Fishes of Mongolia

A check-list of the fishes
known to occur in Mongolia with
comments on systematics and nomenclature

MAURICE KOTTELAT

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Foreword

Water is an essential element in Mongolia's development plans; initiatives currently being considered include projects such as hydroelectric dams, water transfers, irrigation schemes, and aquaculture. Assessing the impacts of these projects on freshwater biodiversity is hindered by inadequate knowledge of the fauna.

The World Bank is supporting Mongolia in its efforts to ensure sustainable exploitation of its considerable natural resources. This report is the latest product of the Environment and Social Development Department in the East Asia and Pacific Region of the World Bank, and has been produced within the framework of the Netherlands-Mongolia Trust Fund for Environmental Reform (NEMO). This wide-reaching initiative has touched almost all aspects of environmental management in Mongolia in 2005–06. In addition to this study, we have supported several other studies, such as assessing threats and devising management needs for a number of animal groups, analyzing the illegal wildlife trade and the illegal timber trade, and evaluating the success of tree planting projects.

This report establishes a reliable and comprehensive list of Mongolian fish. The work is based on a review of the existing literature; interviews with local and international experts; examination of material preserved in natural history museums and research institutes in Beijing, Wuhan, St. Petersburg, Berlin, Stockholm and Paris; and supplementary fieldwork. Maurice Kottelat has applied his unparalleled knowledge of the fish of the region to write a critical analysis of the fish fauna of Mongolia. This report represents an essential foundation of knowledge. Together with the recently published Red List of Mongolian Fish and the Action Plans for Mongolian Fish (which we also supported), it should provide indispensable material to support environmental impact assessments for any development project affecting water resources in Mongolia.

This is the second time such a report has been published by the World Bank. We do so again in recognition of the foundational role of taxonomy in sustainable development, of the importance of freshwater biodiversity in the lives of subsistence and commercial fishers, and of the important role that biological knowledge plays in natural resource planning.

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Acronyms and Abbreviations

CD	Coefficient of difference
Code	International Code on Zoological Nomenclature
EIA	Environmental Impact Assessment
ESC	Evolutionary Species Concept
IHB	Institute of Hydrobiology, Chinese Academy of Sciences, Wuhan
IZCAS	Institute of Zoology, Chinese Academy of Sciences, Beijing
MNHN	Muséum National d'Histoire Naturelle, Paris
mtDNA	Mitochondrial DNA (Deoxyribonucleic acid)
NEMO	Netherlands-Mongolia Trust Fund for Environmental Reform
PCA	Principle Component Analysis
SL	Standard length
USSR	Union of Soviet Socialist Republics
WWF	World Wide Fund for Nature
ZISP	Zoological Institute, Russian Academy of Sciences, St. Petersburg
ZMB	Museum für Naturkunde, Berlin

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Editorial assistance was provided by Bob Livernash, and the publication process was handled by Bryony Morgan, who spent many long hours checking and re-checking the text and compiling photographs. I am pleased to thank M. Erdenebat, Zeb Hogan and Johannes Schöffmann for permission to use their photographs.

This publication would never have come to light without the efforts, help, tenacity and friendship of Tony Whitten of the World Bank who planned and organised the work, and made enormous efforts to get all possible benefit from it.

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Executive Summary

A total of 76 native fish species are reliably recorded in Mongolia's waters. Five of them are possibly new to science and unnamed. Five additional species are often reported as being present in Mongolia but are in fact only presumed to exist and should be deleted from the Mongolian faunal lists. Four other species are introduced species that have not been sighted for years and presumably did not become established, and a further two are introduced species which have become established. Nine species are known from immediately adjacent waters in China and Russia and might be present, either as permanent inhabitants or vagrant individuals.

The systematic status and nomenclature of all species have been reevaluated. Compared to the last synthesis of the fishes known from the same area (Baasanjav & Tsendayush, 2001), 11 (15 percent) of the 72 formerly recognized species are invalid, and the names of 28 (39 percent) of the then-known species were incorrect (either because of misidentifications, or for various nomenclatural reasons). Therefore, in total more than half (39 out of 72) of the species in this synthesis were incorrectly listed, to which a further 15 species not previously recognized should be added. This clearly demonstrates that present knowledge of fish diversity in Mongolia is far from adequate, that the number of species is underestimated, and that more species probably still await discovery. Survey work is needed in addition to an approach of taxonomy incorporating modern standards, concepts, and procedures.

The fish fauna of the Chinese provinces of Xinjiang and Nei Mongol and of the Russian Tuva and Buryatia Republics have been compared with the Mongolian fish fauna, where relevant, in an attempt to make the nomenclatures used in the three countries compatible and in agreement with the International Code of Zoological Nomenclature. Some of the systematic findings and nomenclatural changes are summarized in the section containing species lists.

This exercise has revealed a large number of nomenclatural inconsistencies across boundaries, and many species in Mongolia, China, and Russia which are not yet properly named. There are indications (and in many cases, firm evidence) that a number of widely distributed "species" in fact are artificial assemblages of species restricted to a small geographic area. This has immediate implications for resource management and conservation because species endemic to a small area, or to a single lake or stream, have greater biodiversity value and thus require closer attention. Also, the transplantation across drainage boundaries of fish stocks believed to be different populations of a single species may actually be the introduction of a species into the range of another species, carrying all the risks associated with introductions, including the risk of replacement of the original species with a hybrid complex.

Introduction

This publication results from work conducted in 2005 as part of a consultancy funded by the World Bank's Netherlands-Mongolia Trust Fund for Environmental Reform (NEMO). This particular project concerned freshwater fish biodiversity in the context of establishing reliable lists of Mongolian animals, in order to prepare reliable lists of threatened species for which conservation action is necessary.

This work is based on a review of the existing literature, interviews with local and international experts, examination of material preserved in natural history museums and research institutes in Beijing, Wuhan, St. Petersburg, and Berlin (plus others that I had examined before this project in Stockholm and Paris), and a limited amount of field work (one weekend in central Mongolia).

Although there is a general assumption that the diversity of the Mongolian fish fauna is well known and there is not much interest in investing time, money, and effort in further taxonomic work, my observations show that much remains to be done. I found that a number of the Mongolian fish species are still unnamed, many are misidentified, and that several earlier taxonomic works present problems. Besides, there are a vast number of nomenclatural problems, most of which cannot be solved without additional extensive data on the fauna of adjacent areas in Russia, Kazakhstan, China, and Korea.

The problems largely result from different conceptual approaches to taxonomy, the lack of communication (an obvious result of international politics and linguistic problems, from which I also suffered), and in part an ignorance or non-respect of international practices or of the International Code of Zoological Nomenclature.

As an example of the serious limitation of our knowledge of the Mongolian fish fauna and of the extremely serious need for careful attention, I will cite my limited experience in the field. My schedule and terms of reference during the first research visit to Mongolia did not allow for actual field work, but I did manage to spend a weekend in the field. Of course, this could not be far from Ulaanbaatar. One of the two places I visited was Terelj Nature Reserve, close to the bridge on Tuul River, an area which had probably been visited by all ichthyologists who have been in Mongolia in the last 50 years.

