Smith,1945 is a tentative synonym.

Osteobrama alfrediana (Valenciennes, in Cuvier & Valencienes, 1844) **S**

Osteobrama belangeri (Valenciennes, in Cuvier & Valenciennes, 1844) **S**

Osteobrama feae Vinciguerra, 1890 (p.311) **S**

Osteochilus brachynotopteroides Chevey,1934 (p.34) **A**
The systematics of the genus follow Karnasuta (1982).

Osteochilus enneaporos (Bleeker,1852) **MA**

Osteochilus hasselti (Valenciennes, in Cuvier & Valenciennes, 1842) **S, CP, ME, MK, SE, A, MA**
Karnasuta (1982:185) examined the holotype of *Rohita vittatus* Valenciennes, in Cuvier & Valenciennes, 1842. He found that it was not the species usually recorded under that name (here called *O. microcephalus*), but was not sure about its identity. He considered the holotype of *R. vittatus* as possibly close to *O. hasselti, O. harrisoni* or a still not formally named species. The type locality of *R. vittatus* is Java. *Osteochilus harrisoni* and the unnamed species are restricted to western Borneo and thus are unlikely to be *vittatus,* especially as its holotype was collected long before any Borneo material became available to ichthyologists. *Osteochilus hasselti* is common in all South-East Asia, including Java, so that it is very likely to be the same as *R. vittatus.*
Osteochilus hasselti is the commonest member of the genus and it has been the subject of various researches in fisheries, ecology and toxicology. The name *O. vittatus* has been used until recently for *O. microcephalus*, a species nearly as widely distributed and common as *O. hasselti.* The two names are available from the same publication. If *O. hasselti* and *O. vittatus* are really the same species, then they are simultaneous synonyms and there is a potential risk of confusion, depending of the choice of the first reviser: the use of *O. vittatus* (which has been associated for more than 100 years with what we now call *O. microcephalus*) instead of *O. hasselti* is certainly not desirable. In order to definitively avoid that *O. hasselti* be replaced by *O. vittatus*, I formally consider them as synonyms (this can be confirmed or infirmed by subsequent researches). As they are simultaneous synonyms and as there is no first reviser, I select *O. hasselti* as the valid name and retain *O. vittatus* as synonym.
Banarescu & Bianco (1984:65) indicated that specimen RMNH 23368 had already been designated as lectotype. Actually there is no published lectotype designation for this species prior to Banarescu & Bianco's action; they are thus authors of the lectotype designation. However this designation is not valid as the specimen RMNH 23368 has been collected in Banjermassin (Borneo) by J.Wolff in 1850 (or 8 years after the publication of Valenciennes' description) and cannot be part of the type series. Valenciennes apparently based his description on a single specimen, the holotype, MNHN 3857.

Osteochilus kahajanensis (Bleeker,1857) **MA**

Osteochilus lini Fowler,1935 **SE, CP, ME**

Osteochilus melanopleura (Bleeker,1852) **MA, MK, CP, ME**

Osteochilus microcephalus (Valenciennes, in Cuvier & Valenciennes,1842) **A, ME, CP, MK, MA**
This is the *O. vittatus* of most authors; *O. vittatus* is considered here as a synonym of *O. hasselti.*

Osteochilus pleurotaenia (Bleeker,1855) **MA**

Karnasuta (1982:72) pointed the fact that this species is type species of *Diplocheilichthys*, a name which is senior to *Osteochilus* but has been used only twice by Bleeker (1860:423, 1864:194). He wrote that he would ask the International Commission on Zoological Nomenclature to suppress *Diplocheilichthys*. This has not yet been done.

Osteochilus schlegelii (Bleeker,1851) **CP, MK**

Osteochilus spilurus (Bleeker,1851) **MA**

Osteochilus triporos (Bleeker,1852) **MA**

Osteochilus waandersi (Bleeker,1852) **ME, SE, CP, MK, MA**

Oxygaster anomalura van Hasselt,1829 **MA**

Parachela hypophthalmus (Bleeker,1860) **MA**

Parachela maculicauda (Smith,1934) **MA, ME**

Parachela oxygastroides (Bleeker,1852) **ME, CP, MA**

Parachela pointoni (Fowler,1934) **CP, ME?**
Exact generic position still needs examination (see Howes, 1979:190).

Parachela siamensis (Günther,1868) **ME, CP, MA**

Parachela williaminae Fowler,1934 **ME**

Paralaubuca barroni (Fowler,1934) **ME**
Banarescu (1971c) revised the genus.

Paralaubuca harmandi Sauvage,1883 **ME, CP**

Paralaubuca riveroi (Fowler,1935) **ME, CP, MA**

Paralaubuca stigmabrachium (Fowler,1934) **CP, ME**

Paralaubuca typus Bleeker,1865 **CP, ME, MA**

Poropuntius bantamensis (Rendahl,1920) **CP, ME**
Generic nomenclature follows Rainboth (1981).

Poropuntius beasleyi (Fowler,1937) **ME**

Poropuntius birtwistlei (Herre,1940) **MA**

Poropuntius chondrorhynchus (Fowler,1934) **ME**

Poropuntius deauratus (Valenciennes, in Cuvier & Valenciennes, 1842) **A, SE, MA, ME?**

Poropuntius faucis (Smith,1945) **CP**
Probably the juvenile of an other species.

Poropuntius hampaloides (Vinciguerra,1890) (p.298) **S, MK**

Poropuntius huguenini (Bleeker,1853) **ME?, CP?**
Records of this Javanese species in Indochinese waters by Smith (1945:184) and Taki (1968:11; 1974b:130) needs confirmation.

Poropuntius laoensis (Günther,1868) **ME**

Poropuntius malcolmi (Smith,1945) **CP**

Poropuntius shanensis (Hora & Mukerji,1934) (1934b:362) **ME?**
A single record (Fowler,1936:510) needing confirmation.

Poropuntius smedleyi (de Beaufort,1933) **MA** (p.34)

Poropuntius vernayi (Norman,1925) (p.315) **S, MK**

Poropuntius wetmorei (Smith,1931) **CP**

Probarbus jullieni Sauvage,1880 **ME, CP, MK, MA**
Barbus pahangensis Duncker,1904 (p.179) is a synonym (Alfred, 1963b:165). *Cyclocheilichthys jullieni* Sauvage,1880 (p.230) is probably a synonym (Kottelat, 1984c:800).

Puntioplites bulu (Bleeker,1851) **ME, MA**
Barbus carassioides Heckel,1843 (p.1019) from Borneo apparently is a member of this genus. Its correct identification must await examination of the type(s) which cannot be located at the momemt in NMW.

Puntioplites proctozysron (Bleeker,1865) **ME, CP, MK, MA**

Puntioplites waandersi (Bleeker,1859) **ME**

Puntius aurotaeniatus (Tirant,1885) (1929:160) **ME, SE**
Puntius stigmatosomus Smith,1931 and *Barbus pessuliferus* Fowler,1937 are synonyms (Kottelat,1987a:8; Taki,1974b:122). *Puntius sametensis* Smith,1945 is a tentative synonym.

Puntius binotatus (Valenciennes, in Cuvier & Valenciennes,1842) **A, ME, CP, S, SE, MK, MA**

Puntius brevis (Bleeker,1850) **ME, CP, SE, MK, MA**
Including *P. leiacanthus* auct. (e.g. Smith,1945:172).

Puntius burmanicus (Day,1878) **S**

Puntius chola (Hamilton,1822) **S**

Puntius compressiformis (Cockerell,1913) (p.133) **S**
Endemic to Inlé Lake, Burma. *Barbus compressiformis* is the oldest of three replacement names for *B. compressus* Boulenger, 1893 (p.202). The two others are *B. stedmanensis* Boulenger, in Annandale,1918 (p. 47) and *B. liui* Fowler,1958 (p.12).

Puntius dunckeri Ahl,1929 (p.165) **MA**
The specimens reported as *P. everetti* (Boulenger,1894) (p.248) from the Malay Peninsula (Menon,1954:20; Cramphorn,1983:18) are *P. dunckeri* (Alfred,1966a:24). *Puntius everetti* is restricted to Borneo.

Puntius eugrammus Silas,1956 (p.194) **MA**
A replacement name for *Barbus fasciatus* Bleeker,1853 (p. 190), a secondary homonym of *Cirrhinus fasciatus* Jerdon,1849 (p.305).

Puntius jacobusboehlkei (Fowler,1958) **ME**
Puntius simus Smith,1945 is a secondary homonym of *Barbus simus* Sauvage & Dabry de Thiersant,1874 (p.8) [now an *Onychostoma*] when placed in *Barbus* and Fowler (1958:11) proposed *Barbus jacobusboehlkei* as replacement name. Neither Smith's nor Sauvage & Dabry' species are now considered as *Barbus*, but Smith's *B. simus* having been replaced before 1961, it is permanently invalid.

Puntius johorensis (Duncker,1904) (p.178) **MA, ME**
Including *Barbus hexazona* Weber & de Beaufort, 1912 (see also Alfred,1963a:139).

Puntius lateristriga (Valenciennes, in Cuvier & Valenciennes, 1842) **MA**

Puntius lineatus (Duncker,1904) (p.180) **MA**

Puntius orphoides (Valenciennes, in Cuvier & Valenciennes,1842) **ME, CP, SE, MK, MA**

Puntius partipentazona (Fowler,1934) **ME, SE, CP, MK, MA**

Puntius pierrei Sauvage,1880 (p.232) **ME, CP, MK, MA**
Puntius daruphani Smith,1934 is considered as a synonym by Kottelat (1984c:804).

Puntius puntio (Hamilton, 1822) **ME?**
A single record by Hora & Mukerji (1934b: 369) needing confirmation.

Puntius sarana (Hamilton, 1822) **S**
Includes *Barbus caudimarginatus* Blyth, 1860, *B. oatesii* Boulenger, 1893 (p. 201), *B. sewelli* Prashad & Mukerji, 1929 (p. 197), *B. myitkyinae* Prashad & Mukerji, 1929 (p. 198) and *Barbus binduchitra* Hora, 1937 (p. 327) (Pillay, 1951).

Puntius schanicus (Boulenger, 1893) **S**

Puntius semifasciolatus (Günther, 1868) **A**
Barbus aureus Tirant, 1883 (p. 96) and its replace-

ment name *B. fernandezyepezi* Fowler, 1958 (p. 12) are apparently synonyms (Kottelat,1987a:7).

Puntius sophore (Hamilton,1822) **ME?**
A single record (Hora & Mukerji,1934b:355) needing confirmation.

Puntius sophoroides (Günther,1868) **CP?**
A single doubtful record (Smith,1945:174).

Puntius spilopterus (Fowler,1934) **CP**

Puntius ticto (Hamilton,1822) **S, CP, ME**

'Puntius' ashmeadi (Fowler,1937) **ME**
This and the following four species form a distinct genus according to Rainboth (1981). It is still not formally named.

'Puntius' colemani (Fowler,1937) **CP, ME**
Barbodes parva Wu & Lin, in Wu et al.,1977 (p.243) is a tentative synonym.

'Puntius' halei (Duncker,1904) (p.178) **MA**

'Puntius' schroederi (Smith,1945) **CP**

'Puntius' somphongsi Benl & Klausewitz,1962 (p.21) **MK**

Raiamas guttatus (Day,1869) **S, CP, ME, MK, MA**
See Howes (1980a:194) for generic position.

Rasbora argyrotaenia (Bleeker,1850) **ME, CP, MK, MA**
Placed in *Parluciosoma* by Howes (1980a:194), together with *R. cephalotaenia, R. daniconius, R. dusonensis and R. volzi* Popta,1905. Rainboth & Kottelat (1987:422) noted some problems concerning the identification of *Rasbora rasbora,* type species of *Rasbora,* and prefered not to use *Parluciosoma* as long as *Rasbora* is not properly defined. The large *Rasbora* still present a number of taxonomic problems at the species level.

Rasbora aurotaenia Tirant,1885 (1929:141) **ME, CP, MA**
Rasbora retrodorsalis Smith,1945 is a synonym (Kottelat,1987a: 15); this possibly also apply to *R. myersi* Brittan,1954 (p.17).

Rasbora axelrodi Brittan,1976 (p.92) **ME?, CP?**
The record (Rainboth & Kottelat,1987:419) from Chao Phraya and Mekong basins of this species otherwise known from Borneo and Sumatra seems doubtful.

Rasbora bankanensis (Bleeker,1853) **MA**

Rasbora borapetensis Smith,1934 **ME, CP, SE, MK, MA**

Rasbora brittani Axelrod,1976 (p.94) **MA?**
Description based on aquarium material reportedly from Malaya. Type locality needs to be confirmed by new collections in southern Malaysia.

Rasbora caudimaculata Volz,1903 **MA, ME**

Rasbora cephalotaenia (Bleeker,1852) **MA**

Rasbora daniconius (Hamilton,1822) **S, CP, ME, MK, MA**
Includes *R. rasbora* var. *kobonensis* Chaudhuri,1913 (p.251) and *R. palustris* Smith,1945.

Rasbora dorsinotata Kottelat, in Kottelat & Chu,1988 (1988a:315) **CP**

Rasbora dorsiocellata Duncker,1904 (p.182) **MA**

Rasbora dusonensis (Bleeker,1851) **MA**

Rasbora einthovenii (Bleeker,1851) **MA**

Rasbora elegans Volz,1903 **MA**

Rasbora espei Meinken,1967 (p.15) **SE**

Rasbora heteromorpha Duncker,1904 (p.182) **MA**

Rasbora hobelmani Kottelat,1984 (1984a:718) **ME**
This is possibly the species described by Hora & Mukerji 1934b:357) as *R. taytayensis* Herre,1924 (p.264).

Rasbora jacobsoni Weber & de Beaufort,1916 **MA**
A single record from Johore by Alfred (1970:110).

Rasbora kalochroma (Bleeker,1851) **MA**

Rasbora maculata Duncker,1904 (p.182) **MA**

Rasbora pauciperforata Weber & de Beaufort,1916 **MA, SE**

Rasbora paucisqualis Ahl, in Schreitmüller,1935 (p.97) **ME**
Ahl (1935:144) described this species as *R. paucisquamis.* The description appeared on 1st August. But on 12 February, Schreitmüller (1935) had published a short report mentioning this species as *R. paucisqualis* Ahl. This description antedates *R. paucisquamis* Ahl. As is clear from the text, the description and the name are based on data from Ahl who has to be considered as author. Brittan (1954:101) used the spelling *paucisquamis.* As *paucisqualis* is not an incorrect original spelling (as defined by article 32 of the International Code of Zoological Nomenclature), it is the spelling to be retained; *paucisquamis* is an incorrect subsequent spelling [Code, art.33 (a), (b)].

Rasbora sumatrana (Bleeker,1852) **ME, CP, SE, MK, MA**
Synonyms: *R. vulgaris* Duncker,1904 (p.181), *R. cromiei* Fowler,1937 and *R. cheroni* Fowler,1937 (Brittan,1954) and *R. paviei* Tirant, 1885 (1929:142) (Kottelat,1987a:15).

Rasbora rasbora (Hamilton,1822) **CP?**
Records from Central Thailand (Hora,1923a:152; Smith,1945:114) are probably based on misidentifications and might concern *R. aurotaenia* or *R. argyrotaenia.*

Rasbora somphongsi Meinken,1958 (p.1) **MK**

Rasbora spilocerca Rainboth & Kottelat,1987 (p.419) **ME**

Rasbora taeniata Ahl,1922 (p.295) **MA**
The specific limits of this species, *R. agilis* Ahl,1937 (p.113) and *R. chrysotaenia* Ahl,1937 (p.114) are still not clear.

Rasbora trilineata Steindachner,1870 **MA, MK, CP, SE, ME**
The type series is apparently polyspecific. A lectotype designation is needed.

Rasbora urophthalma Ahl,1922 (p.295) **MA, MK, CP, ME**
Original description based on aquarium specimens. As long as a type locality is not restricted and as long as the nominal (sub-)species is not diagnosed and redescribed, the practice to recognize local variants [e.g. *R.u. brigittae* Vogt,1978 (p.155)] seems questionable.

Rasborinus lineatus Pellegrin,1907 **(MA, Introduced)**

Rhodeus rheinardti (Tirant,1883) (p.97) **A**
Rhodeus spinalis Oshima,1926 (p.16) and *R. ocellatus vietnamensis* Yen,1978 (p.179) apparently are synonyms (Kottelat,1987a:13).

Salmostoma sardinella (Valenciennes, in Cuvier & Valenciennes, 1844) **S**

Sawbwa resplendens Annandale,1918 (p.48) **S**
Endemic to Inlé Lake, Burma.

Scaphognathops bandanensis Boonyaratpalin & Srirungroj,1971 (p.24) **ME**
Scaphognathops mekongensis Taki,1974 (1974a:130) is a synonym.

Scaphognathops stejnegeri (Smith,1931) **ME**

Sikukia gudgeri (Smith,1934) **CP, ME**
See Kottelat (1985a:955) for discussion of generic status.