Field work was not planned when I left for Mongolia and I was therefore totally unequipped for efficient sampling. Erdenebat M. and I had to resort to primitive tools almost constructed on the spot. Nevertheless, we collected six species, of which there were identification problems for four. One is locally identified under the name of a European species (*Phoxinus phoxinus*), but is clearly a distinct species; one is identified

as a very variable species (*Barbatula toni*) with a strong suspicion that several species are confused under that name; two are species new to science (*Barbatula* sp. Tuul, *Triplophysa* sp. Tuul), of which the last one is the first record of the genus in the Selenge (and Yenisei) drainage. The last two also belong to species reported to be very variable (*Rhynchocypris czekanowskii*, *Cobitis melanoleuca*), which still deserve study throughout their ranges (all of northern Asia and parts of Europe and northern China).

The purpose of the present check-list is to present an overview of our present knowledge of the diversity, systematics, and nomenclature of the fishes of Mongolia. It also includes a selected bibliography of the publications of greatest immediate concern when working on this fauna.

Although two books have already been published on the fishes of Mongolia (Sokolov, 1983; Baasanjav & Tsendayush, 2001) they are outdated and somewhat misleading. The first task is to ensure that the nomenclature used in Mongolia, China, Russia, Korea, and in the rest of the world are compatible and conforms to the International Code of Zoological Nomenclature [*Code* hereafter] (International Commission on Zoological Nomenclature, 1999).

Decisions of a strictly scientific nature can be influenced by non-scientific considerations, and this negatively impacts the efficiency of field work and research. It also interferes with scientific exchanges. Exchange of material, data and knowledge is necessary for good management of natural resources, and is beneficial for the country in the long run; if one is able to benefit from the results of research conducted abroad, there is no need to replicate it and this saves time, effort and money. The present work had to be done with access to only a limited number of samples and this obviously has limited the conclusions. In many instances, very little additional work is needed to solve complex problems, but this last step has not been possible. This is indicated in the text (e.g., under *Barbatula compressirostris*, *Cottus dzungaricus*).

The list in this report includes all the fishes which have been recorded in the scientific literature or observed by myself in Mongolia. Species recorded from within a few kilometres upstream or downstream of the Mongolian border in China and Russia but not yet known from Mongolia are not included in the Mongolian fauna, but their distribution and taxonomy is discussed. Records based on the literature are included but only if they seem reasonably reliable; that is, either there are ways to confirm the identification from the document itself or from voucher specimens, or the author(s) is (are) known to be well experienced. Fisheries records have not been taken into consideration since they tend to be unreliable and/or too superficial for serious biodiversity work. Introduced species are discussed only if they have established self-sustaining (breeding) populations or are regularly observed.

A very small area of westernmost Mongolia drains to the Irtysh River. There is almost no data on the fishes of that area. Data on the fishes of adjacent areas in China can be found in Anonym (1979).

Methods

The species concept used herein is the evolutionary species concept (see Mayden & Wood, 1995; Kottelat, 1997). The formal synonymies include only references to original descriptions of nominal species and only those based on material from Asia and usually ignore those nominal species whose type locality is in Europe or North America. I did not include information on type material as this does not seem relevant for the level of the present discussion, except in a few exceptional cases. The spellings of scientific names in the synonymies follow exactly those in the cited publications; this explains the apparent inconsistencies. The nomenclatural authors (the authors who first established a name) are not used in the text because they do not add to the discussion; to the contrary, they make the reading more difficult and often create confusion for the readers not familiar with nomenclatural rules. Anyway, their citation is only an optional tool for retrieval of bibliography and—contrary to a frequent misperception—their mention is not compulsory. For those who absolutely wish to know them, they are given in Table 1 and can also be retrieved from the formal synonymies. Nomenclaturally relevant information for species cited in the text but not part of the Mongolian fauna are listed in Appendix 1. Place names in the formal synonymies are as they appear in the original publication, including the then-administrative or political units. In several of these historical accounts, "Mongolia" includes present Mongolia, as well as Inner Mongolia, Liaoning, Xinjiang, Tibet, and adjacent areas.

There are inconsistencies in the spelling or transcription of the names of rivers, lakes, and localities used in this report. My efforts to find maps showing all names in a consistent system failed, as well as to find a reviewer. I could have tried to adjust them, but these could result in introducing errors and confusion and I prefer to stick to names as they appear in the literature or in the various maps accessible to me. Toponymy for China follows whenever feasible Zhonghua Renmin Gongheguo Fen Sheng Dituji (Hanyu Pinyinban), Beijing, 1977.

The "Great Lakes Valley", or "Lakes Valley" of Russian authors is called Great Lakes Basin, and the "Gobi Valley" is called Gobi Lakes Valley. This follows WWF ecoregion terminology (ecoregions PA1316 and PA1315, respectively; http://worldwildlife.org/science/ecoregions/palearctic.cfm).

I have not attempted to list all citations of a given name as this would have been much too time-consuming and detrimental to more important issues within the limited time available.

The discussions on the status of Chinese species of the family Cyprinidae is based to some extent on Chen (1998) and Yue (2000). In many cases, I have followed these conclusions, but I have to indicate some


RUSSIAN FEDERATION
KAZAKHSTAN
CHINA
CHINA
CHINA
Lake Baikal
Yenissei
Angara
Irtysh
Er Tix
Lakes of Darkhad depression
Lake Khuvsgul
Lake Uvs
Lake Uvsiin
Ulaangom
Lake Achit
Olgii
Khovd
Tes
Lake Khyargas
Lake Airag
Lake Khar
Lake Khar Us
Lake Dörööö
Bulgan
Uliastai
Tsagaan-Olom
Altai
Hatgal
Mörön
Sühbaatar
Erdenet
Darkhan
Selenge
Orkhon
Tuul
Zavkhan
Tsetserleg
Bayankhongor
Arvaiheer
Dundgov'
Sainshand
Dalandzadgad
Lake Böön Tsagaan
Lake Orog
Ereentsav
Bayan Uul
Choibalsan
Lake Hulun
Lake Buir
Khalkhyn
Kherlen
Ondörhaan
Zuunmod
Tamsagbulag
Baruun-Urt
Hongor
UVS
KHUVSGUL
BAYAN-ÖLGII
ZAVKHAN
KHOVD
ARKHANGAI
BULGAN
SELENGE
ULAANBAATAR
TÖV
KHENTII
DORNOD
SÜKBAATAR
GOVI-ALTAI
ÖVÖRKHANGAI
DUNDGOV'
DORNOGOV'
BAYANKHONGOR
ÖMNÖGOV'
MAIN RIVERS AND LAKES
AS USED IN "FISHES OF MONGOLIA"
AMUR WATERSHED
GREAT LAKES WATERSHED
OB WATERSHED
YENISSEI WATERSHED
SELECTED CITIES AND TOWNS
PROVINCE (AIMAG) CAPITALS
NATIONAL CAPITAL
RIVERS
PROVINCE (AIMAG) BOUNDARIES
INTERNATIONAL BOUNDARIES
0 100 200 300 Kilometers
0 50 100 150 200 Miles
MONGOLIA
SEPTEMBER 2006
IBRD 35040

reservations because I have a strong feeling that the species diversity is severely underestimated for many groups.