Sikukia stejnegeri Smith,1931 **CP, ME, MA**

Xenocheilichthys loppei Durand,1940 (p.8) is a synonym (Kottelat,1985a:955).
'Spinibarbus' macracanthus Pellegrin & Chevey, 1936 (1936c:376)**A**
Balantiocheilos hekouensis Wu, in Wu et al.,1977 (p.332) is a synonym (Chu & Kottelat,in press).
Thryssocypris tonlesapensis Roberts & Kottelat,1984 (p.146) **ME**
Thynnichthys thynnoides (Bleeker,1852) **ME, CP, MK, MA**
Tor douronensis (Valenciennes, in Cuvier & Valenciennes,1842) **A, ME, CP, MK, MA**
Tor mosal (Hamilton,1822) **S**
Tor soro (Valenciennes, in Cuvier & Valenciennes,1842) **S, CP, MK,SE, MA**
Tor tambra (Valenciennes, in Cuvier & Valenciennes,1842) **MA**
Tor tambroides (Bleeker,1854) **S, CP, MA, ME**
Tor tor (Hamilton,1822) **S**

Family BALITORIDAE
The family-group name Homalopterini Bleeker,1858 is a junior synonym of Balitoridae Swainson,1839 (Kottelat,1988a).
Acanthocobitis zonalternans (Blyth,1860) **S, MK, MA**
Nemacheilus phuketensis Klausewitz,1957 (1957a: 195) is a synonym (Kottelat, ms.).
Acanthocobitis botia (Hamilton,1822) **S, MK**
Annamia normani (Hora,1930) (p.582) **ME**
Balitora annamitica Kottelat,1988 (1988a:498) **ME**
Balitora burmanica Hora,1932 (p.291) **S**
Balitora meridionalis Kottelat,1988 (1988a:498) **SE**
Ellopostoma sp. **MA**
Hemimyzon sp. **CP**
An undescribed species mentioned by Kottelat & Chu (1988b).
Homaloptera bilineata Blyth,1860 **S**
Homaloptera indochinensis Silas,1953 (p.192) **A**
Homaloptera johorensis Herre,1944 (p.51) **MA**
Homaloptera leonardi Hora,1941 (p.61) **MA**
Homaloptera maxinae Fowler,1937 **CP**
Homaloptera modesta (Vinciguerra,1890) (p.202) **S**
Homaloptera nebulosa Alfred,1969 (p.227) **MA**
Homaloptera nigra Alfred,1969 (p.217) **MA**
Homaloptera ogilviei Alfred,1967 (p.587) **MA**
Homaloptera orthogoniata Vaillant,1902 **MA, SE** The material from SE Thailand and Kampuchea might represent a distinct and unnamed species; it is presently under study.
Homaloptera sexmaculata Fowler, 1934 **CP**
Homaloptera smithi, Hora, 1932 **ME, CP, SE, MK, MA**
Homaloptera lineata Smith,1945 is a tentative synonym.
Homaloptera thamicola Kottelat,1988 (1988b:228) **S, cave**
Homaloptera tweediei Herre,1940 (p.7) **MA**
Homaloptera zollingeri Bleeker,1853 **MA**
Micronemacheilus cruciatus (Rendahl,1944) (p.37) **A**
Nemacheilus binotatus Smith,1933 **CP, MK**
Nemacheilus sp. 1. **ME**
Nemacheilus masyae Smith,1933 **MA, SE**
Nemacheilus sp. 2. **MA**
Nemacheilus sp. 3. **CP, ME, MK**
Nemacheilus sp. 4. **ME**
Nemacheilus selangoricus Duncker,1904 (p.75) **MA**
Nemacheilus translineatus Fowler,1939 and *N. kuiperi* de Beaufort,1939 (p.190) are synonyms (Kottelat,1984b:254).
Nemacheilus troglocataractus Kottelat & Géry, 1989 (p. 273) **MK, cave**
Nemacheilus sp. **MK, cave**
'Nemacheilus' baenzigeri Kottelat,1983 (1983a:151) **CP, MA**
This and the following species belong to a new genus to be named soon (Kottelat, ms.).
"Nemacheilus' cambodgiensis Kottelat, ms. **ME**
Neonoemacheilus labeosus (Kottelat,1982) (1982b:169) **S**
Infundibulatus Menon,1987 (p.177) is a synonym of *Neonoemacheilus* Zhu & Guo,1985 (p.321) (Kottelat, ms.).
Physoschistura brunneana (Annandale,1918) (p.44) **S**
Physoschistura sp. 1. **ME, CP**
Physoschistura raoi (Hora,1929) (p.332) **S**
Physoschistura rivulicola (Hora,1929) (p.324) **S**
Physoschistura shanensis (Hora,1929) (p.322) **S**
Schistura sp. 1. **S**
Schistura balteata (Rendahl,1948) (p.42) **MA**
Schistura sp. 2.. **ME**
Schistura breviceps (Smith,1945) **ME**
Schistura bucculenta (Smith,1945) **ME**
Schistura cincticauda (Blyth,1860) **S**
Schistura desmotes (Fowler,1934) **CP, MK**
Schistura sp. 3. **CP**
Schistura sp. 4. **CP, MA**
Schistura kengtungensis (Fowler,1935) (p.509) **ME**
Schistura kohchangensis (Smith,1933) **SE**
Nemacheilus deignani Smith,1945 is a synonym (Kottelat, ms.).
Schistura sp. 5. **ME**
Schistura sp. 6. **S**
Schistura sp. 7. **ME**
Schistura sp. 8. **S**
Schistura menanensis (Smith,1945) **CP**
Schistura sp. 9. **S**
Schistura nasifilis (Pellegrin,1936) (p.247) **A**
Schistura nicholsi (Smith,1933) **ME**
Schistura oedipus (Kottelat,1988) (1988b:225) **S, cave**
Schistura sp. 10. **S**
Schistura pellegrini (Rendahl,1944) (p.26) **A, ME**
Schistura poculi (Smith,1945) **ME, S, CP, mon**
Schistura reidi (Smith,1945) **S**
Schistura sp. 11. **MA**
Schistura schultzi (Smith,1945) **ME, CP, mon**
Schistura sexcauda (Fowler,1937) **CP**
Nemacheilus fowlerianus Smith,1945 is a synonym (Kottelat, ms.).
Schistura sp. 12. **S**
Schistura spiloptera (Valenciennes, in Cuvier & Valenciennes, 1846) (p.27) A?
This species was described from Cochinchina without detailed locality information. It has not been collected again.
Schistura spilota (Fowler,1934) **CP**
Schistura vinciguerrae (Hora,1935) (p.62) **S**
Schistura waltoni (Smith,1945) **CP**
Nemacheilus obscurus Smith,1945 is a synonym (Kot-

telat, ms.).
Schistura sp. **MK, cave**
'Schistura' atriceps (Smith,1945) **CP**
A new genus to be named soon (Kottelat, ms.).
Sewellia lineolata (Valenciennes, in Cuvier & Valenciennes,1846) (p.99) **A**
Vaillantella maassi Weber & de Beaufort,1912 **MA**
I have seen photographs of an unidentified species of this genus from **SE.**
Yunnanilus brevis (Boulenger,1893) (p.203) **S**
See Kottelat & Chu (1988c:66) for generic status. *Petruichthys* Menon,1987 (p.181) is a synonym of *Yunnanilus* Nichols,1925 (1925a:1) (Kottelat, ms.).

Family COBITIDAE
Acanthopsoides gracilis Fowler,1934 **CP, ME**
Acantopsis dialuzona van Hasselt,1823 **ME, CP, SE, MK, S, MA**
Botia beauforti Smith,1931 **ME, CP, MK, MA**
Including *B. lucasbahi* Fowler,1937, *B. beauforti* var. *formosa* Pellegrin & Fang,1940 (p.119) and *B. yunnanensis* Chen,1980 (p.6) (Kottelat & Chu,1987:394).
Botia berdmorei (Blyth,1860) **S**
Botia eos Taki,1972 (p.66) **ME**
Botia helodes Sauvage,1876 (p.99) **ME, CP**
Material from Chao Phraya and Mekong basins usually referred to as *B. hymenophysa* actually are *B. helodes* (Kottelat,1984c: 807; Nalbant & Bianco,1984: 78).
Botia histrionica Blyth,1860 **S**
Botia hymenophysa (Bleeker,1852) **MA**
Botia lecontei Fowler,1937:156 **ME**
Botia modesta Bleeker,1865 **CP, ME, MK**
Botia morleti Tirant,1885 (1929:133) **ME, CP, MK, MA**
Botia horae Smith,1931 is a synonym (Taki,1974b: 168; Kottelat, 1987a:17).
Botia rostrata Günther,1868 **S**
Kottelat & Chu (1987:397) recorded this species from the Salween and Irrawaddy basin in China, adjacent to the Burmese border. They noted that comparison with Indian topotypical specimens is needed.
Botia sidthimunki Klausewitz,1959 (p.51) **ME, CP**
Cobitis laoensis Sauvage,1878 (1878b:241) **ME**
Cobitis misgurnoides Rendahl,1944 (p.21) **A**
Lepidocephalichthys berdmorei (Blyth,1860) **S, CP, ME, MA, mon**
Lepidocephalichthys guntea (Hamilton,1822) **S**
Lepidocephalichthys hasselti (Valenciennes, in Cuvier & Valenciennes,1846) **ME, SE, CP, S, MK, MA**
Lepidocephalichthys micropogon (Blyth,1860) **CP, S, MA**
Including *Lepidocephalus furcatus* de Beaufort,1933 (p.32) and *L. berdmorei* of most authors (e.g. Smith, 1945: 295; Banarescu & Nalbant,1968:347).
Lepidocephalichthys sp. **ME**
Lepidocephalus macrochir (Bleeker,1854) **MA**
Misgurnus anguillicaudatus (Cantor,1842) (p.485) **A**
I have examined a single specimen (MZC) from Koh Chang; the locality seems doubtful and I did not include **SE** in the distribution.
Neacanthopsis gracilentus Smith,1945 **ME**
Pangio anguillaris (Vaillant,1892) **ME, CP, MA**
Species formerly placed in *Acanthophtalmus* sensu Bleeker,1859, *Apua* Blyth,1860, *Eucirrhichthys Perugia*, 1892 and *Cobitophis* Myers,1927 are *Pangio* (Kottelat,1987b:371). *Cobitophis vermicularis* Weber & de Beaufort,1916 and *C. perakensis* Herre, 1940 (p.8) are synonyms (Hora,1941:49). *Eucirrhichthys doriae* Perugia,1892 is possibly a senior synonym. The genus is currently being revised.
Pangio mariarum (Inger & Chin,1962) (p.118) **MA**
Inger & Chin (1962) named the species *mariae* after their wives, both of them being named Mary. The name must be plural and emended as *mariarum.*
Pangio muraeniformis (de Beaufort,1933) (p.32) **MA**
Pangio myersi (Harry,1949) (p.69) **SE, MA**
Pangio oblonga (Valenciennes, in Cuvier & Valenciennes,1846) **MA, CP, ME**
Pangio pangia (Hamilton,1822) **S**
Pangio semicincta (Fraser-Brunner,1940) (p.172) **MA**

Family GYRINOCHEILIDAE
Gyrinocheilus aymonieri (Tirant,1884) **ME, CP, MK, MA**
Includes *G. kaznakovi* Berg,1906 and *Gyrinocheilops pennocki* Fowler,1937. I cannot follow Hanel (1982) who recognized both as distinct. He based his conclusions on litterature review, second hand information and aquarium specimens (without locality data) of a single species, a questionable procedure. A revision of the family is in progress.

Family BAGRIDAE
Bagroides hypselopterus (Bleeker,1852) **ME, MA**
Bagroides macracanthus (Bleeker,1854) **CP, ME**
Bagroides macropterus Bleeker,1853 **CP, ME**
Bagroides melapterus Bleeker,1851 **CP?**
A doubtful report by Sauvage (1883:154).
Batasio tengana (Hamilton,1822) **S, MA**
Including *B. affinis* Blyth,1860, *Macrones blythii* Day,1877, *Leiocassis fluviatilis* Day,1888 (p.805), *Macrones dayi* Vinciguerra,1890 (p.230), *Macrones marianensis* Chaudhuri,1913 (p.253), *Mystus havmolleri* Smith,1931 and *Mystus stigmaturus* Fowler,1934 (Hora & Law, 1941:36).
Heterobagrus bocourti Bleeker,1864 **CP, ME**
Leiocassis baramensis Regan,1906 **MA**
Leiocassis fuscus Popta,1904 **MA**
Leiocassis leiacanthus Weber & de Beaufort,1912 **MA**
Leiocassis micropogon (Bleeker,1852) **MA**
Leiocassis poecilopterus (Valenciennes, in Cuvier & Valenciennes, 1839) **MA**
Leiocassis siamensis Regan,1913 **CP, SE, ME, MK, MA**
Leiocassis stenomus (Valenciennes, in Cuvier & Valenciennes,1839) **MA, SE, MK**
Mystus armatus (Day,1865) **S, MA**
Mystus atrifasciatus Fowler,1937 **CP**
Mystus baramensis (Regan,1906) **MA**
Mystus bleekeri (Day,1877) **ME?**
Record by Hora & Mukerji (1934b:355) needs confirmation.
Mystus cavasius (Hamilton,1822) **S, CP, ME, MA**
Specific limits of *M. nigriceps* and *M. cavasius* not well understood now. Tentatively including *M. rhegma* Fowler,1935.
Mystus elongatus Günther,1864 **MA?**

Originally described from Singapore, this species has not been collected again. The locality data is probably erroneous. This name is used for a South Chinese species (Anon,1986:174).

Mystus gulio (Hamilton,1822) **CP, MA, ME, A, SE**

Mystus leucophasis (Blyth,1860) **S**

Mystus micracanthus (Bleeker,1846) **MA, CP, ME, SE**

Mystus nemurus (Valenciennes, in Cuvier & Valenciennes,1839) **A, ME, SE, CP, MK, S, MA**
Tentatively including *M. johorensis* Herre,1940 (p.13), *M. pahangensis* Herre,1940 (p.14) and *Macrones filamentus* Chaux & Fang,1949 (1949a:200). The genus is in need of revision.

Mystus nigriceps (Valenciennes, in Cuvier & Valenciennes,1839) **MA, CP, ME**
See *M. cavasius* above.

Mystus planiceps (Valenciennes, in Cuvier & Valenciennes,1839 **MA, ME, CP**

Mystus rufescens (Vinciguerra,1890) (p.226) **S**

Mystus vittatus (Bloch,1797) **S, CP, ME, MK, MA**
The specific limits of this species are not clear.

Mystus wolffii (Bleeker,1851) **MA, CP, ME**

Mystus wyckii (Bleeker,1858) **CP, ME, MA**

Mystus wyckoides Chaux & Fang,1949 (1949a:199) **ME**
Tentatively including *M. aubentoni* Desoutter,1975 (p.449).

'Pelteobagrus' ornatus (Duncker,1904) (p.173) **MA**
An unnamed genus which cannot be described properly due to lack of material (see also Kottelat,1982a: 434).

Family SILURIDAE

Belodontichthys dinema (Bleeker,1851) **MA, MK, CP, ME**

Ceratoglanis scleronema (Bleeker,1863) **MA, CP**

Hemisilurus heterorhynchus (Bleeker,1853) **ME**

Kryptopterus apogon (Bleeker,1851) **ME, CP, MA**

Kryptopterus bicirrhis (Valenciennes, in Cuvier & Valenciennes, 1839) **MA, CP, ME**

Kryptopterus bleekeri Günther,1864 **CP, ME, MA, MK**

Kryptopterus cheveyi Durand,1940 (p.19) **ME, CP, MA**
Tentatively including *K. moorei* Smith,1945 and *K. urbaini* Chaux & Fang,1949 (1949a:197).

Kryptopterus cryptopterus (Bleeker,1851) **ME, CP, MK, MA**

Kryptopterus hexapterus (Bleeker,1851) **MA, CP, ME**

Kryptopterus limpok (Bleeker,1852) **CP, ME, MK, MA**

Kryptopterus macrocephalus (Bleeker,1858) **MA**

Kryptopterus micronemus (Bleeker,1846) **CP, MA**

Ompok bimaculatus (Bloch,1797) **S, MA, MK, CP, SE, ME**
Including *Wallago krattensis* Fowler,1934 (1934b: 335).

Ompok hypophthalmus (Bleeker,1846) **MA, CP, ME**

Ompok leiacanthus (Bleeker,1853) **MA**

Silurichthys hasseltii Bleeker,1858 **MA, SE**
The genus is in need of a revision.

Silurichthys phaiosoma (Bleeker,1851) **MA, SE**

Silurichthys schneideri Volz,1904 **MA**

Silurus bokorensis (Pellegrin & Chevey,1937) (p.315) **SE, MA?**
Erroneously considered as synonym of *S. conchinchinensis* by Kottelat (1985b:269). The genus is in need of revision. The specimen reported from Nakhon Si Thammarat as *Silurichthys* sp. by Srirungroj & Boonyaratpalin (1973:18) possibly represent the present species.

Silurus burmanensis Thant,1966 (p.219) **S**

Silurus cochinchinensis Valenciennes, in Cuvier & Valenciennes, 1839 **S, MA, ME?**

Silurus sp. **MK, cave**

Wallago attu (Schneider,1801) **ME, CP, MA, MK, S**

Wallago leerii Bleeker,1851 **CP, MA, ME**
Wallagonia tweediei Hora & Misra, in Hora & Gupta, 1941 (p.18) is possibly a synonym (Roberts,1982b: 891).

Family SCHILBIDAE

Eutropiichthys vacha (Hamilton,1822) **S**

Family PANGASIIDAE

Helicophagus hypophthalmus Sauvage,1878 **CP, ME**

Helicophagus waandersii Bleeker,1858 **CP, ME**

Laides hexanema (Bleeker,1852) **ME, CP, MA, MK**

Pangasianodon gigas Chevey,1930 **ME**
Meenakarn (1988) described juvenile stages of this species otherwise known only from large adults. Future researches might show that this genus cannot be distinguished from *Pangasius*.

Pangasianodon sutchi (Fowler,1937) **CP, ME**
Generic position follows Durand (1949:113).

Pangasius aequilabialis Fowler,1937 **CP**

Pangasius bocourti Sauvage,1881 **ME, CP**
Tentatively including *P. beani* Smith,1931 (Kottelat, 1984c: 812). The genus is in a bad need of a revision.

Pangasius fowleri Smith,1931 **CP, MK**

Pangasius krempfi Chaux & Fang,1949 (1949b:343) **ME, eur**

Pangasius larnaudii Bocourt,1866 **CP, ME**

Pangasius longibarbis Fowler,1934 **ME**

Pangasius macronema Bleeker,1851 **CP, ME**

Pangasius micronemus Bleeker,1847 **MA, CP**

Pangasius nasutus (Bleeker,1863) **ME, CP**
Tentatively including *P. altifrons* Durand,1940 (p.23).

Pangasius pangasius (Hamilton,1822) **S, CP, MK, ME, MA**

Pangasius paucidens Chaux & Fang,1949 (1949b:344) **ME**

Pangasius pleurotaenia Sauvage,1878 **ME, CP**

Pangasius polyuranodon Bleeker,1852 **CP, ME**

Pangasius ponderosus Herre & Myers,1937 (p.67) **MA**

Pangasius sanitwongsei Smith,1931 **CP, ME**

Pangasius siamensis Steindachner,1879 **CP, ME**
Possibly extinct (C. vidthayanon, pers. comm.)

Pangasius taeniurus Fowler,1935 **CP, MA**

Platytropius siamensis (Sauvage,1883) **CP**

Pteropangasius cultratus (Smith,1931) **MA, MK, CP, ME**

Pteropangasius sp. **ME**

Family AMBLYCIPITIDAE

Amblyceps mangois (Hamilton,1822) **S, ME, SE, MA**

Family AKYSIDAE

Acrochordonichthys ischnosoma Bleeker,1858 **MA**

Acrochordonichthys melanogaster (Bleeker,1854) **MA**

Acrochordonichthys rugosus (Bleeker,1847) **MA, MK**

Akysis armatus Vaillant,1902 **MA?**
Record by Smith (1931:180) needs confirmation.