Bibliography and references: years in **bold** font indicate sources that I have not been able to examine personally; the data quoted from these sources are those repeated in the literature.

For a few species that present identification problems, the abbreviation "cf." added between the genus and the species names indicates a species that looks similar to a named species but possibly represents a distinct, unnamed species. For example *Brachymystax* cf. *tumensis* indicates that the species is similar to *B. tumensis* but until a revision (a comparison of all species of the genus) can be done, one cannot be absolutely sure.

Best Guesses

As will be obvious from many of the comments below, the status of many species/populations/names is still far from clear and cannot be elucidated without actual baseline studies, especially not without a sampling program to obtain the material suitable for a professional taxonomic analysis. Decisions might be needed in relation with conservation issues and it is likely that many decisions cannot be delayed until the taxonomy can be elucidated. As this report is written within a conservation background and aim, it seems important that users may make decisions even in the absence of complete data or final taxonomic conclusion. This might be important, for example, when precautionary decisions have to be made, or research targets have to be defined. For these reasons, a number of species accounts include my "best guess" or "educated guess" of what is likely to appear once the discussed problems can be clarified.

Clearly, these best guesses are not at all scientific results but can be considered as scientific hypotheses. They are based on a blend of knowledge of the fauna, of the topography, of the mechanisms underlying areas of endemism, experience with the literature, with the way of working of earlier (and recent) scientists and, the most important tool in the field, instinct.

An educated guess often is the only efficient tool (and the only available) in the absence of reliable data, in the field or for triage, whatever academics and theoreticians may say.

Species Lists

The check-list below summarizes nomenclaturally valid names of Mongolian fish species, with taxonomic authority. The apparent inconsistency with the use of parentheses in fact is precisely dictated by the International Code of Zoological Nomenclature. The presence of parentheses indicates that the species was placed in a different genus by its original author. For example, *Brachymystax lenok* (Pallas, 1773) was first described by Pallas in 1773 as a species of the genus *Salmo*, therefore the parentheses, and *B. tumensis* Mori, 1930 was originally described by Mori in 1930 as a species of the genus *Brachymystax*, therefore no parentheses.

Native

Petromyzontidae
- *Lethenteron reissneri* (Dybowski, 1869)

Acipenseridae
- *Acipenser baerii* Brandt, 1869
- *Acipenser schrenckii* Brandt, 1869

Salmonidae
- *Hucho taimen* (Pallas, 1773)
- *Brachymystax lenok* (Pallas, 1773)
- *Brachymystax* cf. *tumensis* Mori, 1930

Coregonidae
- *Coregonus chadary* Dybowski, 1869
- *Coregonus migratorius* (Georgi, 1775)
- *Coregonus pidschian* (Gmelin, 1789)

Thymallidae
- *Thymallus arcticus* (Pallas, 1776)
- *Thymallus baicalensis* Dybowski, 1874
- *Thymallus brevirostris* Kessler, 1879
- *Thymallus grubii* Dybowski, 1869
- *Thymallus nigrescens* Dorogostaisky, 1923
- *Thymallus* sp. 1

Esocidae
- *Esox lucius* Linnaeus, 1758
- *Esox reichertii* Dybowski, 1869

Cyprinidae
- *Acheilognathus asmussii* (Dybowski, 1872)

Carassius carassius (Linnaeus, 1758)
Carassius gibelio (Bloch, 1782)
Chanodichthys erythropterus (Basilewsky, 1855)
Chanodichthys mongolicus (Basilewsky, 1855)
Culter alburnus Basilewsky, 1855
Cyprinus rubrofuscus La Cepède, 1803
Eupallasella percnurus (Pallas, 1814)
Gnathopogon strigatus (Regan, 1908)
Gobio acutipinnatus Menshikov, 1939
Gobio cynocephalus Dybowski, 1869
Gobio sibiricus Nikolski, 1936
Gobio soldatovi Berg, 1914
Gobio tenuicorpus Mori, 1934
Gobio sp. Onon
Hemibarbus labeo (Pallas, 1776)
Hemibarbus maculatus Bleeker, 1871
Hemiculter leucisculus (Basilewsky, 1855)
Hemiculter varpachovskii Nikolski, 1904
Ladislavia taczanowskii Dybowski, 1869
Leuciscus baicalensis (Dybowski, 1874)
Leuciscus dzungaricus Koch & Paepke, 1998
Leuciscus idus (Linnaeus, 1758)
Leuciscus waleckii (Dybowski, 1869)
Microphysogobio anudarini Holcík & Pivnicka, 1969
Oreoleuciscus angusticephalus Bogutskaya, 2001
Oreoleuciscus dsapchynensis Warpachowski, 1899
Oreoleuciscus humilis Warpachowski, 1889
Oreoleuciscus potanini (Kessler, 1879)
Phoxinus cf. *phoxinus* (Linnaeus, 1758)
Phoxinus ujmonensis Kashchenko, 1899
Pseudaspius leptocephalus (Pallas, 1776)
Pseudorasbora parva (Temminck & Schlegel, 1846)
Rhodeus sericeus (Pallas, 1776)
Rhynchocypris czekanowskii (Dybowski, 1869)
Rhynchocypris lagowskii (Dybowski, 1869)
Rutilus rutilus (Linnaeus, 1758)
Sarcocheilichthys soldatovi (Berg, 1914)
Saurogobio dabryi Bleeker, 1871
Squalidus chankaensis (Dybowski, 1872)
Tinca tinca (Linnaeus, 1758)

Nemacheilidae

Barbatula compressirostris (Warpachowski, 1897)
Barbatula dgebuadzei (Prokofiev, 2003)
Barbatula toni (Dybowski, 1869)
Barbatula sp. Tuul
Barbatula sp. Egiin
Lefua costata Kessler, 1876

Triplophysa gundriseri Prokofiev, 2002
Triplophysa sp. Tuul

Cobitidae
Cobitis melanoleuca Nichols, 1925
Iksookimia lebedevi (Vasil'eva & Vasil'ev, 1984)
Misgurnus mohoity (Dybowski, 1869)

Siluridae
Silurus asotus Linnaeus, 1758

Lotidae
Lota lota (Linnaeus, 1758)

Percidae
Perca fluviatilis Linnaeus, 1758

Cottidae
Cottus szanaga Dybowski, 1869
Mesocottus haitej (Dybowski, 1869)
Leocottus kesslerii (Dybowski, 1874)

Odontobutidae
Perccottus glenii Dybowski, 1877

Introduced

a) Species that established self-sustaining populations

Coregonidae
Coregonus peled (Gmelin, 1789)
Cyprinus carpio Linnaeus, 1758

b) Species usually reported to be present in Mongolia but apparently result from occasional capture of stocked or aquaculture individuals, or introduced species that did not establish

Coregonidae
Coregonus sardinella Valenciennes, 1848

Cyprinidae
Ctenopharyngodon idella (Valenciennes, 1844)
Hypophthalmichthys molitrix (Valenciennes, 1844)

Siluridae
Silurus soldatovi Nikolski & Soin, 1948

The list below contains the invalid names, synonyms, misidentifications, main misspellings, and erroneous records appearing in recent Mongolian literature and Russian and Chinese literature for adjacent areas and their valid equivalents.

INVALID NAMES	VALID NAME
Acanthorhodeus asmussi	*Acheilognathus asmussii*
Acipenser baeri baicalensis	*Acipenser baerii*
Barbatula barbatula toni	*Barbatula toni*
Barbatula nuda	misidentified *Barbatula toni*
Carassius auratus gibelio	*Carassius gibelio*
Chilogobio czerskii	misidentified *Sarcocheilichthys soldatovi*
Chilogobio soldatovi	*Sarcocheilichthys soldatovi*
Cobitis granoei olivai	misidentified, *C. melanoleuca*
Cobitis granoei	misidentified, *C. melanoleuca*
Cobitis lebedevi	*Iksookimia lebedevi*
Cobitis taenia granoei	misidentified, *C. melanoleuca*
Cobitis taenia sibirica	misidentified, *C. melanoleuca*
Cobitis taenia	misidentified, *C. melanoleuca*
Coregonus autumnalis migratorius	*Coregonus migratorius*
Coregonus cylindraceus	*Prosopium cylindraceum*; no actual record from Mongolia
Coregonus mongolicus	*Prosopium cylindraceum*; no actual record from Mongolia
Coregonus lavaretus pidschian	*Coregonus pidschian*
Cottus kesslerii	*Leocottus kesslerii*
Cottus poecilopus	misidentified *Cottus szanaga*
Cottus sibiricus	no actual record from Mongolia
Culter brevicauda	*Culter alburnus*
Culter erythropterus	applied to both *Chanodichthys erythropterus* and *Culter alburnus*
Culter mongolicus	*Chanodichthys mongolicus*
Cultrichthys erythropterus	applied to both *Chanodichthys erythropterus* and *Culter alburnus*
Cyprinus carpio haematopterus	*Cyprinus rubrofuscus*
Cyprinus carpio	applied to both *Cyprinus carpio* (introduced) and *C. rubrofuscus* (native)
Eleotris glehni	*Perccottus glenii*
Erythroculter erythropterus	applied to both *Chanodichthys erythropterus* and *Culter alburnus*
Erythroculter mongolicus	*Chanodichthys mongolicus*
Gnathopogon chankaensis	*Squalidus chankaensis*
Gobio albipinnatus tenuicorpus	*Gobio tenuicorpus*
Gobio albipinnatus	*Gobio tenuicorpus*
Gobio gobio cynocephalus	applied to both *Gobio cynocephalus* and *G. sibiricus*
Gobio gobio sibiricus	*Gobio sibiricus*

Gobio gobio	misidentified *Gobio acutipinnatus*, *G. cynocephalus*, *G. sibiricus*
Gobio soldatovi tungussicus	misidentified *Gobio* sp. Onon
Hemiculter bleekeri varpachovskii	*Hemiculter varpachovskii*
Hemiculter lucidus	*Hemiculter varpachovskii*
Hemiculter lucidus varpachovskii	*Hemiculter varpachovskii*
Huso dauricus	no actual record from Mongolia
Iksookimia choii	misidentified *Iksookimia lebedevi*
Lagowskiella czekanowskii	*Rhynchocypris czekanowskii*
Lagowskiella lagowskii	*Rhynchocypris lagowskii*
Lampetra japonica	*Lethenteron camtschaticum*; no actual record from Mongolia
Lampetra reissneri	*Lethenteron reissneri*
Lethenteron japonicum	*Lethenteron camtschaticum*; no actual record from Mongolia
Leuciscus leuciscus baicalensis	*Leuciscus baicalensis*
Microphysogobio amurensis	misidentified, *Microphysogobio anudarini*
Microphysogobio tungting	misidentified, *Microphysogobio anudarini*
Misgurnus anguillicaudatus	misidentified *Misgurnus mohoity*
Nemacheilus barbatula toni	*Barbatula toni*
Nemacheilus dorsalis humilis	invalid name replaced by *Triplophysa gundriseri*
Nemacheilus nudus	misidentified *Barbatula toni*
Nemacheilus toni	*Barbatula toni*
Nemachilus cobdonensis	see under *Barbatula compressirostris*
Nemachilus compressirostris	*Barbatula compressirostris*
Noemacheilus stoliczkai	no actual record from Mongolia
Noemacheilus strauchi	misidentified *Triplophysa gundriseri*
Oreoleuciscus pewzowi	misidentified *Oreoleuciscus angusticephalus*
Orthrias dgebuadzei	*Barbatula dgebuadzei*
Orthrias golubtsovi	see under *Barbatula compressirostris*
Orthrias toni	*Barbatula toni*
Paracottus kessleri	*Leocottus kesslerii*
Paraleucogobio strigatus	*Gnathopogon strigatus*
Parasilurus asotus	*Silurus asotus*
Phoxinus czekanowskii	*Rhynchocypris czekanowskii*
Phoxinus lagowskii	*Rhynchocypris lagowskii*
Phoxinus oxycephalus	misidentified *Rhynchocypris lagowskii*
Phoxinus percnurus	*Eupallasella percnurus*
Phoxinus perenurus	*Eupallasella percnurus*
Prosopium cylindraceum	*Prosopium cylindraceum*; no actual record from Mongolia
Rhinchocypris	*Rhynchocypris*
Rhynchocypris costata	misidentified *Rhynchocypris lagowskii*
Rhynchoypris oxycephalus	misidentified *Rhynchocypris lagowskii*
Romanogobio tenuicorpus	*Gobio tenuicorpus*

Rostrogobio amurensis	misidentified *Microphysogobio anudarini*
Rutilus rutilus lacustris	*Rutilus rutilus*
Sarcocheilichthys czerskii	misidentified *Sarcocheilichthys soldatovi*
Sarcocheilichthys nigripinnus czerckii	misidentified *Sarcocheilichthys soldatovi*
Saurogobio amurensis	misidentified *Microphysogobio anudarini*
Silurus soldatovi	misidentified *Silurus asotus*

Accounts of Species Recorded from Mongolia

Family Petromyzontidae
(lampreys)

Lampreys are eel-like fishes. The adults are immediately recognized by their disc-shaped mouth without jaws (that is, which cannot be closed) and 7 round branchial openings on each side of the head. The species are mainly distinguished by the kind, number and disposition of teeth. The larvae (called ammocoetes) spend several years hidden in muddy to sandy bottom. The large species live several years, may migrate to the sea, are predatory and feed on fish to which they attach with their mouth. The small species are non-predatory and non migratory; after their larval stage, they metamorphose and reproduce within a few weeks or months. The adults do not eat and they die shortly after spawning. Their dentition is relatively undeveloped and it is often difficult to identify them.