Akysis hendricksoni Alfred,1966 (p.467) **MA**

Akysis leucorhynchus Fowler,1934 **CP, MA?**
Akysis macronemus Bleeker,1860 **SE**
Record by Smith (1931:180) needs confirmation.
Akysis maculipinnis Fowler,1934 **SE**
Akysis pictus Günther,1883 (p.138) **S?, MA?**
Described from 'Tenasserim'; precise locality unknown.
Parakysis verrucosus Herre,1940 (p.12) **MA**

Family SISORIDAE
Bagarius bagarius (Hamilton,1822) **MA, S, MK, CP?, ME**
The absence of record for the Chao Phraya is probably due to insufficient collecting. The genus has been revised by Roberts (1983).
Bagarius suchus Roberts,1983 (p.442) **ME**
Bagarius yarrelli Sykes,1841 **ME, CP**
Erethistes maesotensis Kottelat,1983 (1983b:71) **S**
Erethistes pusillus Müller & Troschel,1845 **S**
Euchiloglanis feae (Vinciguerra,1890) (p.256) **S**
Exostoma berdmorei Blyth,1860 **S**
Exostoma labiatum (M'Clelland,1842) **S**
Gagata cenia (Hamilton,1822) **S**
Glyptothorax buchanani Smith,1945 **CP**
Indochinese species are badly in need of revision. Some are marginally treated by Mo & Chu (1986).
Glyptothorax callopterus Smith,1945 **MA**
Glyptothorax cavia (Hamilton,1822) **S**
Glyptothorax dorsalis Vinciguerra,1890 **S**
Tentatively including *G. minutus* Hora,1921 (p.180).
Glyptothorax fuscus Fowler,1934 **SE, MA, CP, ME**
Glyptothorax lampris Fowler,1934 **CP, ME**
Glyptothorax laoensis Fowler,1934 **CP, ME**
Glyptothorax major (Boulenger,1894) **ME**
Glyptothorax platypogon (Valenciennes, in Cuvier & Valenciennes, 1839) **MA**
Record by Herre & Myers (1937:68) needs confirmation.
Glyptothorax platypogonoides (Bleeker,1855) **MA**
Tentatively including *G. siamensis* Hora,1923 and *G. prashadi* Mukerji,1932 (p.281).
Glyptothorax trilineatus Blyth,1860 **S, MA?**
Including *G. trilineatoides* Li,1984 (p.80) (Mo & Chu, 1986:340).
Hara hara (Hamilton,1822) **S**
Oreoglanis delacouri (Pellegrin,1936) (p.244)**ME**
Oreoglanis siamensis Smith,1933 **CP, ME, mon**
Pareuchiloglanis poilanei Pellegrin,1936 (p.246) **A**
Pseudecheneis sulcatus (M'Clelland,1842) **S**

Family CLARIIDAE
Clarias batrachus (Linnaeus,1758) **S, CP, ME, A, SE, MK, MA**
Clarias cataractus (Fowler,1939) **MA**
Clarias leiacanthus Bleeker,1851 **MA**
Clarias macrocephalus Günther,1864 **ME, SE, CP, MK, MA**
Clarias meladerma Bleeker,1847 **MA**
Clarias nieuhofii Valenciennes, in Cuvier & Valenciennes,1840 **MA**
Clarias teijsmanni Bleeker,1857 **MA**
Encheloclarias tapeinopterus (Bleeker,1852) **MA**

Family HETEROPNEUSTIDAE
Heteropneustes fossilis (Bloch,1797) **ME, CP S,, MA**

Family CHACIDAE
Chaca bankanensis Bleeker,1852 **MA**

Family OLYRIDAE
Olyra longicauda M'Clelland,1842 **S**

Family ARIIDAE
Arius acutirostris Day,1877 **S**
The genus is in bad need of a critical revision. See Wheeler & Baddokwaya (1981) for comments on the validity of *Arius* and *Tachysurus.*
Arius argyropleuron Valenciennes, in Cuvier & Valenciennes,1840 **MA, eur**
Arius burmanicus Day,1869 **S**
Arius caelatus Valenciennes, in Cuvier & Valenciennes, 1840 **MA, CP, ME, eur**
Arius cochinchinensis Günther,1864 **eur?**
Not collected again since its original description.
Arius crossocheilos Bleeker,1846 **eur**
Arius gagora (Hamilton,1822) **S, eur**
Arius harmandi (Sauvage,1880) **eur**
Doubtful validity (Smith,1945:414).
Arius leiotetocephalus Bleeker,1846 **MA, CP, SE, eur**
Arius leptonotacanthus Bleeker,1849 **MA, eur?**
Arius macronotacanthus (Bleeker,1846) **MA, eur**
Arius maculatus (Thunberg,1792) **MA, CP, SE, eur**
Arius melanochir Bleeker,1852 **CP?**
A doubtful record by Fowler (1935:100; see Smith, 1945:414).
Arius microcephalus Bleeker,1855 **ME, MA, eur**
Arius sagor (Hamilton,1822) **MA, CP, SE, eur**
Arius sciurus Smith,1931 **MA, CP, eur**
Arius stormii (Bleeker,1858) **ME, CP, eur**
Arius truncatus Valenciennes, in Cuvier & Valenciennes, 1840 **MA, MK, CP, SE, ME, eur**
Arius venosus Valenciennes, in Cuvier & Valenciennes, 1840 **CP, MA, SE, eur**
Batrachocephalus mino (Hamilton,1822) **ME, SE, CP, eur**
Hemipimelodus bicolor Fowler,1935 **CE, ME**
Including *H. atripinnis* Fowler,1937 (Desoutter,1977: 19).
Hemipimelodus borneensis (Bleeker,1851) **CP, ME**
Including *H. siamensis* Sauvage,1878 (Desoutter, 1977: 21).
Hemipimelodus daugueti Chevey,1932 (1932b:41) **ME**
Hemipimelodus intermedius Vinciguerra,1880 **CP**
Ketengus typus Bleeker,1847 **CP, MA, eur**
Osteogeneiosus militaris (Linnaeus,1758) **MA, MK, CP, SE, ME, eur**
Osteogeneiosus stenocephalus Day,1877 **S**

Family PLOTOSIDAE
Plotosus canius Hamilton,1822 **S, MA, MK, CP, SE, ME, eur**
Plotosus lineatus (Thunberg,1787) **MA, CP, eur**

Family SUNDASALANGIDAE
Sundasalanx praecox Roberts,1981 (1981b:299) **MA, ME?**
Roberts (1984:214) tentatively reported a *Sundasalanx* from the Mekong basin as *S. praecox.*

Family BREGMACEROTIDAE
Bregmaceros macclellandi Thompson,1840 **MA, SE, eur**

Family BATRACHOIDIDAE
See Hutchins (1976, 1981) for nomenclature of species occuring in Indochinese waters.
Batrichthys grunniens (Linnaeus,1758) **CP, SE, eur**
Halophryne trispinosus (Günther,1861) **MA, eur**

Family HEMIRHAMPHIDAE
Dermogenys pusillus van Hasselt,1823 **S, MA, MK, CP, SE, M**
Including *D. siamensis* Fowler,1934 and *D. burmanensis* Mukerji, 1935 (p.213)? The record of *S. orientalis* (Weber,1894) (p.427) by Herre & Myers (1937:17) needs confirmation as this species is otherwise known from Sulawesi only. The genus is in need of a revision.
Hemirhamphodon phaiosoma (Bleeker,1852) **MA?**
Presence in Singapore needs confirmation (Alfred, 1966a: 61).
Hemirhamphodon pogonognathus (Bleeker,1853) **MA**
Hyporhamphus limbatus (Valenciennes, in Cuvier & Valenciennes , 1846) **ME, eur**
Hyporhamphus quoyi (Valenciennes, in Cuvier & Valenciennes,1846) **MA, eur**
Hyporhamphus unifasciatus (Ranzani,1842) **MA, eur**
Melapedalion breve (Seale,1909) **MA, eur**
Zenarchopterus beauforti Mohr,1926 (p.259) **MA, eur**
Zenarchopterus buffonis (Valenciennes, in Cuvier & Valenciennes, 1846) **MA, ME ?**
Record from Kampuchea by Chevey (1932a:19) needs confirmation.
Zenarchopterus clarus Mohr,1926 (p.241) **CP**
Zenarchopterus dunckeri Mohr,1926 (p.257) **SE, eur**
Zenarchopterus ectuntio (Hamilton,1822) **MA, CP, ME**
Zenarchopterus gilli Smith,1945 **MA, CP**
Zenarchopterus pappenheimi Mohr,1926 (p.258) **CP**
Zenarchopterus quadrimaculatus Mohr,1926 (p.257) **MA**

Family BELONIDAE
Strongylura leiura (Bleeker,1850) **ME, MA, eur**
Strongylura strongylura (van Hasselt,1823) **ME, MA, CP, eur**
Xenentodon cancila (Hamilton,1822) **S, MA, MK, CP, SE, ME, A**
Xenentodon canciloides (Bleeker,1853) **CP, ME, MA**
The validity of this taxon and of the various records need confirmation.

Family ORYZIIDAE
Oryzias javanicus (Bleeker,1854) **MA, eur**
Oryzias mekongensis Uwa & Magtoon,1986 (p.474) **ME**
Oryzias minutillus Smith,1945 **CP, MA**

Family APLOCHEILIDAE
Aplocheilus panchax (Hamilton,1822) **S, MA, MK, CP, SE, ME**

Family POECILIIDAE
Gambusia holbrooki (Girard,1859) **(CP, Introduced)**
Poecilia reticulata Peters,1859 **(CP, MA, Introduced)**
Poecilia sphenops Valenciennes, in Cuvier & Valenciennes, 1846 **(MA, Introduced)**

Family ATHERINIDAE
Hypoatherina valenciennei (Bleeker,1853) **CP, SE, MA, A, eur**
Including *Haplochilus argyrotaenia* Tirant,1883 (p.95) (Ivantsoff & Kottelat, 1988)
Prasenus pinguis (Lacepède,1803) **MA, eur**

Family PHALLOSTETHIDAE
Ceratostethus bicornis (Regan,1916) (p.14) **MA, SE, eur**
Neostethus lankesteri Regan,1916 (p.2) **MA, eur**
Neostethus siamensis Myers,1937 **SE, eur**
Phallostethus dunckeri Regan,1913 (p.550) **MA, eur**
Phenacostethus posthon Roberts,1971 (p.12) **MA, eur**
Phenacostethus smithi Myers,1928 **CP, SE, eur**

Family INDOSTOMIDAE
Indostomus paradoxus Prashad & Mukerji,1929 (p.220) **MA, CP, ME**

Family SYNGNATHIDAE
See Dawson (1985) for a recent revision of the Indo-Pacific members of the family.
Doryichthys boaja (Bleeker,1851) **ME, CP, MA**
Doryichthys deokhatoides (Bleeker,1853) **MA**
Microphis annandalei Hora,1924 (p.472) is a synonym (Dawson, 1981: 4; 1985).
Doryichthys martensii (Peters,1869) **MA, SE**
Hippichthys cyanospilus (Bleeker,1854) **MA, eur**
Hippichthys heptagonus Bleeker,1849 **MA, CP, eur**
Hippichthys penicillus (Cantor,1849) **MA, eur**
Hippichthys spicifer (Rüppell,1838) **ME, SE, CP, MA, eur**
Hippocampus arnei Roule,1916 (1916a:11) **ME?**
This sea-horse, reportedly collected in the Mekong where it forms the border between Laos and Thailand, has not been collected again since its description. The original spelling used by Roule (1916a:11), *aimei,* is a typographic error and has been emended in *arnei* by Roule (1916b:383).
Ichthyocampus carce (Hamilton,1822) **MA, MK, CP, ME, eur**
Microphis argulus (Peters,1855) **eur**
Microphis leiaspis (Bleeker,1853) **eur**
Microphis brachyurus (Bleeker,1853) **ME, eur**

Family SYNBRANCHIDAE
Nomenclature follows Rosen & Greenwood (1976).
Macrotrema caligans (Cantor,1849) **CP, MA, eur**
Monopterus albus Zuiew,1793 **A, ME, SE, CP, MK, MA, S**
Monopterus cuchia (Hamilton,1822) **S**
Ophisternon bengalense M'Clelland,1845 **CP, ME**

Family SCORPAENIDAE
Vespicula trachinoides (Cuvier, in Cuvier & Valenciennes,1829) **MA, eur**

Family PLATYCEPHALIDAE
Platycephalus indicus (Linnaeus,1758) **MA, eur**

Family CENTROPOMIDAE
Lates calcarifer (Bloch,1790) **eur**

Family AMBASSIDAE
The generic classification of Fraser-Brunner (1954) is followed here, taking into account Opinion 1121 of the International Commission on Zoological Nomenclature (1979: 223). *Chanda nama* Hamilton,1822 being type-species of *Chanda* Hamilton,1822 and *Hamiltonia* Swainson,1839 being on the Official Index of Rejected and Invalid Names in Zoology, *Hamiltonia* sensu Fraser-Brunner (1954) has to be called *Chanda* and *Chanda* sensu Fraser-Brunner (1954) has to be called *Parambassis* Bleeker,1874.
Ambassis buroensis Bleeker,1856 **ME, SE, CP, MK, eur**
Ambassis dussumieri Cuvier, in Cuvier & Valenciennes,1828 **CP, MA, eur**
Ambassis gymnocephala (Lacepède,1802) **A, SE, MA, eur**
Ambassis kopsii Bleeker,1858 **MA, CP, SE, eur**
Chanda nama Hamilton,1822 **MA**
Gymnochanda filamentosa Fraser-Brunner,1954 (p.210) **MA**
Gymnochanda filamentosa Boeseman,1957 (p.75) is a synonym and homonym.
Parambassis altus (Cuvier, in Cuvier & Valenciennes, 1828) **MA, eur**
Parambassis baculis (Hamilton,1822) **CP, ME**
Parambassis notatus (Blyth,1860) **S, MA, CP, ME**
Chanda siamensis Fowler,1937 is a synonym according to Fraser-Brunner (1954:208). Guha & Talwar (1983:19) disagree with this conclusion but did not provide arguments.
Parambassis punctulatus (Fraser-Brunner,1954) (p.206) **MA**
Parambassis ranga (Hamilton,1822) **S**
Parambassis thomassi (Day,1870) **CP?, MA?**
The records from **CP** (Hora,1923a:176) and **MA** (Duncker,1904) seem doubtful. Other records of this species are restricted to South India (Fraser-Brunner, 1954:204).
Parambassis wolffii (Bleeker,1851) **CP, ME**

Family SERRANIDAE
Epinephelus malabaricus (Schneider,1801) **MA, eur**
"Promicrops itajara" (Lichtenstein,1822) **SE, eur**
Smith (1933:85) reports this species from the estuary of Chantabun River. This is obviously a misidentification as the species is known from West Atlantic and eastern Pacific Oceans (Böhlke & Chaplin,1968:283).

Family TERAPONIDAE
Nomenclature follows Vari (1978).
Pelates quadrilineatus (Bloch,1790) **SE, MA, eur**
Terapon jarbua (Fors[s]kal,1775) **MA, CP, SE, eur**
Terapon puta Cuvier,1829 **MA, eur**
Terapon theraps Cuvier,1829 **MA, CP, SE, eur**

Family APOGONIDAE
Apogon amboinensis Bleeker,1853 **MA, eur**
Apogon hyalosoma B leeker,1852 **MA, eur**

Family SILLAGINIDAE
See McKay (1985) for a revision of the family.
Sillago sihama (Fors[s]kal,1775) **MA, eur**

Family LEIOGNATHIDAE
Nomenclature follows Jones (1985).
Leiognathus decorus de Vis,1884 **MA, eur**
Leiognathus equulus (Fors[s]kal,1775) **MA, CP, SE, eur**
Secutor insidiator (Bloch,1787) **CP, eur**
Secutor ruconius (Hamilton,1822) **MA, eur**

Family LUTJANIDAE
See Allen & Talbot (1985) for a revision of *Lutjanus.*
Lutjanus argentimaculatus (Fors[s]kal,1775) **MA, eur**
Lutjanus fulviflamma (Fors[s]kal,1775) **MA, CP, SE, eur**
Lutjanus johnii (Bloch,1792) **CP, eur**
Lutjanus russelli (Bleeker,1849) **MA, eur**
Lutjanus vitta (Quoy & Gaimard,1824) **MA, eur**

Family LOBOTIDAE
Datnioides microlepis Bleeker,1853 **MA, CP, ME**
Datnioides quadrifasciatus (Sevastianov, 1809) **MA, CP, ME**
Lobotes surinamensis (Bloch,1790) **MA, eur**

Family GERREIDAE
Gerres filamentosus Cuvier,1829 **A, SE, CP, MA, eur**

Family HAEMULIDAE
Pomadasys argenteus (Fors[s]kal,1775) **MA, eur**

Family SCIAENIDAE
Most of the freshwater records of members of this family need to be checked. The following list includes all the species likely to occur in freshwaters in area, based on distribution and habitat data in Trewavas (1979).
Aspericorvina jubata (Bleeker,1855) **eur**
Bahaba polykladiskos (Bleeker,1852) **ME, eur**
Boesemania microlepis (Bleeker,1859) **CP, ME**
Dendrophysa russelli (Cuvier,1830) **MA, eur**
Johnius carutta Bloch,1793 **eur**
Johnius belangeri (Cuvier,1830) **eur**
Johnius coitor (Hamilton,1822) **eur**
Johnius sina (Cuvier,1830) **eur**
Johnius trachycephalus (Bleeker,1850) **MA, CP, eur**
Johnius vogleri (Bleeker,1853) **eur**
Johnius weberi Hardenberg,1936 (p.251) **eur**
Nibea soldado (Lacepède,1802) **MA, eur**
Nibea semifasciata Chu, Lo & Wu,1963 (pp.51,91) **CP, eur**
Otolithes ruber (Schneider,1801) **eur**
Otolithoides biauritus (Cantor,1850) **eur**
Otolithoides pama (Hamilton,1822) **eur**
Pterotolithus maculatus Cuvier,1830 **eur**
Pterotolithus lateoides (Bleeker,1850) **MA, eur**

Family MONODACTYLIDAE
Monodactylus argenteus (Linnaeus,1758) **MA, eur**

Family TOXOTIDAE
See Allen (1978) for a revision of the family.
Toxotes blythi Boulenger,1892 (p.143) **S**
Toxotes chatareus (Hamilton,1822) **S, MA, CP, ME**
Toxotes jaculatrix (Pallas,1766) **MA, CP**
Toxotes microlepis Günther,1860 **CP, S, ME**

Family SCATOPHAGIDAE
Scatophagus argus (Bloch,1788) **MA, MK, CP, SE eur**

Family NANDIDAE
Pristolepis fasciata (Bleeker,1851) **ME, SE, CP, MK, MA, S**
Nandus nandus (Hamilton,1822) **S**
Nandus nebulosus (Gray,1835) **MA, MK, CP, SE, ME**

Family BADIDAE
Badis badis (Hamilton,1822) **S, MA, MK**
Tentatively including *B. b. burmanicus* Ahl,1937 (p.118), *B. b. assamensis* Ahl,1937 (p.118) and *B. b. siamensis* Klausewitz, 1957 (1957a:199).

Family CICHLIDAE
See Trewavas (1983) for nomenclature of the following species.
Oreochromis mossambicus (Peters,1852) **introduced**
Oreochromis niloticus (Linnaeus,1758) **introduced**
Sarotherodon melanotheron heudelotii Duméril,1858 **introduced**

Family POMACENTRIDAE
Pomacentrus melanopterus Bleeker,1852 **MA, eur**

Family MUGILIDAE
Several species of *Mugilidae* are known to occur in Indochinese fresh waters. Their systematics is very confused and most of the records need confirmation. See Wongratana et al. (1984) for a review of the species occuring in Thailand.
Liza melinoptera (Valenciennes, in Cuvier & Valenciennes, 1836) **MA, CP, ME, eur**
Liza subviridis (Valenciennes, in Cuvier & Valenciennes, 1836) **MA,CP, eur**
Mugil cephalus (Linnaeus,1758) **MA, A, eur**
Valamugil cunesius (Valenciennes, in Cuvier & Valenciennes, 1836) **MA, eur**

Family POLYNEMIDAE
Several species of Polynemidae are known to occur in Indochinese fresh waters. Their systematics is very confused and most of the records need confirmation. The nomenclature follows Myers (1936).
Eleutheronema tetradactylum (Shaw,1804) **A, ME, CP, MA, eur**
Eleutheronema tridactylum (Bleeker,1845) **MA, eur**
Polynemus borneensis Bleeker,1857 **ME, eur**
Polynemus indicus Shaw,1804 **MA, eur**
Polynemus longipectoralis Weber & de Beaufort,1922 **ME, eur**
Polynemus multifilis Schlegel,1845 **CP, eur**
Polynemus paradiseus Linnaeus,1758 **MA, CP, ME, eur**
Polynemus plebejus Broussonet,1782 **MA, CP, eur**

Family BLENNIIDAE
Istiblennius edentulus (Bloch, in Schneider,1801) **MA, eur**
Omobranchus elongatus (Peters,1855) **CP, eur**
Omobranchus ferox (Herre,1927) (p.277) **MA, eur**
Omobranchus meniscus Springer & Gomon, 1975 (p.52) **SE, eur**
Omobranchus punctatus (Valenciennes, in Cuvier & Valenciennes, 1836) **SE, MA, eur**
Omobranchus zebra (Bleeker,1868) **MA, CP, SE, eur**
Phenablennius heyligeri (Bleeker,1859) **MA, SE, eur?**
See redescription by Springer & Smith-Vaniz (1972).

Family CALLIONYMIDAE
Callionymus fluviatilis Day,1876 **A, CP, eur**

Family ELEOTRIDIDAE
Bostrichthys sinensis (Lacepède,1802) **MA, CP, eur**
Butis amboinensis (Bleeker,1853) **SE, eur**
Butis butis (Hamilton,1822) **MA, MK, CP, SE, eur**
Eleotris fusca (Schneider,1801) **CP, MA, eur**
Eleotris insulindica (Bleeker,1875) **MA, eur**
Eleotris melanosoma Bleeker,1852 **MA, eur**
Ophiocara porocephala (Valenciennes, in Cuvier & Valenciennes, 1837) **MA, CP, SE, ME, eur**
Oxyeleotris marmorata Bleeker,1852 **MA, CP, ME**
Oxyeleotris siamensis (Günther,1861) **CP**
Oxyeleotris urophthalmus (Bleeker,1851) **CP, MA**
Philypnus chalmersi Nichols & Pope,1927 (p.390) **A**
Prionobutis koilomatodon (Bleeker,1849) **MA, CP, SE, eur**

Family GOBIIDAE
Generic nomenclature follows in part Koumans (1953), Masuda et al. (1984) and Hoese (1986).
Acentrogobius caninus (Valenciennes, in Cuvier & Valenciennes, 1837) **A, CP, MA, eur**
Acentrogobius chlorostigmatoides (Bleeker,1849) **MA, CP, SE, eur**
Acentrogobius cyanomos (Bleeker,1849) **CP, eur**
Acentrogobius masoni (Day,1873) **CP, eur**
Acentrogobius moloanus (Herre,1927) **SE, eur**
Acentrogobius viridipunctatus (Valenciennes, in Cuvier & Valenciennes,1837) **MA, CP, SE, eur**
Awaous grammepomus (Bleeker,1849) **S, eur**
Bathygobius fuscus (Rüppell,1828) **MA, CP, SE, eur**
Boleophthalmus boddaerti (Pallas,1770) **MA, CP, SE, eur**
Boleophthalmus pectinirostris (Linnaeus,1758) **CP, MA, eur**
Brachygobius kabiliensis Inger,1958 (p.110) **MA, SE, ME, eur?**
Brachygobius sua (Smith,1931) **CP, eur**
Brachygobius xanthomelas Herre, in Herre & Myers,1937 (p.43) **MA**
Callogobius moroana (Seale,1909) **SE, eur**
Creisson janthinopterus (Bleeker,1852) **MA, eur**
Creisson sealei Smith,1931 **CP, eur**
Cryptocentrus callopterus Smith,1945 **SE, MA, eur**
Cryptocentrus cyanotaenia (Bleeker,1853) **CP, SE, eur**
Cryptocentrus diproctotaenia Bleeker,1876 **SE, eur**

Cryptocentrus maudae Fowler,1937 **CP, eur**
Eugnathogobius microps Smith,1931 **CP, eur**
Glossogobius aureus Akihito & Meguro,1975 (p.128) **ME, CP, MA, eur**
See Akihito & Meguro (1975) for a synopsis of the genus.
Glossogobius biocellatus (Valenciennes, in Cuvier & Valenciennes, 1837) **MA, eur**
Glossogobius circumspectus (Macleay,1884) **MA, eur**
Glossogobius giuris (Hamilton,1822) **S, MA, CP, ME, A, eur**
Glossogobius sparsipapillus Akihito & Meguro,1976 (p.9) **ME, eur**
Gnathogobius aliceae Smith,1945 **CP, eur**
Gnatholepis calliurus Jordan & Seale,1905 **MA, eur**
Gobiopsis macrostoma Steindachner,1861 **CP, SE, eur**
Gobiopterus brachypterus (Bleeker,1855) **MA?, eur**
Gobiopterus chuno (Hamilton,1822) **CP, MA, eur?**
Istigobius ornatus (Rüppell,1828) **MA, SE, eur**
Mahidolia mystacina (Valenciennes, in Cuvier & Valenciennes,1837) **SE, eur**
Mugilogobius avicennia (Herre,1940) (p.17) **MA, eur**
Mugilogobius chulae (Smith,1932) **MA, SE, eur**
Mugilogobius jurongensis (Herre,1940) (p.18) **MA, eur**
Mugilogobius mawaia (Herre,1936) (p.19) **MA, eur**
Mugilogobius perakensis (Herre,1940) (p.21) **MA**
Mugilogobius rambaiae (Smith,1945) **CP, eur**
Oligolepis cylindriceps (Hora,1923) (1923b:745) **MA, eur**
Oxuderces dentatus Eydoux & Souleyet,1850 **MK, CP, eur**
See Springer (1978) for synonymy and Bauchot et al. (1982) for date of publication.
Oxyurichthys microlepis (Bleeker,1849) **MA, SE, eur**
Oxyurichthys ophthalmonema (Bleeker,1857) **MA, eur**
Parapocryptes serperaster (Richardson,1846) **SE, CP, MA, eur**
Periophthalmodon schlosseri (Pallas,1770) **CP, eur**
Periophthalmus barbarus (Linnaeus,1766) **CP, MA, eur**
Periophthalmus chrysospilos Bleeker,1853 **MA, eur**
Periophthalmus malaccensis Eggert,1935 **MA, eur**
Periophthalmus tredecemradiatus (Hamilton,1822) **CP, MA, S?, eur**
Periophthalmus variabilis Eggert,1935 **CP, eur**
Pseudapocryptes lanceolatus (Bloch, in Schneider,1801) **MA, CP,ME, eur**
Pseudogobiopsis oligactis (Bleeker,1875) **CP, eur**
Pseudogobiopsis siamensis (Fowler,1934) **CP, MA, eur**
Redigobius balteatus (Herre,1935) **MA, eur**
Rhinogobius chiengmaiensis Fowler,1934 **CP**
Rhinogobius kranjiensis (Herre,1940) (p.22) **MA, eur**
Rhinogobius mekongianus (Pellegrin & Fang,1940) (p.122) **ME**
Ctenogobius cephalopardus Smith,1945 is a synonym (Kottelat, 1982c:525).
Rhinogobius ocellatus Fowler,1937 **ME**
Rhinogobius paludosus (Herre,1940) (p.23) **MA, eur**
Rhinogobius vexillifer (Fowler,1937) **CP, eur**
Scarteleos viridis (Hamilton,1822) **CP, SE, eur**
Stigmatogobius poecilosoma (Bleeker,1849) **MA, eur**
Stigmatogobius sadanundio (Hamilton,1822) **MA, CP, SE, eur**
Yongeichthys criniger (Valenciennes, in Cuvier & Valenciennes, 1837) **MA, eur**
Yongeichthys nebulosus (Fors[s]kal,1775) **MA, eur**

Family GOBIOIDIDAE
Brachyamblyopus brachysoma (Bleeker,1853) **CP, eur**
Brachyamblyopus urolepis (Bleeker,1852) **CP, eur**
Caragobioides geomys (Fowler,1935) **CP, eur**
Taenioides anguillaris (Linnaeus,1766) **CP, eur**
Taenioides buchanani (Day,1873) **S, eur**
Taenioides cirratus (Blyth,1860) **MK, eur**
Taenioides gracilis (Valenciennes, in Cuvier & Valenciennes, 1837) **CP, eur**
Taeniodes nigrimarginatus Hora,1924 **MA, eur**

Family TRYPAUCHENIDAE
Ctenotrypauchen microcephalus (Bleeker,1860) **MA, eur**
Trypauchen vagina (Bloch, in Schneider,1801) **MA, CP, SE, eur**
Trypauchenichthys typus Bleeker,1860 **MA, eur**

Family MICRODESMIDAE
Parioglossus philippinus (Herre,1945) (p.14) **SE, eur**
See Rennis & Hoese (1985) for revision of the genus.

Family SIGANIDAE
Siganus canaliculatus (Park,1797) **MA, eur**
Siganus javus (Linnaeus,1766) **MA, eur**

Family SCOMBRIDAE
Scomberomorus sinensis (Lacepède,1800) **ME, eur**
Cybium cambodgiense Durand,1940 (p.37) is a synonym (Blanc et al.,1965; d'Aubenton & Blanc,1965).

Family ANABANTIDAE
Anabas testudineus (Bloch,1792) **A, ME, SE, CP, MK, MA, S**

Family BELONTIIDAE
Belontia hasselti (Cuvier, in Cuvier & Valenciennes,1831) **MA**
Betta abbreviata Pellegrin,1925 (p.181) **ME**
The whole genus is in very bad need of a serious and critical revision. It the last years, belontiids became a 'battle-field' for aquarist-systematists. As was foreseeable, this resulted in an increased chaos. Feelings and pride are often hardly masked by pseudo-scientific arguments.
Betta anabatoides Bleeker,1850 **MA?**
Doubtful records; according to Vierke (1986:84) this species would be restricted to Borneo.
Betta bellica Sauvage,1884 **MA**
Betta coccina Vierke,1979 (p.288) **MA**
Betta imbellis Ladiges,1975 (p.262) **MA**
Betta macrophthalma Regan,1910 **MA**
Betta waseri Krummenacher,1986 (p.177), described on the basis of a single specimen might be a synonym (Schmidt,1988:341)
Betta persephone Schaller,1986 (p.298) **MA**
Betta pugnax (Cantor,1849) **MA**
Betta brederi Myers,1935 (p.25) is a tentative synonym according to Vierke (1986:95).
Betta smaragdina Ladiges,1972 (p.190) **ME**
Betta splendens Regan,1910 **CP**

Micracanthus marchei Sauvage,1878 (1878c:95) is considered as a synonym (Roberts,1981a:91). A revision of the splendens-group is needed before taking any definitive action concerning this name.

Betta tussyae Schaller,1985 (1985b:348) **MA**
Vierke (1986:87) considered this taxon at most as a subspecies of *B. coccina*. I have seen material of both and disagree with his conclusions. Both species occur, not sympatrically, in Malaysia.

Parosphromenus deissneri (Bleeker,1859) **MA**

Parosphromenus harveyi Brown,1987 (p.34) **MA**
Made available in 40 words and one picture! Its validity still has to be demonstrated.

Parosphromenus nagyi Schaller,1985 (1985b:302)**MA**

Parosphromenus paludicola Tweedie,1952 (p.69) **MA**

Sphaerichthys osphromenoides Canestrini,1860 **MA**

Trichogaster leeri (Bleeker,1852) **MA**

Trichogaster microlepis Günther,1861 **ME, CP**

Trichogaster pectoralis (Regan,1910) **ME, SE, CP, MK (MA, S introduced)**

Trichogaster trichopterus (Pallas,1770) **A, ME, SE, CP, MK, MA (S introduced ?)**

Trichopsis pumila (Arnold, in Ahl,1937) (p.116) **ME, CP, MA**

Trichopsis schalleri Ladiges,1962 (p.101) **ME**

Trichopsis vittata (Cuvier, in Cuvier & Valenciennes,1831) **ME, SE, CP, MK, MA**
Including *T. harrisi* Fowler,1934.

Family HELOSTOMATIDAE

Helostoma temminckii Cuvier, in Cuvier & Valenciennes, 1831 **MA, CP**

Family OSPHRONEMIDAE

Osphronemus goramy Lacepède,1802 **MA, MK, CP, SE, ME**
Probably introduced in a part of its range.

Family LUCIOCEPHALIDAE

Luciocephalus pulcher (Gray,1830) **MA**

Family CHANNIDAE

Channa lucius (Cuvier, in Cuvier & Valenciennes,1831) **MA, CP, ME, SE, MK**

Channa marulioides (Bleeker,1851) **MA**

Channa marulia (Hamilton,1822) **CP, MA, S**

Channa melanoptera (Bleeker,1855) **MA**

Channa melasoma (Bleeker,1851) **ME, CP, MA**

Channa micropeltes (Cuvier, in Cuvier & Valenciennes, 1831) **ME, SE, CP, MK, MA, S**

Channa orientalis Bloch, in Schneider,1801 **A, ME, SE, CP, MK, MA, S**
A number of records involve either *C. orientalis* or *C. gachua* Hamilton,1822. There is also a long list of potential synonyms. In recent times, the tendency was to recognize a single species. But morphological and field observations by Deraniyagala (1963) and behaviour observations by Ettrich (1986:289) obviously indicate that at least two species are involved.

Channa siamensis (Günther,1861) **CP?**
Doubtful validity.

Channa striata (Bloch,1797) **S, MA, MK, CP, SE, ME, A**

Family MASTACEMBELIDAE

Species of Thailand and Burma have been revised by Roberts (1980, 1986).

Macrognathus aculeatus (Bloch,1787) **MA**

Macrognathus caudiocellatus (Boulenger,1893) (p.199) **S**
Endemic to Inlé Lake.

Macrognathus circumcinctus (Hora,1924) **MA, CP, SE, ME**

Macrognathus maculatus (Valenciennes, in Cuvier & Valenciennes, 1831) **MA**

Macrognathus meklongensis Roberts,1986 (p.99) **MK**

Macrognathus perakensis (Herre & Myers,1937) (p.74) **MA**

Macrognathus semiocellatus Roberts,1986 (p.99) **ME, CP, MK**

Macrognathus siamensis (Günther,1861) **CP, ME**

Macrognathus zebrinus (Blyth,1858) **S**

Mastacembelus alboguttatus Boulenger,1893 (p.200) **S**

Mastacembelus armatus (Lacepède,1800) **S, MA, MK, CP, SE, ME**

Mastacembelus erythrotaenia Bleeker,1850 **MA, CP, ME**

Mastacembelus favus Hora,1923 **MA, MK, CP, ME**

Mastacembelus oatesi Boulenger,1893 (p.199) **S**
Endemic to Inlé Lake.

Mastacembelus unicolor Valenciennes, in Cuvier & Valenciennes, 1831 **MA**

Family CHAUDHURIIDAE

Chaudhuria caudata Annandale,1918 (p.41) **S, MA, CP, ME**

Family SOLEIDAE

Achiroides leucorhynchos Bleeker,1851 **MA**

Achiroides melanorhynchus (Bleeker,1850) **MA, ME**
Synaptura achira Duncker,1904 (p.168) was proposed as a replacement name for both *A. melanorhynchus* and *A. leucorhynchos*, which Duncker considered conspecific and having inappropriate names. As first reviser, I restrict it as a (unnecessary) replacement name (thus an objective junior synonym) of *A. leucorhynchos*. The exact identity of the material listed by Duncker (ZMH 8642, Selangor Museum 642 and Raffles Museum uncat.) is irrelevant to this problem as they cannot be types.

Euryglossa aenea (Smith,1931) **CP, MA**

Euryglossa harmandi (Sauvage,1878) (1878a:94) **ME**
euryglossa aenea and *E. harmandi* might be synonyms.

Euryglossa orientalis (Schneider,1801) **ME, CP, MA, eur**

Euryglossa siamensis (Sauvage,1878) (1878a:94) **ME, CP, MA**
Synaptura krempfi Durand,1940 (p.39) and *Chabanaudetta smithi* Joglekar,1971 (p.370) are synonyms (Kottelat,1984c:817).

Synaptura pan (Hamilton,1822) **S**

Synaptura panoides Bleeker,1851 **MA, CP, eur**

Typhlachirus elongatus Pellegrin & Chevey,1940 (p.155) **ME, eur**

Family CYNOGLOSSIDAE

Cynoglossus borneensis (Bleeker,1858) **CP, SE, eur**

Menon (1977:34) redescribed *C. borneensis* and listed *Plagusia trulla* Cantor,1849, a senior synonym, in its synonymy, without explanation.

Cynoglossus cynoglossus (Hamilton,1822) **S, MA, CP, eur**

Cynoglossus feldmanni (Bleeker,1853) **ME**

Cynoglossus aubentoni Stauch,1966 (p.126) is a synonym (Menon, 1977:89).

Cynoglossus lingua Hamilton,1822 **MA, CP, SE, eur**

Cynoglossus microlepis (Bleeker,1851) **CP, ME**

Family TRIACANTHIDAE

Triacanthus biaculeatus (Bloch,1786) **MA, eur**

Family TETRAODONTIDAE

Carinotetraodon lorteti (Tirant,1885) (p.75 [1929:96]) **MA, CP, ME**

Tetraodon somphongsi Klausewitz,1957 (1957b:205), *C. chlupatyi* Benl,1957 (p.1) and *Monotreta tiranti* d'Aubenton & Blanc,1966 (p.556) are synonyms (Dekkers,1975:97). Tyler (1980:312) recognizes *Carinotetraodon* as a valid genus.

Chelonodon patoca (Hamilton,1822) **MA, eur**

Chonerhinus modestus (Bleeker,1850) **MA**

Chonerhinus nefastus Roberts,1982 (1982a:10) **MA, CP, ME**

Sphoeroides lunaris (Bloch, in Schneider,1801) **MA, CP, SE, eur**

Takifugu oblongus (Bloch, in Schneider,1801) **MA, SE, eur**

Tetraodon bayleyi Sontirat,1985 (p.47) **ME**

This is apparently the T. *hispidus* (non Linnaeus, 1758) of Smith (1945:575).