Two species have been reported from Mongolia, *Lampetra japonica* and *Lampetra reissneri*. Both are now placed in the genus *Lethenteron*; the species name *Lampetra japonica* in fact is invalid and the correct name is *Lethenteron camtschaticum* (see Kottelat, 1997). At present, there is no evidence of the presence of *Lethenteron camtschaticum* in Mongolia. The species is known from the lower reaches of rivers or lowlands, coastal and estuarine habitats. It is not known from the Yenisei drainage (Berg, 1948: 38; Reshetnikov, 2002: 28) and in the Amur it is recorded only downriver of Khabarovsk. All records of lampreys in Mongolia are from the Onon drainage and apparently refer to *L. reissneri*.

Lethenteron camtschaticum is included in the Mongolian fauna by Baasanjav & Tsendayush (2001: 13) because of the presence of a specimen from River Gorlog (Mongolian name of upper part of Yenisei) at Kargina (53.75°N 110.17°E) in the Zoological Institute of St. Petersburg (ZISP 28338). This leads them to speculate on the presence of the species in the Selenge and in Mongolia. *Lethenteron reissneri* is the only lamprey definitively recorded from the Yenisei (but only downriver of Lake Baikal).

Lethenteron reissneri

Petromyzon Reissneri Dybowski, 1869: 958 (type locality: Russia: Amur basin: Onon and Ingoda rivers)

Lampetra mitsukurii Hatta, **1901: 24** (type locality: Japan: Hondo, Hokkaido)

Petromyzon kessleri Anikin, 1905: 10 (type locality: Russia: Tom River and mouth of Kirgizka River near Tomsk, Ob drainage)

Lampetra mitsukurii minor Hatta, 1911: 268, pl. 8 figs. 3–4 (type locality: Japan: Gifu, Sapporo, and numerous localities listed p. 264)

Remarks on systematics. *Lethenteron reissneri* is reported from Mongolia as *Lampetra reissneri* by Holcik & Pivnicka (1969), Dashdorj & Demin (1977: 142). Sokolov (1983: 104) considered these records to be misidentified *Lampetra japonica*. Baasanjav & Tsendayush (2001: 13) considered that *L. reissneri* indeed occurs in Mongolia, in Onon-Khurkh drainage. They also considered that the records of *Lampetra japonica* by Dulmaa (1999: 194) and Bogayevski (1949; Khod, Promysel, Amur drainage) refer to this species [they do not give the bibliographic reference to Bogayevski's paper].

The description in Sokolov (1983: 104) is from Nikolski (1956) and is based on specimens in the Zoological Institute of St Petersburg (ZISP 25351) collected in the stream Naleo which flows into the liman of Amur River (liman is a Russian terminology designating a lagoon at the estuary of a river created by a littoral bar blocking the access to the sea).

The record by Holcik & Pivnicka (1969: 3) from the Onon is based on a single larva (ammocoete) 147 mm long. They do not indicate which diagnostic characters they used for its identification.

In her account of "*L. japonica*", Dulmaa (1999) does not mention predatory (parasitic) feeding, but mentions a small adult size (200 mm), explicitly states that it does not migrate far, and that it has a mean number of 9,000 oocytes. This is a misidentification as *L. camtschaticum* reaches 625 mm, has over 50,000 oocytes, migrates to the sea where it spends 1–3 years, and is predatory.

The taxonomy of the various populations usually referred to as *L. reissneri* is not yet settled. *Lethenteron reissneri* is usually recorded to occur in all the rivers draining to the Pacific Ocean, from Kamtschatka to Korea, and Japan. Molecular studies of a number of populations in Japan have shown that the *L. reissneri* of Japanese authors in fact represents two species, which even occur in sympatry at some localities (Yamazaki et al., 2003). Yamazaki et al. (2006) show that the *L. reissneri* from the Onon in fact is the same species as some of the *L. kessleri* from northern Japan and Far Eastern Russia, and not conspecific with the two Japanese *L.* cf. *reissneri* species.

Anyway, as the type locality of *L. reissneri* is the Onon and Ingoda rivers, at least we know that the name of the Mongolian populations will not be affected by the final identity of the Japanese species. In any case, the name *L. reissneri* (established by Dybowski, 1869) will remain as it is older than *L. kessleri* (established by Anikin, 1905).

Distribution. In Mongolia: only recorded in Onon drainage. Distribution outside Mongolia: Eurasia, in Arctic Oceans basin, from Kola Peninsula to Anadyr drainage; Amur drainage; Sakhalin Island; Hokkaido (Japan).

Family Acipenseridae
(sturgeons)

Three species of sturgeons are listed in the recent literature as occurring in Mongolia, but one (*Huso dauricus*) is only an assumption.

Huso dauricus is listed by Baasanjav & Tsendayush (2001: 15) on the basis of information by people in the area of Bindir (on Onon River, Amur drainage) of a specimen "as long as the platform of a ГА3-51" [GA3-51; a model of Russian truck; the platform is about 2 m long] caught in the 1950s. No other information is available to identify the species, except for the size and the drainage. Two species of sturgeons are known from the Amur drainage, *Huso dauricus* and *Acipenser schrenckii*. The distribution of both is mapped by Reshetnikov (2002: 49, 54) and is recorded to reach only to the confluence of the Onon and Indoga, about 400 river-km downstream of the Mongolian border. *Huso dauricus* is recorded to reach a maximum size of 5 m (Reshetnikov, 2002: 54) and *A. schrenckii* up to 2.9 m and therefore there is no way to objectively identify this individual. The largest individual *A. schrenckii* known from the Amur drainage was 204 cm long (Dulmaa, 1999: 194) and the Bindir specimen may be either one of the Amur species *A. schrenckii* or *H. dauricus*.

Acipenser baerii

Acipenser Baerii Brandt, 1869a: 175 (type locality: Russia: Siberia: Ob and Lena rivers and their main tributaries; also in Brandt, **1869b: 115**)
Acipenser stenorrhynchus Nikolski, 1896: 400 (type locality: Russia: "large rivers of Siberia flowing to Arctic Ocean, but not in Lake Baikal")
Acipenser stenorrhynchus var. *baicalensis Nikolski*, 1896: 401 (type locality: Russia: Siberia: Lake Baikal)
Acipenser baeri chatys Drjagin, **1948: 532** (type locality: Russia: Sakha [Yakutia]: from Lena to Kolyma rivers)

Remarks on systematics. *Acipenser baerii* is definitively recorded in Mongolia, by Sokolov (1983: 108), Baasanjav & Tsendayush (2001: 17), Dulmaa (1999: 194) and others.