Tetraodon biocellatus Tirant,1885 (1929:95) **MA, MK, CP, SE, ME**

Crayracion fluviatilis var. *ocellata* Steindachner,1870 (p. 640) (preoccupied by Linnaeus,1758 in *Tetraodon*) and *T. steindachneri* Dekkers,1975 (p.132) are synonyms (Kottelat, 1987a:20).

Tetraodon cutcutia (Hamilton,1822) **S, MA?**

The record from the Malay Peninsula is based on a single juvenile collected near Ranong.

Tetraodon fangi Pellegrin & Chevey,1940 (p.157) **MK?, CP, ME**

Tetraodon fluviatilis Hamilton,1822 **S, MA, CP, eur?**

Tetraodon leiurus Bleeker,1851 **MA, MK, CP, SE, ME**

This species has been recently redescribed by Dekkers (1975: 108). My own collections in Sumatra, Malay Peninsula and northern Thailand make me have serious doubts that a single species is involved. This group should be revised, taking into account also *M. fangi* recognized as valid by Dekkers and *T. cochinchinensis* Steindachner,1866 (p.480) overlooked by Dekkers. *Tetraodon suvattii* Sontirat & Soonthornsatit,1985 (p.49) is a very likely candidate for synonymy with *T. cochinchinensis* and/or *T. cambodgiensis* Chabanaud, 1923 (1923b: 137).

Tetraodon nigroviridis Procé,1822 **S, MA, CP, ME, eur**

Tetraodon palembangensis Bleeker,1852 **MA, CP, SE, ME**

Xenopterus naritus (Richardson,1848) **MA, eur**

DISCUSSION

A. GENERALITIES

The Indochinese inland fish fauna includes 930 native species in 316 genera and 87 families (Table 1). In addition, there are at least 15 introduced species. 583 species (63%) and 154 genera (49%) belong to 31 primary or secondary division families and 347 species (37%) and 162 genera (51%) belong to 56 peripheral families.

Among primary and secondary division fishes, Cypriniformes (389 species or 67%, 91 genera or 59%) and Siluriformes (126 species or 22%, 40 genera or 26%) rank first as in most Asia (Table 2). The following discussion will be restricted to primary and secondary division families only.

143 species are recorded from the Salween basin, 222 from the Chao Phraya, 244 from the Mekong, 34 from Annam, 71 from coastal streams of the North-East coast of the Gulf of Thailand, 102 from the Mae Khlong, and 263 from the Malay Peninsula.

Salween

The Salween basin shares only 38 of its 143 species with the Mekong (27% of the fauna of the first and 16% of the second) and 37 with the Chao Phraya (26, respectively 17%). The boundary between the Salween on one side and the Chao Phraya/Mekong on the other is the sharpest in the area. 47 species (33%) are endemic to the basin and 28 species (20%) are shared only with the Irrawaddy and Sittang basin.

The Salween counts 77 genera, 42 (55%) of which are shared with the lower Mekong (which has 86 genera), 46 (60%) with the Middle Mekong (91 genera), 46 (60%) with the Chao Phraya (91 genera), 67 (87%) with the Irrawaddy (79 genera), 59 (77%) with the Brahmaputra (73 genera) and 55 (71%) with the Ganges (71 genera) (Table 3). Two genera are endemic to the Salween and both are known only from Inlé Lake *(Inlecypris, Sawbwa). Neonoemacheilus,* and *Exostoma* are shared only with the Irrawaddy and Brahmaputra basins and *Glaridoglanis* and *Pseudexostoma* only with the Irrawaddy.

The divide between the Salween and the Mekong/Chao Phraya is the eastern limit of the range of several genera widely distributed in India (e.g. *Amblypha-*

Table 1. Fish families known to occur in Indochinese inland waters, with respective numbers of genera and species; native taxa only.

	genera	species
Carcharhinidae	3	5
Pristidae	1	1
Dasyatidae	3	7
Osteoglossidae	1	1
Notopteridae	1	3
Megalopidae	1	1
Anguillidae	1	3
Ophichthidae	2	3
Congridae	1	1
Muraenidae	1	1
Chirocentridae	1	1
Clupeidae	11	18
Pristigasteridae	2	3
Engraulididae	5	21
Chanidae	1	1
Cyprinidae	65	280
Balitoridae	16	78
Cobitidae	9	30
Gyrinocheilidae	1	1
Bagridae	6	31
Siluridae	8	24
Schilbidae	1	1
Pangasiidae	6	25
Amblycipitidae	1	1
Akysidae	3	10
Sisoridae	10	25
Clariidae	2	8
Heteropneustidae	1	1
Chacidae	1	1
Olyridae	1	1
Ariidae	5	27
Plotosidae	1	2
Sundasalangidae	1	1
Bregmacerotidae	1	1
Batrachoididae	2	2
Hemirhamphidae	5	15
Belonidae	2	4
Oryziidae	1	3
Aplocheilidae	1	1
Atherinidae	2	2
Phallostethidae	4	6
Indostomidae	1	1
Syngnathidae	5	12
Synbranchidae	3	4
Scorpaenidae	1	1
Platycephalidae	1	1
Centropomidae	1	1
Ambassidae	4	13
Serranidae	2	2
Teraponidae	2	4
Apogonidae	1	2
Sillaginidae	1	1
Leiognathidae	2	4
Lutjanidae	1	5

Table 1 (continued). Fish families known to occur in Indochines inland waters, with respective numbers of genera and species; native taxa only.

	genera	species
Lobotidae	2	3
Gerreidae	1	1
Haemulidae	1	1
Sciaenidae	9	18
Monodactylidae	1	1
Toxotidae	1	4
Scatophagidae	1	1
Nandidae	2	3
Badidae	1	1
Pomacentridae	1	1
Mugilidae	3	4
Polynemidae	2	8
Blenniidae	3	7
Callionymidae	1	1
Eleotrididae	7	12
Gobiidae	30	65
Gobioididae	3	8
Trypauchenidae	3	3
Microdesmidae	1	1
Siganidae	1	2
Scombridae	1	1
Anabantidae	1	1
Belontiidae	6	23
Helostomatidae	1	1
Osphronemidae	1	1
Luciocephalidae	1	1
Channidae	1	9
Mastacembelidae	2	15
Chaudhuriidae	1	1
Soleidae	4	9
Cynoglossidae	1	5
Triacanthidae	1	1
Tetraodontidae	7	15

ryngodon, Aspidoparia, Chagunius, Osteobrama, Salmostoma, Rita, Clupisoma, Eutropiichthys, Erethistes, Exostoma, Gagata, Hara, Olyra) as well as the western limit of the range of many genera widely distributed in S.E. Asia (*Albulichthys, Amblyrhynchichthys, Balantiocheilos, Barbichthys, Cosmocheilus, Cyclocheilichthys, Epalzeorhynchos, Hampala, Henicor-hynchus, Leptobarbus, Lobocheilos, Lucio-soma, Macrochirichthys, Parachela, Paralaubuca, Poropuntius, Probarbus, Puntioplites, Sikukia, Thynnichthys, Gyrinocheilus, Acanthopsoides, Bagroides, Heterobagrus, Leiocassis, Belodontichthys, Hemisilurus, Kryptopterus, Helicophagus, Laides, Pteropangasius, Betta, Trichogaster, Trichopsis, Osphronemus).* The genera crossing this border are either widely distributed in Asia (e.g. *Notopterus, Bangana, Barilius, Brachydanio, Chela, Cirrhinus, Crossocheilus, Danio, Esomus, Labeo, Raiamas, Rasbora, Tor, Botia, Lepidocephalichthys, Pangio, Schistura, Mystus, Ompok, Silurus, Wallago, Pangasius, Amblyceps, Clarias, Heteropneustes, Nandus, Pristolepis, Anabas, Channa, Macrognathus, Mastacembelus, Chaudhuria, Indostomus*), montane fishes [at least in S.E. Asia] (*Cyprinion, Garra, Neolissochilus, Balitora, Homaloptera, Glyptothorax, Oreoglanis*), large S.E. Asian genera represented only by one usually widely

distributed species across this border *(Labiobarbus, Mystacoleucus, Osteochilus, Acantopsis, Akysis)* or genera whose systematics are poorly known (*Puntius*).

Cyprinus, Physoschistura, Yunnanilus, Hemimyzon, and *Pseudecheneis* are shared by the Salween and Mekong. Except for *Physoschistura* which is also recorded from the northernmost part of Thailand, In Indochinese waters they occur only in the upper Mekong; *Cyprinus, Physoschistura* and *Yunnanilus* also have endemic species in Inlé Lake.

Oreichthys, Microrasbora, Acanthocobitis, Chaca, Batasio, and *Badis* are shared by the Salween/ Irrawaddy and India (except *Microrasbora*) on the one hand and the Malay Peninsula on the other (*Oreichthys* also occurs in S.E. Thailand and *Acanthocobitis* in the Mae Khlong); they will be discussed with the fauna of the Malay Peninsula.

Taki (1975) considered the Irrawaddy-Salween fauna as a "transitional and more or less intermediate one between the Indian and the Indosinian faunas, but closer to the Indian". Taki based his conclusions on a classification of the different genera into Indian, Indo-Indosinian, Indosinian, and Chinese elements. As these elements were first defined on the basis of their distribution, this is quite a circular reasoning.

To me, the Salween fauna does not seem to be intermediate between Indian and Mekong/Chao Phraya faunae, as nearly all the genera shared between the Salween and the Chao Phraya and Mekong are also shared with the Brahmaputra and the Ganges and are widely distributed in South and South-East Asia and can have no value as zoogeographic indicators. To this category belong most of Taki's Indo-Indosinian elements (but *Catlocarpio, Schismatorhynchus, Oxygaster* and probably *Thynnichthys* which Taki classified as Indo-Indosinian are restricted to S.E. Asia, among *Osteochilus* which is represented in S.E. Asia by about 20 species, only *O. hasselti,* its member with the broadest distribution is recorded from the Salween, and *Sawbwa* is endemic to Inlé Lake in the Salween basin).

The sharp boundary East of the Salween, the lack of such a boundary with the Irrawaddy to the West, and the distinctive genera shared with Brahmaputra and Ganges are much more significant than the presence of widely distributed taxa to indicate affinities. Thus, I consider the Salween and Irrawaddy fishes as almost typical of North Indian fauna.

Mekong and Chao Phraya

The Indochinese part of the Mekong and the Chao Phraya basins have very similar fish fauna, comprising a total of 298 species. 244 species (82%) are known from the Mekong and 222 (74%) from the Chao Phraya, 168 of them being common to both basins (56%, or 68% of the Mekong fauna, or 75% of the Chao Phraya fauna). 142 species (48%) are endemic to the Mekong/Chao Phraya basins; 62 species (21%, or 25% of Mekong fauna) are endemic to the Mekong basin, 34 (11%, or 15% of Chao Phraya fauna) to the Chao Phraya and 46 (15%) are restricted to these two basins.

Of the 103 genera occuring in the Mekong and Chao Phraya basins, 98 have been reported from the Mekong and 91 from the Chao Phraya; 86 are common to both basins. The Mekong genera unknown in the Chao Phraya are endemic genera *(Mekongina, Scaphognathops, Neacanthopsis, Annamia),* genera restricted to montane areas and known from Upper Mekong, Red River or Upper Salween *(Acanthorhodeus, Onychostoma, Cobitis, Balitora),* genera known from the Malay Peninsula, Borneo and/or Sumatra *(Neobarynotus, Thryssocypris, Hemisilurus)* and the widely distributed genus *Amblyceps* whose absence is possibly the result of lack of collections. The Chao Phraya genera unknown in the Mekong are the endemic *Platytropius,* two genera widely distributed in the Malay Peninsula and Sunda Islands *(Ceratoglanis, Helostoma)* and two genera known only from Upper Nan River and shared with Upper Mekong *(Hemimyzon, 'Schistura')* (see below).

The Chao Phraya/Mekong fauna has strong affinities with the Sundaic one. It has 69 genera (67%) in common with Borneo, Sumatra and Java (which have 98 genera), while it shares only 48 (47%) genera with the Salween, 21 (20%) with the Red River and 18 (17%) with the Yangtze. Indochinese genera absent from Sundaic waters are the endemic *Catlocarpio, Henicorhynchus, Longiculter, Mekongina, Scaphognathops, Neacanthopsis, Annamia, Platytropius, Pangasianodon* and *Heterobagrus,* genera shared with the

Table 2. Indochinese primary and secondary freshwater families with their respective numbers of genera and species.

	genera	species	genera % of total	species total	genera % of total freshwater	species
Osteoglossidae	1	1	0.3	0.1	0.6	0.2
Notopteridae	1	3	0.3	0.3	0.6	0.5
Cyprinidae	65	280	20.6	30.1	42.2	48.0
Balitoridae	16	78	5.1	8.4	10.4	13.4
Cobitidae	9	30	2.8	3.2	5.8	5.1
Gyrinocheilidae	1	1	0.3	0.1	0.6	0.2
Bagridae	6	31	1.9	3.3	3.9	5.3
Siluridae	8	24	2.5	2.6	5.2	4.1
Schilbidae	1	1	0.3	0.1	0.6	0.2
Pangasiidae	6	25	1.9	2.7	3.9	4.3
Amblycipitidae	1	1	0.3	0.1	0.6	0.2
Akysidae	3	10	1.0	1.1	1.9	1.7
Sisoridae	10	25	3.2	2.7	6.5	4.3
Clariidae	2	8	0.6	0.9	1.3	1.4
Heteropneustidae	1	1	0.3	0.1	0.6	0.2
Chacidae	1	1	0.3	0.1	0.6	0.2
Olyridae	1	1	0.3	0.1	0.6	0.2
Sundasalangidae	1	1	0.3	0.1	0.6	0.2
Aplocheilidae	1	1	0.3	0.1	0.6	0.2
Oryziidae	1	3	0.3	0.3	0.6	0.5
Indostomidae	1	1	0.3	0.1	0.6	0.2
Nandidae	2	3	0.6	0.3	1.3	0.5
Badidae	1	1	0.3	0.1	0.6	0.2
Anabantidae	1	1	0.3	0.1	0.6	0.2
Belontiidae	6	23	1.9	2.5	3.9	3.9
Helostomatidae	1	1	0.3	0.1	0.6	0.2
Osphronemidae	1	1	0.3	0.1	0.6	0.2
Luciocephalidae	1	1	0.3	0.1	0.6	0.2
Channidae	1	9	0.3	1.0	0.6	1.5
Mastacembelidae	2	15	0.6	1.6	1.3	2.6
Chaudhuriidae	1	1	0.3	0.1	0.6	0.2

Malay Peninsula *(Paralaubuca, Probarbus, 'Puntius', Sikukia, Pteropangasius)*, genera shared with the Salween basin and India *(Bangana, Cirrhinus, Cyprinion, Danio, Esomus, Raiamas, Balitora, Physoschistura, Heteropneustes, Amblyceps, Chaudhuria, Indostomus;* some also present in the Malay Peninsula), and montane genera *(Hemimyzon, 'Schistura', Oreoglanis, Acanthorhodeus, Onychostoma, Cobitis)* often with affinities with East Asian species and occuring at the northern margin of the basin.

Sundaic genera unknown in the Mekong/Chao Phraya basins are the endemic *Eirmotus, Nematabramis, Oxygaster, Paracrossochilus, Schismatorhynchus, Rasborichthys, Rohteichthys, Ellopostoma, 'Elxis', Gastromyzon, Glaniopsis, Parhomaloptera, Protomyzon, Vaillantella, Lepidocephalus, 'Pelteobagrus', Silurichthys, Acrochordonichthys, Breitensteinia, Parakysis, Encheloclarias, Blontia, Parosphromenus, Sphaerichthys,* and *Luciocephalus,* and two genera with members in India and Burma *(Pseudeutropius, Chaca).*

Malay Peninsula

263 species are known from the Malay Peninsula, of which 40 species (15%) are shared with the Salween, 123 (47%) with Chao Phraya, 116 (44%) with the Me-

kong and 174 (66%) with Borneo, Java, and Sumatra. 40 species (15%) are endemic. Of its 94 genera, 78 (83%) are shared with Borneo, Sumatra and Java, 74 (79%) with Mekong and Chao Phraya and 45 (48%) with the Salween. The Malayan ichthyofauna is distincly Sundaic as it shares with Borneo, Sumatra and Java many of the genera which distinguish this fauna from the Indochinese one (*Oxygaster, Ellopostoma, Vaillantella, Lepidocephalus, 'Pelteobagrus', Silurichthys, Acrochordonichthys, Parakysis, Enchelocларias, Belontia, Parosphromenus, Sphaerichthys, Lucioce-phalus).*

A distinctive feature of the Malayan ichthyofauna is the presence of several genera which are elsewhere known only to occur in the Salween, Irrawaddy and India but are unknown from the Chao Phraya basin *(Microrasbora, Oreichthys* [also known from S.E. Thailand], *Batasio).* A similar pattern is exhibited by *Acanthocobitis* and *Badis* which in addition also occur in the Mae Khlong basin. According to Roberts (1985:oral presentation), these distribution patterns could be explained by Quaternary dispersal. As Roberts has not yet published his observations, it is difficult to argue on his conclusions. However the fact that these 'Indian' species are mostly known from the northern part of the Malay Peninsula and reached various distances southwards seems to support the idea of dispersal from the North East as opposed to vicariance; their absence from the islands of the Sunda Shelf could indicate dispersal posterior to the last glacial maximum when these islands were connected to Malaya. This theory could has well explain the distribution of Indochinese taxa present in Malaysia and unknown in the Sunda Shelf islands *(Paralaubuca, Probarbus, 'Puntius', Raiamas, Sikukia, Pteropangasius, Chaudhuria, Indostomus, Amblyceps).* Genera present in Sumatra but absent from Borneo *(Brachydanio, Neolissochilus, Poropuntius)* occuring in the Malay Peninsula, Indochina and the Salween and Irrawaddy basins could be viewed as the result of earlier dispersal. The distribution of *Chaca,* which is known from India, Burma, the southern extremity of Malay Peninsula, Borneo and Sumatra, could be interpreted as the result of a larger range dispersal followed by extinction in intermediate areas (northern Malay Peninsula, Salween basin).

Mae Khlong

The Mae Khlong and the Chao Phraya enter the Gulf of Thailand almost side by side, the distance between their mouths being about 70 km. As could be expected, their faunae are very similar. 102 species have been reported from the Mae Khlong basin, 30 (29%) of them being shared with the Salween, 84 (82%) with the Chao Phraya and 79 (77%) with the Malay Peninsula. There are 7 (7%) endemic species *('Puntius' somphongsi, Rasbora somphongsi, *Nemacheilus troglocataractus, *Nemacheilus* sp., **Schistura* sp., *Silurus* sp., *Macrognathus meklongensis);* those marked by an asterisk have been collected in caves only.

Of its 64 genera, 38 (59%) only are shared with the Salween while all but three *(Acanthocobitis, Acrochordonichthys, Badis)* are shared with the Chao Phraya and all but four *(Albulichthys,Cirrhinus, Henicorhynchus, Sikukia)* are shared with the Malay Peninsula.

Noteworthy is the distribution of *Acrochordonichthys rugosus,* a species elsewhere known from the Malay Peninsula and the Sunda Islands, which reaches its nothermost distribution in the Mae Khlong basin.

Also noteworthy is the distribution of *Poropuntius hampaloides, P. vernayi, Acanthocobitis botia, A. zonalternans,* and *Badis badis.* The two *Poropuntius* have a distribution restricted to the Salween and Mae Khlong basins, *A. botia* is widely distributed in India and Burma, *A. zonalternans* and *Badis badis* also have a wide distribution from Assam to the Malay Peninsula. None of them occur in the Chao Phraya. Their present distribution is probably best explained by river capture between the Salween and Mae Khlong, but considering the poor state of our knowledge of the geomorphology of this area, it is not possible to identify which stream(s) or part of stream(s) is involved. All these species are inhabitants of the upper reaches of the rivers.

South East Thailand and South West Kampuchea

The coastal streams of South East Thailand and South West Kampuchea are very short and, as could be expected, have a quite poor fish fauna. 71 species have been reported, 21 (30%) being shared with the Salween, 46 (65%) with the Mae Khlong, 53 (75%)

Table 3. Distribution of primary and secondary division freshwater fish genera in South and South-East Asia, between the Ganges and the Yangtze basins.
1. Ganges, 2. Brahmaputra, 3. Irrawaddy, 4. Salween, 5. Chao Phraya, 6. Mekong, 6A. Upper Mekong (Lantsang-Jiang), 6B. Middle Mekong (from China - Burma border to Khone Falls), 6C. Lower Mekong (below Khone Falls), 7. Red River, 8. Yangtze and Nanpan-Jiang, 9. Mae Khlong, 10. Malay Peninsula, 11. Sumatra, 12. Borneo, 13. Java, 14. South-East Thailand and South-West Kampuchea, 15. Annam.

Genera	1	2	3	4	5	6	6 A	6 B	6 C	7	8	9	10	11	12	13	14	15
ACIPENSERIDAE																		
Acipenser											x							
CATOSTOMIDAE																		
Myxocyprinus											x							
POLYODONTIDAE																		
Psephurus											x							
OSTEOGLOSSIDAE																		
Scleropages													x	x	x		x	x
NOTOPTERIDAE																		
Notopterus	x	x	x	x	x	x		x	x		x	x	x	x	x	x	x	
CYPRINIDAE																		
Abbottina										x	x							
Acanthobrama											x							
Acanthorhodeus						x	x	x		x	x							x
Acheilognathus											x							
Acrossocheilus						x	x			x	x							
Albulichthys					x	x		x	x			x		x	x			
Amblypharyngodon	x	x	x	x														
Amblyrhynchichthys					x	x		x	x			x	x	x	x			
Anabarilius											x							
Ancherythroculter											x							
Aphyocypris											x							
Aristichthys											x							
Aspidoparia	x	x	x	x														
Atrilinea											x							
Balantiocheilos					x	x		x	x				x	x	x			
Bangana	x	x	x	x	x	x		x	x									
Barbichthys					x	x		x	x			x	x	x	x	x		
Barilius	x	x	x	x	x	x		x	x	x		x	x		x		x	
Brachydanio	x	x	x	x	x	x		x	x			x	x	x			x	
Carassioides											x							
Carassius											x							
Catla	x																	
Catlocarpio					x	x		x	x									
Chagunius	x	x	x	x														
Chela	x	x	x	x	x	x		x	x			x	x	x	x			x
Cirrhinus	x	x	x	x	x	x		x	x	x	x	x						
Coreius											x							
Cosmochilus					x	x		x	x						x			
Crossocheilus	x	x	x	x	x	x		x	x			x	x	x	x	x		
Ctenopharyngodon											x							
Culter										x	x							
Cyclocheilichthys					x	x		x	x	?		x	x	x	x	x		
Cyprinion			x	x	x	x		x		x								x
Cyprinus				x		x	x			x	x							
Danio	x	x	x	x	x	x		x				x	x					
Danionella			x															
Diptychus											x							

Table 3 (continued). Distribution of primary and secondary division freshwater fish genera in South and South-East Asia, between the Ganges and the Yangtze basins.

Genera	1	2	3	4	5	6	6 A	6 B	6 C	7	8	9	10	11	12	13	14	15
Discogobio											x							
Distoechodon											x							
Eirmotus															x			
Elopichthys										x	x							
Epalzeorhynchos					x	x		x	x				x	x	x			
"Epalzeorhynchos" (1)				x														
Erythroculter										x	x							x
Esomus	x	x	x	x	x	x		x	x			x	x					
Folifer										x	x							
Garra	x	x	x	x	x	x	x	x	x	x	x	x	x		x		x	x
Gnathopogon										x	x							
Gobiobotia										x	x							
Gymnocypris											x							
Hampala					x	x		x	x			x	x	x	x	x	x	
Hemibarbus										x	x							
Hemiculter										x	x							x
Hemiculterella											x							
Henicorhynchus					x	x		x	x			x						
Huigobigo											x							
Hypophthalmichthys											x							
Inlecypris				x														
Ischikauia										x	x							
Labeo	x	x	x	x	x	x		x	x			x	x	x	x	x		
Labiobarbus				x	x	x		x	x			x	x	x	x	x	x	
Leptobarbus					x	x		x	x			x	x	x	x			
Lobocheilos					x	x		x	x			x	x	x	x	x		
Longiculter					x	x			x									
Luciobrama										x	x							
Luciocyprinus						x	x			x	x							
Luciosoma					x	x		x	x			x	x	x	x	x		
Macrochirichthys					x	x		x	x			x	x	x	x	x		
Megalobrama										x	x							
Mekongina						x		x	x									
Microphysogobio										x	x							
Microrasbora			x	x									x					
Mylopharyngodon										x	x							
Mystacoleucus				x	x	x		x	x			x	x	x	x	x	x	
Nematabramis															x			
Neobarynotus						x			x				x	x	x			
Neolissochilus	x	x	x	x	x	x		x	x				x	x			x	
Nicholsicypris										x	x							
Ochetobius										x	x							
Onychostoma						x	x	x		x	x							x
Opsariichthys						?		?		x	x							
Oreichthys	x	x	x	x									x				x	
Osteobrama	x	x	x	x														
Osteochilus			x	x	x	x		x	x	x	x	x	x	x	x	x	x	x
Oxygaster					?	?		?					x	x	x	x		
Parabramis											x							
Paracanthobrama											x							
Paracheilognathus											x							
Parachela					x	x		x	x			x	x	x	x	x		
Paracrossochilus															x			
Paralaubuca					x	x		x	x			x	x					

Table 3 (continued). Distribution of primary and secondary division freshwater fish genera in South and South-East Asia, between the Ganges and the Yangtze basins.

Genera	1	2	3	4	5	6	6 A	6 B	6 C	7	8	9	10	11	12	13	14	15
Parapelecus										x	x							
Pararhodeus										x	x							
Parasinilabeo											x							
Parator										x	x							
Parazacco											x							
Percocypris						x	x			x	x							
Plagiognathops										x	x							
Platysmacheilus											x							
Poropuntius					x	x		x	x				x	x			x	
Probarbus					x	x		x	x			x	x					
Procypris										x	x							
Pseudogobio											x							
Pseudohemiculter											x							
Pseudolaubuca											x							
Pseudoperilampus										x	x							
Pseudorasbora						?	?			x	x							
Ptychidio											x							
Puntioplites					x	x		x	x			x	x	x	x			
Puntius	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x
"Puntius" (2)					x	x		x				x	x					
Racoma						x	x				x							
Raiamas	x	x	x	x	x	x		x	x			x	x					
Rasbora	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	
Rasborichthys														x	x			
Rasborinus										x	x							
Rectoris										x	x							
Rhinogobio											x							
Rhodeus										x	x							x
Rhynchocypris										x								
Rohteichthys														x	x			
Salmostoma	x	x	x	x														
Sarcocheilichthys										x	x							
Saurogobio										x	x							
Sawbwa				x														
Scaphognathops						x		x	x									
Schismatorhynchus														x	x			
Schizopygopsis											x							
Schizothorax						x	x				x							
Securicula	x	x																
Semilabeo										x	x							
Sikukia					x	x		x	x			x						
Sinibrama										x	x							
Sinilabeo										x	x							
Sinocrossocheilus											x							
Sinocyclocheilus											x							
Spinibarbus										x	x							
"Spinibarbus" (2)										x								x
Squaliobarbus										x	x							
Thryssocypris						x			x						x			
Thynnichthys					x	x		x	x				x	x	x			
Tor	x	x	x	x	x	x		x	x	?	?	x	x	x	x	x	x	x
Toxabramis										x	x							
Typhlobarbus											x							
Xenocypris										x	x							

Table 3 (continued). Distribution of primary and secondary division freshwater fish genera in South and South-East Asia, between the Ganges and the Yangtze basins.

Genera	1	2	3	4	5	6	6 A	6 B	6 C	7	8	9	10	11	12	13	14	15
Yaoshanicus											x							
Zacco										x	x							
GYRINOCHEILIDAE																		
Gyrinocheilus					x	x		x	x			x	x		x			
COBITIDAE																		
Acanthopsoides					x	x		x	x						x			
Acantopsis			x	x	x	x		x	x			x	x	x	x	x		
Botia	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
Cobitis						x		x		x	x							x
Lepidocephalichthys	x	x	x	x	x	x		x	x			x	x	x	x	x	x	
Lepidocephalus													x	x	x	x		
Leptobotia										x	x							
Misgurnus						x	x			x	x						?	x
Neacanthopsis						x		x										
Neoeucirrhichthys		x																
Pangio	x	x	x	x	x	x		x	x			x	x	x	x	x	x	
Somileptes	x	x																
BALITORIDAE																		
Aborichthys		x	x															
Acanthocobitis	x	x	x	x								x	x					
Annamia						x		x										?
Balitora	x	x	x	x		x	x	x		x	x						x	x
Beaufortia											x							
Ellopostoma													x		x			
"Elxis" (3)															x			
Gastromyzon															x			
Glaniopsis															x			
Hemimyzon				x	x	x	x			x	x							
Heminoemacheilus											x							
Homaloptera			x	x	x	x		x	x				x	x	x	x	x	
Homatula						x	x			x	x							
Jinshaia											x							
Lepturichthys											x							
Liniparhomaloptera											x							
Metahomaloptera											x							
Micronemacheilus										x	x							x
Nemacheilus					x	x		x	x			x	x	x	x	x	x	
"Nemacheilus" (2)					x	x			x			?	x	x				
Neonoemacheius		x	x	x														
Oreias											x							
Oreonectes											x							
Paranemachilus											x							
Paraprotomyzon											x							
Parhomaloptera															x			
Physoschistura		x	x	x	x	x		x										
Protomyzon															x			
"Protomyzon" (4)											x							
Pseudogastromyzon											x							
Schistura	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
"Schistura" (2)					x	x	x											
Sewellia																		x
Sinogastromyzon										x	x							
Triplophysa						x	x				x							
Vaillantella													x	x	x		x	

Table 3 (continued). Distribution of primary and secondary division freshwater fish genera in South and South-East Asia, between the Ganges and the Yangtze basins.

Genera	1	2	3	4	5	6	6 A	6 B	6 C	7	8	9	10	11	12	13	14	15
Vanmanenia						x	x			x	x							
Yunnanilus				x		x	x			x	x							
PSILORHYNCHIDAE																		
Psilorhynchus	x	x	x															
BAGRIDAE																		
Aorichthys	x	x	x															
Bagroides					x	x		x	x				x	x	x			
Batasio		x	x	x									x					
Chandramara		x																
Heterobagrus					x	x		x	x									
Leiocassis					x	x		x	x			x	x	x	x	x		
Mystus	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	
Pelteobagrus										x	x							
"Pelteobagrus" (2)													x		x			
Pseudobagrus										x	x							
Rita	x	x	x	x														
SILURIDAE																		
Belodontichthys					x	x		x	x				x	x	x			
Ceratoglanis					x								x	x	x	x		
Hemisilurus						x		x	x					x	x			
Kryptopterus					x	x		x	x			x	x	x	x	x		
Ompok	x	x	x	x	x	x		x	x			x	x	x	x	x	x	
Silurichthys													x	x	x		x	
Silurus	x	x		x	x	x	x		x	x	x	x	x		x		x	
Wallago	x	x	x	x	x	x		x	x			x	x	x	x	x		
SCHILBIDAE																		
Ailia	x	x																
Clupisoma	x	x	x	x														
Eutropiichthys	x	x	x	x														
Proeutropiichthys			x															
Pseudeutropius	x	x	x	x										x	x			
Silonia	x																	
PANGASIIDAE																		
Helicophagus					x	x		x	x					x				
Laides					x	x		x	x				x	x	x	x		
Pangasianodon					x	x		x	x									
Pangasius	x	x	x	x	x	x		x	x			x	x	x	x	x		
Platytropius					x													
Pteropangasius					x	x		x				x	x					
AMBLYCIPITIDAE																		
Amblyceps	x	x	x	x		x		x	x				x				x	
Liobagrus										x	x							
AKYSIDAE																		
Acrochordonichthys												x	x	x	x	x		
Akysis			x	x	x	x		x	x				x	x	x	x		
Breitensteinia														x	x			
Parakysis													x	x	x			
CRANOGLANIDIDAE																		
Cranoglanis										x	x							
SISORIDAE																		
Bagarius	x	x	x	x	x	x		x	x	x		x	x	x	x	x		
Conta	x	x																
Coraglanis	x										x							
Erethistes	x	x	x	x														

Table 3 (continued). Distribution of primary and secondary division freshwater fish genera in South and South-East Asia, between the Ganges and the Yangtze basins.

Genera	1	2	3	4	5	6	6 A	6 B	6 C	7	8	9	10	11	12	13	14	15
Euchiloglanis	x	x	x	x						x	x							
Exostoma		x	x	x														
Gagata	x	x	x	x														
Glaridoglanis			x	x														
Glyptothorax	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Hara	x	x	x	x														
Laguvia	x	?	x															
Myersglanis	x																	
Nangra	x	x	x															
Oreoglanis				x	x	x		x										
Pareuchiloglanis										?	?							x
Pseudecheneis	x	x	x	x		x	x			x	x							
Pseudexostoma			x	x														
Pseudolaguvia			x															
Sisor	x																	
CLARIIDAE																		
Clarias	x	x	x	x	x	x		x	x	x		x	x	x	x	x	x	x
Encheloclarias													x		x			
HETEROPNEUSTIDAE																		
Heteropneustes	x	x	x	x	x	x		x	x									
CHACIDAE																		
Chaca	x	x	x										x	x	x			
OLYRIDAE																		
Olyra	x	x	x	x														
SERRANIDAE																		
Coreoperca										x	x							
Siniperca										x	x							
NANDIDAE																		
Nandus	x	x	x	x	x	x		x	x			x	x	x	x	x	x	
Pristolepis	x	x	x	x	x	x		x	x			x	x	x	x	x	x	
BADIDAE																		
Badis	x	x	x	x								x	x					
ANABANTIDAE																		
Anabas	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x
BELONTIIDAE																		
Belontia													x	x	x	x		
Betta					x	x		x	x			x	x	x	x	x	x	
Colisa	x	x	x															
Ctenops	x	x																
Macropodus										x	x							x
Parasphaerichthys			x															
Parosphromenus													x	x	x			
Sphaerichthys													x	x	x			
Trichogaster					x	x		x	x			x	x	x	x	x	x	
Trichopsis					x	x		x	x			x	x	x	x	x	x	
HELOSTOMATIDAE																		
Helostoma					x								x	x	x	x		
OSPHRONEMIDAE																		
Osphronemus					x	x			x			x	x	x	x	x		
LUCIOCEPHALIDAE																		
Luciocephalus													x	x	x			
CHANNIDAE																		
Channa	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x

Table 3 (continued). Distribution of primary and secondary division freshwater fish genera in South and South-East Asia, between the Ganges and the Yangtze basins.

Genera	1	2	3	4	5	6	6 A	6 B	6 C	7	8	9	10	11	12	13	14	15
MASTACEMBELIDAE																		
Macrognathus	x	x	x	x	x	x		x	x			x	x	x	x	x	x	
Mastacembelus	x	x	x	x	x	x		x	x			x	x	x	x	x	x	
Rhynchobdella											x							
CHAUDHURIIDAE																		
Chaudhuria			x	x	x	x		x	x				x					
Pillaia		x																
INDOSTOMIDAE																		
Indostomus			x		x	x			x				x					

Foot-notes:
1. *Epalzeorhynchos bicornis* Wu, in Wu et al,1977 (p.357) represents a new, unnamed genus.
2. New, unnamed genus mentioned in check-list.
3. *Elxis obesus* (Vaillant,1902), from Borneo, represents an unnamed genus (pers.obs.; Banarescu & Nalbant,1982; Rita, Banarescu & Nalbant,1978:185).
4. I doubt that *Protomyzon pachychilus* Chen,1980 (p.106) and *P. sinensis* Chen,1980 (p.106) from Guangxi, China, really belong to the genus *Protomyzon*, originally described from Borneo (Hora & Jayaram,1950, 1951). Direct comparison of Chinese and Borneo material is needed.

with the Chao Phraya, 54 (76%) with the Mekong and 61 (86%) with the Malay Peninsula. There are 5 (7%) endemic species *(Rasbora espei, Balitora meridionalis, Schistura kohchangensis, Silurus bokorensis, Akysis maculipinnis).*

Of the 38 genera of this area, 29 (76%) are shared with the Salween, 29 (76%) with the Mae Khlong, 32 (84%) with the Chao Phraya, 34 (89%) with the Mekong and 36 (95%) with the Malay Peninsula.

The most striking feature is that this small area bordered by the Gulf of Thailand, the Chao Phraya and the Mekong basins has a fish fauna which has more affinities with the Malay Peninsula, sharing with it two genera otherwise known only from the Sunda Islands *Vaillantella, Silurichthys).* This distribution pattern is also met in several species or group of species *(Puntius johorensis,* the pair *Rasbora hete-romorpha* [Malay Peninsula, Sumatra] - *R. hengeli* [S.E. Thailand, S.W. Kampuchea], *R. pauciperforata, Homaloptera orthogoniata, Nemacheilus masyae, Pangio myersi, Leiocassis stenomus).* This distribution pattern is probably best explained by the former drainage connections on the Sunda Shelf during Pleistocene glaciations (Molengraaff & Weber, 1919; Molengraaff,1921; Krempf & Chevey,1933; de Beaufort,1951). During one or several of the glacial maxima, these fishes probably had a continuous distribution over the Sunda Shelf. This distribution has been fragmented by the increasing sea level. Their absence in the Mekong, Chao Phraya and Mae Khlong basins might be due to unfavorable ecological conditions. Available data on the ecology of single species of S.E. Asian fishes are very limited, but all the above mentioned genera and species inhabit small streams in evergreen forest, usually running blackwaters. Their distribution pattern correspond more or less to the 25°C January isotherm, the 1500 mm annual isohyet (Ogino,1967; Geisler et al.,1979) and to annual temperature variations below 5°C which are responsible for the presence of evergreen rain forest in S.E. Asia) sensu Lekagul & McNee-

ly,1977) [or tropical rain forest, sensu Whitmore,1984] which in turn is responsible for the presence of black waters. Black waters are known as an important ecological limiting factor in South America and Africa (Roberts,1972).