Some authors have recognized up to 4 subspecies of *A. baerii*, *A. b. baerii* (from Ob and Irtysh drainages), *A. b. stenorrhynchus* (from Yenisei to Anabar drainages), *A. b. baicalensis* (from Baikal basin [in Yenisei drainage]), and *A. b. chatys* (from Lena to Kolyma drainages) (Reshetnikov et al., 1997: 689; Sokolov, in Reshetnikov, 1998: 19). However, from the original descriptions and the scant data in Berg (1948: 88–89) and Sokolov & Vasil'ev (in Holcik, 1989: 268) their taxonomic status cannot be decided. In the absence of diagnostic information, I do not see reason to distinguish these populations by formal names.

Distribution. In Mongolia: Selenge drainage. Outside Mongolia: drainages of all large rivers flowing to the Arctic Ocean, from Ob in the west to Kolyma in the east.

Acipenser schrenckii

Acipenser Schrenckii Brandt, 1869a: 175 (type locality: Russia: Amur River and its main tributaries; also in Brandt, **1869b: 115**)

Remarks on systematics. *Acipenser schrenckii* is listed by Sokolov (1983: 107) and Baasanjav & Tsendayush (2001: 18). This is based on Dashdorj (1977:143) who guessed its presence in the Onon in Mongolia and that it should be expected also in its largest tributaries like the Balj and Khurkh. Dulmaa (1999:194) report it as inhabiting "some sections of the River Onon, adjacent to Russia", but without indicating the source of this information. Its presence in Mongolia is based on the specimen from Bindir identified as *Huso dauricus* by Baasanjav & Tsendayush (2001: 15); see family introduction for discussion.

The morphological data in Sokolov (1983: 107) are from Nikolski (1956) and not based on Mongolian specimens.

Distribution. In Mongolia: Onon drainage. Outside Mongolia: Amur drainage. Also in Yalu River in Jilin Province of China, and North Korea according to map in Reshetnikov (2002: 49), but is not listed from Korea by Kim (1997) or from Tumen drainage by Zheng et al. (1980).

Family Salmonidae
(salmons and trouts)

Brachymystax lenok

Salmo lenok Pallas, 1773: 716 (type locality: Russia: Yenisei River/streams on hills of eastern Siberia)
Salmo coregonoides Pallas, 1814: 362 (type locality: Russia: streams of the Altai range draining to the Ob and Irtin [Irtysh]/Yenisei and its tributaries /Lake Baikal and Rivers Angara and Selenge/ Rivers Lena, Witim and Kovyma [Kolyma])
? *Brachymystax lenok savinovi* Mitrofanov, **1959: 275** (type locality: Kazakhstan: Altai: Lake Marka-Kul)
Brachymystax lenok swetowidowi Kirillov, 1962: 12 (type locality: Russia: Yakutia: Vilyui River)

Remarks on systematics. Two 'forms' of lenok are recognized in Mongolia: 1) A 'common' "form", with pointed snout and large rounded reddish spots, present in the whole country; hereunder 'pointed-snout lenok'; 2) a 'form' with similar body shape, but with blunt snout, and a colour pattern consisting in small black round spots on the sides, found only

in Kherlen River (together with the pointed-snout lenok); hereunder 'blunt-snout lenok'.

Their taxonomic identity is not clear and they have been at some time treated as different species or subspecies (e.g., Kifa, 1976; Bogutskaya & Naseka, 2004: 150). Others treat them as a single species, though acknowledging the need for further study (e.g., Reshetnikov et al., 1997: 692).

Alekseev et al. (2003) studied *Brachymystax* in East Siberia, from the Olenek to the Kolyma drainages. The pointed-snout lenok was observed in all drainages, while they collected the blunt-snout lenok only in some upper tributaries of the Lena (Vitim and Olekma) and along the northern stretch of the Lena itself. The two 'forms' are found in the upper tributaries. Alekseev et al. note that the blunt-snout lenok is more restricted to mountain tributaries and upstream lakes, and in some lakes only this 'form' was found. Where they occur together, individual hybrids are found, but they do not form "hybrid swamps". They do not report blunt-snout lenok in the Yenisei or in the Selenge drainages.

The two 'forms' of lenok are morphologically distinct, they live in sympatry and only occasionally hybridize and this suggests they are distinct species. Molecular data in Froufe et al. (2003) shows that the same pattern is observed in the Lena and Amur drainages. They also show that the two 'forms' each have unique haplotypes and that identical 'forms' in different drainages share the same haplotypes. They too do not report blunt-snout lenok in the Yenisei or in the Selenge drainages.

Alekseev et al. (2003) comment that in East Siberia (from Lena to Kolyma drainages), individuals of the two forms differ from individuals of their respective forms from the basins of the Ob, Selenge, Amur and Uda rivers and from the rivers of Primorye. They give some of the differences between the East Siberian 'forms' and the Amur 'forms', but in a way not allowing an explicit comparison, so that the significance of the differences cannot be evaluated. The differences seem slight and, combined with the genetic data in Froufe et al. (2003), seem to support the conspecificity of the East Siberian and Amur pointed-snout lenok and the conspecificity of the East Siberian and Amur blunt-snout lenok. With two species of lenok in Siberia and Mongolia, it remains to establish which one is the 'real' *B. lenok* and what the name is of the other. The type locality of *B. lenok* being the Yenisei, and as only the pointed-snout species is known from the Yenisei, thus on the basis of available information the pointed-snout lenok retains the name *B. lenok*.

Kifa (1976) recognized the existence of two species of lenok in the Amur drainage and used the names *B. lenok* for the pointed-snout lenok and *B. savinovi* for the blunt-snout lenok. The type locality of *B. savinovi* is Lake Marka-Kul (in the upper Irtysh drainage in Kazakhstan). I could not access the original description of *B. l. savinovi* by Mitrofanov (**1959**) but the description in Mitrofanov (1986) shows a fish with a blunt snout and low gill-raker count (17–24, usually 20–21) as observed in the East Siberian and Amur blunt-snout lenok. Noteworthy is also that *B. savinovi* is described from an altitude lake, which is also the frequent habitat of the Lena blunt-snout lenok. *Brachymystax lenok savinovi* is considered a synonym of *B. lenok* by, e.g., Shedko (2001) and Bogutskaya & Naseka (2004) who use the name *B. tumensis* for the blunt-snout lenok of the Amur drainage (see comments below).

The synonymy of *B. lenok* and *B. savinovi* might be premature. Alekseev & Osinov (2006) studied the blunt-snout lenoks of the Ob-Irtysh drainage. They conclude that they "diverge substantially morphologically and, especially, genetically from populations of the blunt-snout[…] lenok from other river basins of Siberia and the Far East of Russia. In the Ob'-Irtysh basin populations of the blunt- and [pointed-snout] lenoks are spatially segregated: the former are found in the Ob' River basin proper and the latter, in the Irtysh River basin, the degree of their morphological and genetic […] divergence is high." This suggests that they might be distinct species, and that *B. savinovi* would be the name of the blunt-snout lenok of the Irtysh.