A few other patterns involving this area deserve mention. *Scleropages* also occurs on the Sunda Islands, the Malay Peninsula and S.E.Thailand, but it is also known from Annam. *Amblyceps* is widely distributed from India to the Mekong basin and the Malay Peninsula but has not yet been recorded from the Chao Phraya and the Mae Khlong. *Oreichthys* is recorded from India to the Salween and is also known from the Malay Peninsula. *Balitora* is recorded from India to the Pearl River basin, including the lower Mekong.

Annam

The fish fauna of the coastal streams of Annam is a depauperate one (and also a very poorly collected one). It includes 34 species, of which 10 (29%) are shared with the Salween, 15 (44%) with the Mae Khlong, 16 (47%) with the Chao Phraya, 16 (47%) with S.E. Thailand, 17 (50%) with the Malay Peninsula and 18 (53%) with the Mekong; 6 species (18%) are endemic *(Homaloptera indochinensis, Micronemacheilus cruciatus, Schistura nasifilis, Sewellia lineolata, Cobitis misgurnoides, Pareuchiloglanis poilanei)* and all are inhabitants of hill streams. Of its 24 genera, 14 (58%) are shared with the adjacent lower and middle Mekong, 19 (79%) with the Red River and 16 (67%) with the Yangtze and Nanpan-Jiang basins. Two genera *(Sewellia, Pareuchiloglanis)* are endemic and have apparent relationships with Red River and Chinese genera.

The Annamese fish fauna is essentially constituted of widely ranging genera, mostly East Asian. The genera shared with South East Asia are also known from other basins in East Asia *(Cyprinion, Garra, Osteochilus, Puntius, Tor, Balitora, Schistura, Clarias, Anabas, Channa);* the only exceptions being *Scleropages* and *Chela.*

CONCLUSION

The fish fauna of the Indochinese Peninsula can be grouped in three distinct units, one of them divided into two subunits: A. Salween basin, B. Annam, C.1. Mekong, Chao Phraya, Mae Khlong, C.2. Malay Peninsula, South East Thailand - South West Kampuchea.

If one wishes to divide the Asian fish fauna in regions, subregions, districts, etc., this would correspond to the following hierarchy:

Oriental Region
- South Asian Subregion
  - **Salween basin**
    [Irrawaddy, Brahmaputra, Ganges and Indus basins, Peninsular India]
- South-East Asian Subregion
  - Indochinese District
    - **Mekong basin**
    - **Chao Phraya basin**
    - **Mae Khlong basin**
  - Sundaic District
    - **Malay Peninsula**
    - **S.E.Thailand -S.W.Kampuchea**
      [Sumatra, Java, Borneo, Philippines, Sulawesi]
- East Asian Subregion
  - **Annam**
    [Red River, Nanpang-Jiang, Yangtze, Taiwan]

The problem of the exact position of the East-Asian Subregion (Oriental Region, vs. Palaearctic Region) has not been adressed here and I arbitrarily follow Banarescu (1972b) in assigning it to the Oriental Region.

B. INTER-BASIN CONNECTIONS

The only large scale attempt to reconstruct the former river courses in continental East Asia is by Gregory (1925; Gregory & Gregory,1923). His conclusions are shown on Fig. 2. According to his view, at a time between post-Oligocene and present, the Upper Yangtze was formerly connected to the Red River, the Upper Mekong to the Chao Phraya (through the present Mae Nam Yom), the Upper Salween to the Chao Phraya (through the present Mae Nam Ping), the Upper Irrawaddy to the Sittang, the

Tsangpo to the Chindwin and lower Irrawaddy.

The present fish fauna supports some of his conclusions and contradicts others. The Yangtze - Red River, Mekong - Chao Phraya, Irrawaddy - Sittang and Tsangpo - Chindwin connections are apparently supported by the great affinities of their fish fauna. This is absolutely not the case for the Salween - Chao Phraya connection.

As shown above, the Salween fish fauna has very strong affinities with the Irrawaddy and Brahmaputra fauna and no affinities with the Chao Phraya - Mekong fauna. If the Salween, Chao Phraya and Mekong had formed the single river system hypothesized by Gregory (1925; Gregory & Gregory, 1923), then we would expect the three rivers to have retain a common fauna (or at least a part of their common fauna).

If the Salween had any connection with rivers situated East of it, this could be with the Mae Khlong which has some species in common with the Salween (see above). But this concerns only a small portion of the fauna of both rivers and might be indicative only of the capture of a smaller tributary. This is also supported by the distribution of two of the concerned species *(Poropuntius hampaloides* and *P. vernayi)* which are known only from the Mae Khlong and the Mae Nam Moei (a tributary of the Salween) basins. Interestingly, *Homaloptera bilineata* is known only from the Mae Nam Moei (Vinciguerra, 1890; Kottelat, unpubl.) and has very strong affinities with *H. orthogoniata,* a species known from the Sunda Islands and Malaya but which I also expect to occur in the Mae Khlong *(Homaloptera bilineata* had originally
been described as coming from the "Tenasserim Provinces" [Blyth,1860] which is not the present-day Tenasserim; most other species reported from Tenasserim by Blyth have also been collected in the Mae Nam Moei and another species, *Schistura cincticauda,* is also restricted to this basin [Kottelat, ms.].

Gregory's hypothese of a former connection between the Mae Nam Ping and Salween is also contradicted by an examination of maps and my field observations; there are no topographical indications to support this connection. If the Mae Nam Ping had earlier connections with another river, this would more likely be the Mekong. In the northernmost headwaters of the Mae Nam Ping (Ban Na Hwai, 19°38'N 98°57'E), I collected *Rasbora hobelmani* and *Physoschistura pseudobrunneana. Rasbora hobelmani* is known only from Ban Na Hwai and possibly (as *Rasbora taytayensis* in Hora & Mukerji [1934]) from the Nam Mae Hsai, a Mekong tributary forming the border between Thailand and Burma. *Physoschistura pseudobrunneana* also occurs in the Nam Mae Fang and Nam Mae Lao, both tributaries of the Nam Mae Kok, a river entering the Mekong about 20 km downriver of the Nam Ruak of which the Nam Mae Hsai is a tributary. A possible similar Upper Mae Nam Ping - Nam Mae Kok pattern is exhibited by the pair *Rhinogobius chiengmaiensis - R. mekongianus* (Kottelat,1984:721). The distribution of all these species is restricted to upper reaches and is more probably due to capture of small order tributaries than to capture of large sections of the main streams.

The fish fauna of the upper Mae Nam Nan (one of the main branches of the Chao Phraya) is characterized by the presence of two genera *(Hemimyzon* and *'Schistura')* which are otherwise unknown in the Chao Phraya basin. *Hemimyzon* includes at least 10 species occuring from Taiwan to the Salween basin in China (Kottelat & Chu,1988b). These fishes inhabit mostly high-gradient streams and the undescribed species from Mae Nam Nan is the only one known to occur out of China. Its affinities with any precise species (or species group) are not known. *'Schistura'* includes two species, *'S.' atriceps,* restricted to the upper Mae Nam Nan, and an undescribed species from a tributary of the Mekong in Xishuangbanna, Yunnan (Kottelat, ms.). These distribution patterns indicate a former connection between the Mae Nam Nan and the adjacent Mekong.

Gregory's (1925) hypothese also implies a much smaller Mekong which interestingly more or less corresponds with the distribution of three of its endemic genera *(Mekongina, Scaphognathops, Annamia).* A smaller Mekong would have had a smaller discharge and this seems compatible with Workman's (1975:13) observations in the present-day Mekong delta. Workman observed that the shallow depth to bedrock (15

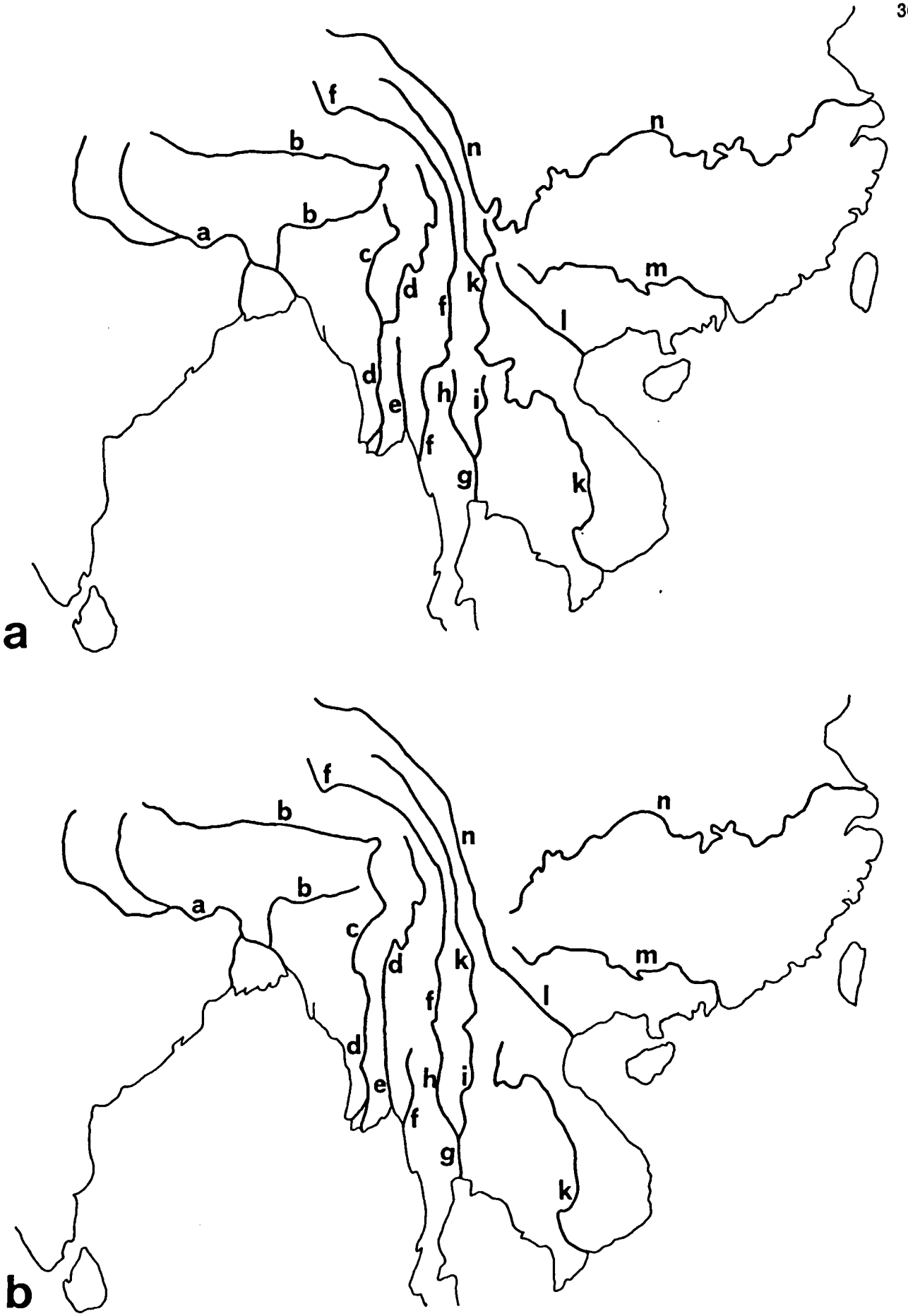

Fig. 2. a, Existing river system of South-East Asia; b, The post-Himalayan river system hypothesized by Gregory (1925). The existing rivers are: a Ganges, b, Brahmaputra - Tsangpo, c, Chindwin, d, Irrawaddy, e, Sittang, f, Salween, g, Chao Phraya, h, Mae Nam Ping, i, Mae Nam Yom, k, Mekong, l, Red River, m Nanpang-Jiang, n, Yangtse.

m at Phnom Penh) and many outcrops of bedrocks (including one at the point of the delta itself) shows that over most of the delta there is only a thin cover of alluvium. Only in the plain below Phnom Penh is there a great thickness of alluvium. One drill-hole near the mouth penetrated 563 m of unconsolidated Quaternary alluvia without reaching the bedrock. The Great Lake (Tonlé Sap) basin has only a thin manttle of alluvia and bedrock appears through them in a number of places.

This alluvium thickness shows that the present Mekong delta either has a young history or that a major part of the Mekong discharge was not reaching the South China Sea through its present delta at some time of its history.

For comparison, the Tertiary of Fang [the Mae Nam Fang is now a tributary of the Mae Nam Kok, itself a tributary of the Mekong in northernmost Thailand] basin exceeds 1000 m in thickness, and includes Oligocene and Miocene-Pliocene sediments. The Chao Phraya plain, about 60,200 km^2, consists of thick Cenozoic sediments. A drilling penetrated about 2000 m without reaching the basement. The Gulf of Thailand extends about 800 km from the deltaic plain near Bangkok and has a shallow flat bottom, 86 m at the deepest. Sediment thickness probably exceeds 6 km (Kobayashi, 1984:30).

C. HEURISTIC COMMENTS ON SOME ICHTHYOGEOGRAPHICAL THEORIES INVOLVING SOUTH - EAST ASIA

This chapter includes some brief comments (sometime quite subjective or provocative, I recognize) which arose as I was working on zoogeography of Indochinese fishes. Most of them would deserve more detailed discussion. For various reasons, this is not presently possible. These reasons are the lack of basic data (especially in the fields of phylogeny, geomorphology and geology), the difficulty met in using the available data on fish taxonomy and distribution in some area (especially language problems with Chinese and Vietnamese literature), the secretive distribution of some works, the very low standards prevailing in some areas and, sorrily, the lack of time. Even if these comments are not as polished as I would have liked, I decided to have them included here as they bring some new insights in older discussions.

a. South-East Asia as a center of origin for freshwater fishes.

South-East Asia has traditionally been seen as the 'center of origin' of the freshwater fish fauna of India (e.g. Banarescu & Nalbant,1982:26). Darlington (1957:100) and Briggs (1979) considered that Ostariophysi originated in tropical Asia and dispersed to Africa, Europe, North and South America.

Most of the authors who shared this concept of South-East Asian center of origin did not provide evidence or references to such evidences. For example, Menon (1987:20) flatly states 'It is a well-known fact that the centre of origin and dispersal of the cyprinoid fishes is in South-East Asia, most probably in South China' refering to a paper by Hora (1949) which does not exist [a paper with a different title but same page numbers (Hora,1949a) does not contain any mention to this 'well known fact'].

A wide array of zoogeographical hypothesis have been based on this 'well-known fact'. As they do not concern directly the evolution of the freshwater fish fauna of the Indochinese peninsula, I shall not discuss them in detail. However, it seems useful to see which incidence recent work on Indochinese fishes might have on these theories.

There is presently no evidence that tropical Asia, South-East Asia or Yunnan would be the 'center of origin' of cyprinoids or any other Ostariophysi [if 'centers of origin' do exist at all, a concept rejected by several authors, e.g. Croizat et al.,1974]. This seems to be based only on the axiom that the area of greatest taxonomic diversity of a group of organisms is the area of origin of that group of organisms (Darlington,1957:31). Briggs (1979) also considers the Oriental Region as the center of origin of ostariophysans by adopting Matthew's (1915) dispersal theory that the most advanced species would be found at the center of origin with the more conservative or primitive species the farthest from it (Briggs,1974) [Brundin (1975:20) defends a diametrically opposed concept]. This is not the place to discuss the possible existence of 'centers of origin', the

(usually empirical) ways to recognize them or the centrifuge vs centripede attribute of primitive vs. derived taxa. I just want to comment that South-East Asia as understood by most of these authors is not precisely defined but includes most of the Indochinese area as well as South China. From the point of view of present ostariophysan faunae, this area consists of three very distinct units with almost nothing in common (grossly corresponding to the Salween, Mekong and Red River basins), suggesting that the three faunae evolved without contact for a long time. Considering this trichotomy, the whole area cannot be accepted as a potential 'center of origin'. Taken separately, these units no longer give this impression of great taxonomic diversity. If the massive dispersal events postulated by some authors had happened, I would expect that there still would be some evidence of it and that the borders between these units would not be so sharp.

The diversity observed by earlier authors is probably better explained as three distinct but adjacent faunae; an additional factor, recent geological history (especially Himalayan orogeny), played an important role in the speciation and evolution of groups inhabiting mountain streams (Cobitidae, Balitoridae, Sisoridae, various cyprinid genera like *Garra, Cyprinion, Onychostoma,* etc.).

b. Satpura hypothesis

To account for the discontinuous distribution of some hill-stream fishes between North-East India and Peninsular India, Hora (1944, 1948, 1949a-e, 1950, 1951, 1953) coined what he called the 'Satpura hypothesis'. Hora thought that these specialized fishes evolved in the mountainous area of Yunnan and Indochina and dispersed fully developed to Peninsular India. According to Hora, these specialized animals could only migrate along a mountain range. As the lowlands between Garo Hills and Rajmahal Hills (which Hora called the Garo-Rajmahal Gap) would be an unsurmontable obstacle, Hora imagined a complex geological history involving the rising of a mountain range [at least 1500-1800 m with a mean annual rainfall of 2150 mm and tropical evergreen forest] in the Miocene-Pleistocene which disappeared after the fish had migrated from Yunnan. Hora's collaborators contributed various pieces to this theory (Biswas & Sampatkumaran,1949; Jayaram,1949a-e; Menon,1951; Roonwal & Nath, 1949; Silas,1952). Hora also spoke of 'waves of fish migration' from North-East India to the Peninsula, a 'concept' also used by Menon (1964, 1987) to explain distribution of *Garra* and nemacheilines. There is no geological support for Hora's Satpura hypothesis (Auden,1949; Dey,1949; Mani,1974). The theory is discussed and negated at length by Kurup (1974) and Mani (1974 [Mani qualified it as a 'flight of fancy']).

I agree with de Beaufort (1951) and Mani (1974) who consider that the disjunct pattern of distribution including North-East India on the one hand and South India on the other is better explained as the remnants of an older wider distribution and not of recent migration. The long list of taxa having disjunct ranges in Assam and Peninsular India provided by Silas (1952) and Menon (1973) all fall in this category. In this context, Sarasin's (1910) theory that these disjunct ranges are the result of extinction due to the Cretaceous to Eocene Deccan volcanism might still be very plausible.

In addition to this general considerations, it is also worth having a closer look at the fishes which inspired the theory. To support the 'Satpura hypothesis', Hora and his followers mentioned the distribution of various taxa of fishes which have discontinuous ranges in South-East Asia and Peninsular India and which are supposedly restricted to hill-streams: *Mystacoleucus, Thynnichthys, Osteochilus, Schismatorhynchus,* Schizothoracinae, Balitorinae (as Homalopteridae), *Silurus, Batasio, Gagata* (Hora,1949d). Among them, Schizothoracinae and Balitorinae only are restricted to montane habitats and the other do not provide support to the postulated existence of a former mountain range. Additionally, *Mystacoleucus, Osteochilus, Schismator- hynchus* and *Gagata* as understood by Hora are not natural units. The Indian species of *'Mystacoleucus'* belongs to *Rohtee* and has apparently no affinities with *Mystacoleucus* (Smith,1945:127; Chu & Kottelat, in press); the same applies to the Indochinese *'Rohtee'* of Silas (1952:431) which are true *Mystacoleucus.* Indian *'Osteochilus'* belong to the unrelated genera *Osteochilichthys* and *Kantaka* which Hora (1942) had pro-

posed as subgenera (Karnasuta,1982:13). The Indian *'Schismatorhynchus'* has been placed in the subgenus *Nukta* by Hora (1942); at the moment, there is no evidence that they belong to the same genus; I have examined material of both taxa and *Schimatorhynchus heterorhynchus* seems to be closely related to *Lobocheilos* while *Nukta* seems to have affinities with *Labeo* s.l. Their placement in the same genus is obviously based on a single character (the 'notched' snout) which is found in several genera of Labeoinae *(Garra, Lobocheilos)* and in *Gyrinocheilus.* The Indonesian *Gagata* actually is a *Glyptothorax* (Weber & de Beaufort,1921:71; pers.obs.). I have not had the opportunity to examine the Indian species of *Thynnichthys,* but I suspect that it is not a true *Thynnichthys.*

For the strictly montane Balitorinae and Schizothoracinae of South India, Hora (1955) propose a radically other theory, but without any mention of his 'Satpura hypothesis'. This time, he concluded that *Lepidopygopsis* (the only non-Hymalayan Schizothoracinae), *Bhavania* and *Travancoria* (the two endemic and monotypic genera of South Indian Balitorinae) evolved about 120,000 years ago in South India after the Indian continent had tilted, elevating the Western Ghats, creating heavy rainfalls and torrential conditions. He did not provide any geological evidence and did not discuss the potential ancestors of these genera. This theory has apparently never been discussed and as it is apparently not substantiated by the slightest evidence, I merely mention it. *Lepidopygopsis* is known only from Periyar Lake in Kerala (Raj,1941; Jayaram,1981) and is apparently not relevant for a discussion of adaptation to torrential life.

Recently, Banarescu & Nalbant (1982) added some taxa to the list of Satpura migrants: *Pristolepis, Botia, Nemacheilus, Oreonectes* and *Mesonoemacheilus. Pristolepis* and *Botia* also fall into the category of the lowland fishes which would not need a mountain range to migrate. *Pristolepis* belongs to the family Nandidae which has a disjunct range including South America *(Monocirrhus, Polycentrus),* West Africa *(Afronandus, Polycentropsis),* India and South-East Asia *(Nandus),* thus strongly indicative of an older Gondwanan distribution. Banarescu & Nalbant (1968, 1982) considered that the Indian, Indochinese and East Asian *Oreonectes* belong to three subgenera, each of them restricted to a single area; data available from Sawada (1982:189) and my examination of material of these three 'subgenera' indicate that the characters used to define them are either plesiomorphic or parallelisms. The affinities which Banarescu & Nalbant (1968, 1982) observed between Indian nemacheilines and *Nemacheilus binotatus* from Thailand is not supported by my recent revision of Indochinese nemacheilines (Kottelat, ms.). The Assamese *Mesonoemacheilus reticulofasciatus* as described and illustrated by Sing & Banarescu (in Singh et al.,1982) and Menon (1987) has great similarities with *Schistura vinciguerrae* (see description and illustrations in Hora, 1935 and Kottelat, ms.). This is especially true for the colour pattern which has no affinities with the remaining (South Indian) species of the genus *Mesonoemacheilus.* Among the characters listed by Banarescu & Nalbant (in Singh et al., 1982) and Menon (1987) as diagnostic for *Mesonoemacheilus,* all are shared by other genera, except the conspicuous and distinctive colour pattern.

c. Plate tectonics and fish distribution in South, South-East and East Asia

Novacek & Marshall (1976) proposed an alternative theory for the origin and biogeographic history of ostariophysans based on a plate tectonic model. They suggested that Ostariophysi originated in what is now South America where they diverged into primitive Cypriniformes and Siluriformes which then dispersed to western Africa; from there they diverged and dispersed to Europe and Asia. Using this model, South-East Asian ostariophysan would have arrived through Europe or West Asia. Novacek and Marshal based they discussion on the phylogeny proposed by Rosen & Greenwood (1970):

- Superorder Ostariophysi
  - Series Anotophysi
    - Order Gonorhynchiformes
      - Suborder Chanoidei
      - Suborder Gonorhynchoidei
  - Series Otophysi
    - Order Cypriniformes

Suborder Characoidei
Superfamily Characoidea
Superfamily Gymnotoidea
Suborder Cyprinoidei
Order Siluriformes

An other phylogeny, proposed by Roberts (1973) differs slightly:

Superorder Ostariophysi
Order Gonorhynchiformes
Suborder Chanoidei
Suborder Gonorhynchoidei
Order Cypriniformes
Suborder Characoidei
Superfamily Characoidea
Superfamily Gymnotoidea
Suborder Cyprinoidei
Superfamily Cyprinoidea
Superfamily Cobitoidea
Suborder Siluroidei

More recently, Fink & Fink (1985) proposed a phylogeny differing in some major points from earlier hypotheses:

Superorder Ostariophysi
Series Anotophysi
Order Gonorhynchiformes
Series Otophysi
Subseries Cypriniphysi
Order Cypriniformes
Subseries Characiphysi
Order Characiformes
Order Siluriformes
Suborder Siluroidei
Suborder Gymnotoidei

Plate tectonics and fish phylogeny are two fields of very active researches in which major new hypotheses can still be expected at any time. We are only beginning to understand the complexity of the evolution of the continents and all proposed phylogenies are likely to suffer major modifications. However, comments on the biogeography of some groups and areas seem justified.

c. 1. Geological background

There are few publications giving an idea of the geological history and palaeogeography of Indochina and surrounding areas. Several are outdated and do not take into account recent trends and developments in geology, like plate tectonics. Most of the available works are merely descriptive stratigraphy and structural morphology and hardly provide useful data for biogeographic studies. Extensive geological surveys have been conducted in several areas, but the results are difficult or impossible to obtain as they are classified data, be it for political or commercial reasons. Some national geographic treatments are available (e.g. Kobayashi, 1984 for Thailand; Burton, 1970 and Gobbett & Hutchison,1973 for Malaya; Workman,1972, 1975 for eastern Thailand, Laos, Kampuchea and southern Viet Nam; Bender,1983 for Burma; Baum et al.,1970 for northern Thailand, Hamilton,1979 for Indonesia) but no one deals with the area as a whole. Additionally, a great number of data and informations are not concordant for adjacent areas. A summary of the available data relevant to the present discussion follows:

At about 180 Ma [Ma: mega-year or 1.000.000 years], Pangea broke up into Laurasia (Eurasia, Greenland and North America) and Gondwana (South America, Africa, Madagascar, India, Australia, Antarctica, etc.). Laurasia then broke up by the separation of North America from Greenland and of both from Eurasia. This resulted in closing the Tethys Ocean that had lain between Gondwana and Laurasia in Triassic time. This closure resulted in a series of collisions between the northern edge of Africa, Arabia, Iran and India with the southern edges of Eurasia (Audley-Charles et al.,1981:22).

Audley-Charles et al. (1981) present a series of maps drawn at 20 Ma intervals from late Triassic (200 Ma) to the present showing the fragmentation and dispersal of Gondwana into the fragments known today: Africa, Arabia, Madagascar, India, Australia/New Guinea, New Zealand, Antarctica and South America. They show the whole Indochinese area as part of Laurasia, a point of view no longer followed by Audley-Charles (1987 [see below]). Africa, Arabia, India, Australia/New Guinea and New Zealand moved northwards and India separated from Antarctica-Australia and Africa and South America at about 140 Ma. The northward movement of India was slow until about 80 Ma then increased until its contact with Laurasia about 55

Ma. Australia/New Guinea collided Asia between 15 and 5 Ma (Audley-Charles,1981:27).

Africa started to break from South America at about 120 Ma (Audley-Charles et al.,1981:14), but the Atlantic Ocean was not entirely opened until middle Turonian (about 89 Ma). But in lower Turonian (about 91-90 Ma), there was a connection between Tethys and Atlantic. At that time, West Africa was still connected with South America but separated from the rest of Africa (Reyment,1975:15-16, figs.5-6).

The NW continental margin of Australia/New Guinea was block-faulted about 150-130 Ma to form a new continental margin. The continental block that is believed to have separated from Australia/New Guinea had not been identified by Audley-Charles et al. (1981). Audley-Charles (1983:49) proposed a different reconstruction of eastern Gondwana, taking into account geological and palaeontological data and the limited available palaeomagnetic data for South-East Asia. This interpretation differs from former ones in that Indonesia, Malaya, Burma, Tibet, Indochina, Turkey and Iran were parts of Gondwana instead of Laurasia.

In late Triassic, Iran/North Tibet/Indochina had moved northwards and collided with Asia (Mitchell,1981; Audley-Charles,1987) and an ocean (Tethys II) had opened between them and South Tibet/Burma/Malaya. South Tibet/Burma/Malaya/Sumatra/Borneo rifted from Australia/New Guinea in mid to late Jurassic [180-150 Ma] (Audley-Charles, 1987: fig. 2.2) and reached their approximate present position by 40-30 Ma (Audley-Charles,1987: figs.2.7-2.8). They were apparently above sea level.

According to Buffetaut & Martin (1985), a latest possible date for the establishment of a land connection between the Indochina fragment and Laurasia is late Triassic as supported by the discovery in Thailand (Martin & Ingavat, 1982) of the fossil lungfish *Ptychoceratodus* cf. *szechuanensis*, closely related to a form from South China. This supports the reconstruction by Liu et al (1985) which shows the Indochina block attached to South China as early as the Permian.

The collision of India with Eurasia began before the middle Eocene (52 Ma). It resulted in about 2000 km of N-S crustal shortening within continental Eurasia. India drifted northwards with a mean velocity of 15-20 cm y^{-1} until 52 Ma, then between 52-56 Ma the motion became erratic and the northwards velocity was reduced to <10 cm y^{-1}. Finally, from 36 Ma to the present, India resumed a stable northward direction at a rate of <5 cm y^{-1}. The velocity drop 52 Ma and the erratic behaviour of India are interpreted as the onset of collision (Patriat & Achache,1984).

In eastern Indochina, according to Workman (1975: 8), in middle Carboniferous, an enlarged stable block (called Annamia) came into existence; it covered central and southern Viet Nam, much of eastern and central Laos and possibly most of NE Thailand and northern and eastern Kampuchea. It is believed to have remained a land-mass with incursion of shelf and lagoonal seas, from the middle of Carboniferous onwards. Around this land-mass, intermittent marine sedimentation continued in the upper Palaeozoic and Triassic. By the middle of the Jurassic, there was a large land mass (called Indosinia) extending over what is now Kampuchea, Laos, Viet Nam, eastern Thailand as well as over parts of the present day shelf seas to the South and East. This land has remained essentially unchanged as a structural unit until now. There were no major marine incursions from the Liassic to the Tertiary and no major folding since lower Jurassic. Large areas of Indosinia were covered by an inland sea during upper Mesozoic. Workman's figures 3 shows four consolidated landmasses resulting from Pre-Cambrian to Hercynian foldings: Annamia, "Red River" (occupying the part of Viet Nam North of Red River), Sichuan and Indian subcontinent.

The Cenozoic palaeogeography of the Philippines remains uncertain and can only be described in speculative terms. Audley-Charles (1981:34) favoured a model regarding the western parts as fragments rifted away from the continental margin of South China during late Mesozoic while the eastern parts are considered to be an intraoceanic arc that collided with the rifted fragments during the Oligocene. The best available evidence seems to suggest that some Philippine volcanoes might have been above sea level for about 140 Ma (about late Jurassic), when they

were close to the Asian continent; other volcanoes and associated islands may have been above sea level for 70 Ma (late Mesozoic).

c.2. An alternative hypothesis for ostariophysan biogeographic history

It is not possible to postulate an hypothesis to explain the evolution and distribution of the Ostariophysi which is at the same time congruent with the available geological information and any of the phylogenetical reconstruction. My data on South and East Asian Ostariophysi show that there are three distinct fish faunae: an Indian (India, Irrawaddy, Salween) one, a South-East Asian (Chao Phraya, Mekong, Sunda Islands) one and a Chinese (China and Red River) one (see also Chu,1986). These three faunae correspond to three plates with very distinct histories: China (as palaeocontinent Qingzangindia) has been part of Laurasia since at least Trias (i.e. before the break up of Pangea) (Wang,1984), India and South-East Asia are adjacent fragments of Gondwana which rifted at different times. This could indicate that some families were already present and differentiated on the three plates at the time of the break up of Gondwana. These families are those which now occur in Africa and South and/or East Asia: Cyprinidae, Balitoridae, Bagridae, Schilbidae and Clariidae among ostariophysans and Notopteridae, Aplocheilidae, Cichlidae, Nandidae, Anabantidae, Channidae and Mastacembelidae among non-ostariophysans. The isolation of the different elements could also explain the existence of many small families restricted to an area more or less corresponding to one or more of the fragments hypothesized by Audley-Charles (1987): Gyrinocheilidae, Amblycipitidae, Akysidae, Heteropneustidae, Chacidae and Olyridae among ostariophysans and Indostomidae, Badidae, Helostomatidae, Osphronemidae, Luciocephalidae and Chaudhuriidae among non-ostariophysans.

The major possible objection to such an hypothesis is that it postulates that some families and genera were already present in Africa when South-East Asia began to drift northwards (180-150 Ma) while they are not present in the other parts of Gondwana which rifted later (South America, Australia, Antarctica, Madagascar). As already noted by Briggs (1979), 'if Gondwanaland did exist, Madagascar and Australia must have been isolated by epicontinental seas [...] to prevent invasion by freshwater fishes'. Alternative and/or complementary explanations could include marine transgressions and climatic factors (e.g. ice sheets) which prevent dispersal or eradicate the existing fauna.

If marine transgressions similar to the one reported by Reyment (1975 [see above]) for the middle Turonian existed earlier (or any other important barrier to ostariophysan dispersal), there would be a simple explanation to the absence of Characiformes in Asia and the absence of Cypriniformes in South America. Such a barrier would allow Cypriniformes to differentiate in a part of present-day Africa in contact with India and Laurasia while Characiformes would differentiate in a part of present-day Africa in contact with South America. If the two parts came into contact after the drift of India and South America, the two orders would have the possibility to disperse through the whole Africa.

To accomodate with this scenario, Siluriformes would need to be about as old as Cypriniformes, or to be able to disperse through marine environment.

A Gondwanian origin has already been proposed for the freshwater snails of the family Pomatiopsidae. Davis (1979, 1982) explains their distribution and history as a succession of vicariance and dispersal, vicariance accounting for their presence in South America, South Africa, Australia and India, dispersal accounting for their presence in South-East and East Asia, and from there in North America. Davis' scenario differs from my ostariophysan scenario in two main points:

- South-East Asia did not play a role in 'carrying' some Gondwanian elements. Information on the Gondwanian origin of South-East Asia became available only recently and Davis (1982) could only include a comment on Ridd's (1980) paper in a foot note, commenting that the early accretion of South-East Asia with mainland Asia does not alter his scenario for the introduction of Pomatiopsidae to Asia from the Indian plate.
- Dispersal, and especially passive dispersal, played a very important role in the history of the aquatic

snails, while its role seems less important for most ostariophysans.

d. Fossils

The few known ostariophysan fossils are of almost no use in a discussion of ostariophysan biogeography. The oldest fossil Siluriformes has been found in the Maastrichtian (Upper Cretaceous) of Bolivia (de Muizon et al.,1983; see Grande,1987), the oldest Cypriniformes in the lower Eocene of Europe (Patterson,1975) and Sumatra (Sanders,1934) and Paleocene of China (Wang et al.,1981) and the oldest Characiformes in the Upper Cretaceous of Bolivia (Gayet,1982a). Gayet (1981) described *Lusitanichthys characiformis* as a Characiformes from the Cenomanian (97-91 Ma) of Portugal; in 1982, she described *Ramallichthys orientalis* as a Gonorhynchiformes or Cypriniformes from the Cenomanian of Israel (Gayet,1982b) and *Mollinichthys inopinatus* as a primitive cyprinid from the Cretaceous of Bolivia (Gayet,1982c). Fink et al. (1984) considered that *Mollinichthys* is not a teleost, *Ramallichthys* is not a member of the Otophysi and *Lusitanichthys* is probably not a Cypriniformes.

Wang et al. (1981) described several fossils from the Paleocene of Sanshui, Guangdong Province, China. Three of them belong to *Osteochilus,* one to *Rasbora* and two to *Mystus.* These genera are known mainly from South-East or South Asia but all have one or two representatives in South China, in the basins of the Red River and Nanpang Jiang. The three species of *Osteochilus* are identified as belonging to this genus apparently only on the basis of the number of branched dorsal rays, 9 in *O. sanshuiensis* and *O. laticorpus,* 11 in *O. longipinnatus.* This character is shared by several other cyprinid genera *(Labeo, Cirrhinus, Lobocheilos,* etc.) which are distinguished by characters of the mouth and lips, soft parts which cannot be recognized in fossils. Additionally the material illustrated seems to have a very different body shape and terminal mouth. On the basis of the Chinese description and the illustrations in the poor copy I obtained, I cannot provide any objective tentative identification. To me they have the appearance of some *Cirrhinus* or *Onychostoma.* There is no character allowing placement of *Rasbora guangzhouensis* in *Rasbora* instead of any other genus of small cyprinid with 7 branched dorsal rays and 5 branched anal rays. *Mystus dalungshanensis* and *M. spinipectoralis* are compared with *Pseudobagrus virgatus* only but placed in *Mystus.* Wang et al. (1981) apparently discussed at length ostariophysan biogeography, but their argument has not been translated. In the English summary, they state that the cyprinids first appeared 'in Laurasia Land in the south-east of Asia in the early Tertiary.' They based their conclusion on the fact that the Guangdong fossils are the oldest known cyprinid fossils, cyprinids are the most primitive lineage among Cypriniformes and by the enigmatic statement 'in the early Tertiary, in the Laurasia land of south-east Asia, the existed desirable paleozoographical condition for the growth of Cyprinidae'. There are obviously linguistic problems and I think that it would be unfair to discuss their discussion on the basis of this poor abstract only. I just wish to state my disagreement with one at least of their statements: the presence of the oldest known cyprinid fossils in South-East Asia does not demonstrate that this is the area of origin of the group. Asia does not demonstrate that this is the area of origin of the group.

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