Li et al. (1966: 42) report the presence of *B. lenok* in the Ertix [Irtysh] in China and it can reasonably

be expected in the Bulgan River in Mongolia (an upper tributary of the Ertix). In their book on fishes of Xinjiang, Anonym (1979) recorded *B. lenok* only from the Ertix; they have a figure (fig. 4) showing a fish with a moderately pointed snout labelled *B. lenok*, the text (p. 11) mentions 21–27 gill-rakers, which is congruent with Mitrofanov's *B. lenok* (19–27), and slightly less than the pointed-snout lenok from Lena (22–29; Alekseev et al., 2003) (the blunt-snout lenok of Lena has 18–23). When the presence of *Brachymystax* is confirmed in the Bulgan, their identity deserves investigation as they would probably be *B. savinovi*, adding one more species to the Mongolian fauna.

Remarks on nomenclature. A neotype designation might be necessary to definitively retain *B. lenok* as the name for the pointed-snout lenok.

Distribution. In Mongolia: Selenge, Yenisei and Amur drainages; might be present in Bulgan drainage. Outside Mongolia: rivers draining to Arctic and Pacific Oceans, from Ob to Amur.

Brachymystax cf. *tumensis*

Brachymystax tumensis Mori, 1930: 42, pl. 3 fig. 1 (type locality: Korea: Tumen River, Yen-gan)

Remarks on systematics. *Brachymystax tumensis* was described from Tumen River. It has been considered as a synonym of *B. lenok* but Bogutskaya et al. (2001: 41), Shedko (2001) and Bogutskaya & Naseka (2004: 151) consider it as a valid species and use this name for the blunt-snout lenok. This deserves more investigation. While Shedko recognizes a single species of lenok in Primorye [southeasternmost province of Russia, at the border with China and Korea], Bogutskaya et al. (2001) and Bogutskaya & Naseka (2004) recognize two species, *B. lenok* (pointed-snout lenok) and *B. tumensis* (blunt-snout lenok). Mori's (1930) description and figure of *B. tumensis* show a fish with numerous large spots on whole body, 22 gill-rakers and a quite elongate snout; Mori (p. 42) even comments that the species has a more pointed snout than *B. lenok*.

Tumen River forms the border between North Korea and China. It has yet to be demonstrated that the *Brachymystax* from Amur and Tumen are conspecific. The name *B. tumensis* does not seem to appear in the recent Korean literature. Instead, authors (e.g., Jeon, 1987; Kim, 1997: 356) report *B. l. tsinlingensis* from Korea; their figures show individuals with a blunt snout (obviously juveniles). Kim's (1997) map shows its distribution extending from South Korea to about Sovetskaya Gavan (49.0°N 140.2°E). The source of the information is not clear and I do not know how accurate the map is; it shows the range extending on part of the Ussuri, a tributary of the Amur. It is noteworthy that all the references to *Brachymystax* in Korean and immediately adjacent waters refer only to blunt-snout lenok and that they are in relatively lowlands, while the Lena blunt-snout lenok are found in altitude rivers and lakes. Similarly, the records by Bogutskaya et al. (2001: 41; Lake Khanka) and Shedko (2001; Primorye) are in relatively low areas.

Brachymystax tsinlingensis was originally described from the Qin Ling range in Shaanxi Province of China, which makes the divide between the Huang He (Yellow River) and Chang Jiang (Yangtze) drainages. The figure in the original description (Li, 1966), Chen (1987) and Anonym (1992) show a deep-bodied, blunt-snouted fish. See also Chen (1986) for distribution data.

Very recently, Xia et al. (2006) analysed the phylogeographic structure of *Brachymystax* populations in Chinese waters. The study is restricted to a geographic area marginal to the whole distribution of the genus. Nevertheless, some of their observations are relevant here. They examined specimens from seven populations in the Amur, Tumen, Yalu and Yellow Rivers. Their results show three clearly separate lineages, 1) Amur River, 2) Tumen and Yalu Rivers, and 3) Yellow River. They also discussed the published data on a Korean population from "Hanjiang" [Hangang ?] (Korea), which is placed in the Yellow River clade. Unfortunately, their study does not make any connection with morphological information.

In conclusion, if it can be demonstrated that there is a single species of blunt-snout lenok in the whole Amur drainage and if it can be demonstrated that it

is conspecific with the Tumen lenok, then the name of the blunt-snout lenok present in Mongolia is *B. tumensis*. With our present knowledge, there is no way to confirm this hypothesis. On the contrary, there are indications that future work might show they are distinct species, in which case the name *B. tumensis* would be used for the Tumen and Yalu species, and there would be no name available for the Amur species. Until this is clarified, I retain the name *B.* cf. *tumensis* for all the blunt-snout lenok of Lena, Kolyma, Amur and Tumen. The published data suggest that *B. tsinlingensis* is a valid species, distributed in the the Yellow River drainage (and central Korea).

Distribution. In Mongolia: Onon and Kherlen drainages. Outside Mongolia: Amur, Lena and Kolyma drainages in Russia and china; Tumen drainage in China and Korea.

Hucho taimen

Salmo Taïmen Pallas, 1773: 716 (type locality: Russia: rivers of Siberia flowing to Arctic Ocean; original spelling should be emended into taimen, *Code* art. 32.5.2.1)

Salmo fluviatilis Pallas, 1814: 359, pl. 73 fig. 2 (type locality: Russia: Siberia: tributaries of Rivers Ob, Irtysh, Yenisei, Lena and tributaries, Lakes Baikal, Vitim, Turuchansk, Ljala, Tura, Uba, Tom, Kama and all streams flowing towards "Eastern Ocean" except Kamchatka)

? *Salmo lossos* Günther, 1866: 140 (type locality: Baltic Sea, Rivers Kama, Kolva, Volga, Petschow, Vitchegda, and Muilwa, Caspian Sea)

Remarks on systematics. Despite its wide distribution across all of northern Asia, *H. taimen* does not show genetic differentiation across the Amur, Lena and Yenisei drainages (Froufe et al., 2003). There is no data for the populations of the remaining basins.

Distribution. In Mongolia: Yenisei, Selenge, Onon and Kherlen drainages. Outside Mongolia: rivers draining to the Arctic Ocean from Ob to Yana drainages; Amur and some adjacent drainages; in Europe, some upper tributaries of Pechora, and Kama in Volga drainage.

Family Coregonidae
(whitefishes, ciscos)

The taxonomy of the Eurasian species of the genus *Coregonus* is extremely confused because of a variety of factors. First of all, being pelagic and silvery, coregonids exhibit very few salient characters. This is contrary to the situation with benthic fishes, which usually have a colour pattern or peculiar morphological features (for camouflage and for visual recognition) and our human eyes and brain recognize these characters, thereby helping us to identify the fish. These characters are usually not prominent in pelagic fishes, which use non-visual signals to identify conspecifics.

Second, at superficial examination, most species look similar. This resulted in their identification being based only on a few characters, like number of gill rakers or lateral line scales. To people not used to taxonomic procedures, countable characters appears more 'reliable' than characters which need to be described, like shape of mouth parts etc. This of course is not true, these characters are simply easier to use for untrained workers. But the unfortunate result is that people pay more attention to some sort of 'magic' formulae than to shapes and structures.

Third, the systematics of coregonids has been handled mainly by fishery biologists without training to handle taxonomic problems. In some areas (Russia, eastern Europe), it has been addressed with 'endemic' concepts and a nomenclatural system not entirely compatible with international practices and rules. This system recognizes a number of infrasubspecific categories, not always explicitly defined. Infrasubspecific names are not available for formal nomenclature, but the occasional use of some of them at a species or subspecies 'level' automatically made them available and it is extremely time consuming to check these and conclude (or often guess) their real status. Language issues contribute to make the problems more complex.

Fourth, with the great confusion resulting from the above, a 'concept' evolved that coregonids escape the general rules and that coregonid systematics

has to be different from the systematics of other fishes. Then appeared an esoteric '*Coregonus* species concept', which certainly is not an appropriate and professional approach of taxonomy.

To make the whole pattern even more complex, many species/populations have been transplanted, introduced and/or hybridized, making it sometimes impossible to sort out what the original species were.

Tradition, the (administrative) fear to have to manage and conserve a significantly larger number of species and their economic value are certainly forces driving some scientists and agencies to close their eyes to, or to seek to negate biological reality and the existence of this taxonomic diversity, or to refuse to give it the same value that a similar diversity would receive had the taxa concerned been birds or African cichlids.

Most authors now appear to be content simply to mention this complexity as an excuse for not elaborating further on the topic. This resulted in almost all populations of the family being dumped at various times in a 'mythic' catch-all species named *Coregonus lavaretus*, which was believed to be extremely variable and plastic, able to adapt quickly to new habitats and which axiomatically had evolved into a great number of ecological morphs. Reviews of the diversity of coregonids in several areas is now showing that this is much exaggerated, that morphological and genetic differences exist, that species can be recognized and that the problem can be addressed as can be the taxonomy of any other group of fishes. Simply, the number of the species makes it a cumbersome and boring work.

In several lakes, several populations (up to 11 in Lake Onega, Russia) are morphologically (and genetically, for the few investigated cases) distinct, live in sympatry, and have different habitats, ecology, preferred preys and spawning seasons. These populations fit the definition of species, negating the theory that only a single species is involved. In fact, the problem is not so much to recognize the different species, which occur in sympatry in a given water body, but to find out whether or not species in adjacent water bodies are conspecific.

Coregonus lavaretus is a species endemic to Lake Bourget in France. The "species" (singular) identified as *C. lavaretus* elsewhere (and most especially in the Russian literature) is a collection of maybe up to 50–100 species, each with its own distribution, biology etc. Some are widespread and some are highly endemic to a single or a few lakes; in many lakes several species may be in sympatry (up to 11; in Mongolia there is at least a record of 2 sympatric 'forms' in Darkhad depression) and the conservation status of all should be determined individually. This is further complicated because there have been several attempts to introduce Russian species (see, e.g., Dulmaa, 1979), some of which were successful (in creating self-sustaining populations and maybe in eliminating native ones). Therefore, there is a need to distinguish between the native and the stocked species and populations. The stocked ones, even if acclimatised, should not appear in discussion of biodiversity issues. A difference should also be made between species native at a given locality, and those native to the country but translocated at a given locality.

In the absence of detailed study of the Mongolian coregonids and also because of the messy state of their taxonomy throughout Siberia, it is impossible to reach conclusions as to the status and identity of the Mongolian species and I conservatively adhere to the 'taxonomy' in current local use.

Prosopium cylindraceum is listed in the Mongolian fauna by Baasanjav & Tsendayush (2001: 38). Warpachowski (1901) described *Coregonus mongolicus* which is considered as a synonym of *P. cylindraceum*. The type locality is "lake of northern Mongolia adjacent to sources of Yenissei River". It is not clear whether this locality is within the boundaries of present-day Mongolia. Actually there is no subsequent record of the species in Mongolian waters, and its presence is only guessed because of its known presence in Gorlog River (upper Yenisei) downstream of the Darkhad depression, but in Russia.

Baasanjav & Tsendayush (2001: 31) list *C. sardinella* as introduced in Mongolia in 1982

into Lakes Tolbo and Khongor-Ulen [small lakes in Bayan Ulgii aimag] from the hatchery of Biisk (Altay Province, Russia). Apparently this species did not establish and is not mentioned by Dulmaa (1995; Erdenebat M., pers. comm., February 2006). Therefore it is not included here.

Coregonus chadary

Coregonus chadary Dybowski, 1869: 954, pl. 17 fig. 8 (type locality: Russia: Amur drainage: Onon River; spelled *chavary* p. 954, *chadary* in Table facing p. 958 and on pl. 17; first revised [Dybowski, 1872: 222] retained *C. chadary* as correct original spelling)

Remarks on nomenclature. *Coregonus chadari* is an incorrect spelling.

Distribution. In Mongolia: Onon drainage. Outside Mongolia: Amur drainage.

Coregonus migratorius

Salmo migratorius Georgi, 1775a: 182 (type locality: Russia: Lake Baikal and its tributaries upper Angara, Sosnowka, Tschiwirkui, Kowak, Bargusin and Selenge)

Remarks on systematics. *Coregonus migratorius* is treated as a subspecies of *C. autumnalis* in earlier Russian literature (e.g., Berg, 1948: 342) (but see below comment on nomenclature). Bogutskaya & Naseka (2004: 143) treat them as distinct species. *Coregonus autumnalis* inhabits the lower part of all drainages of Arctic Ocean in Eurasia from Mezen eastward (except Ob and Baikal), and north America from Cape Barrow to Coronation Bay; it migrates from the sea and estuaries to spawn in freshwater, migrating up to 1500 km upstream in the Yenisei (Berg, 1948: 340).

Coregonus migratorius inhabits only Lake Baikal basin and migrates into its tributaries for spawning. It does not seem to have spawning migration into its effluent Lower Angara.

Berg (1948: 366) recognizes three 'races' (including a 'Selenge race') but his data do not suggest that they differ in characters other than growth rate. With the available data, no taxonomic value can be given to these 'races'.

Remarks on nomenclature. This species often appears under the name *C. autumnalis migratorius* (e.g., Dulmaa, 1973; Baasanjav & Tsendayush, 2001: 32). If one were considering that *C. autumnalis* has two subspecies (*migratorius* and *autumnalis*), then their correct names should be *C. migratorius migratorius* (Georgi, 1775a) and *C. m. autumnalis* (Pallas, 1776) because the name *migratorius* is older than *autumnalis*.

The name *C. autumnalis* is now used for the species migratory between the Arctic Ocean and most major rivers draining to it, except the Ob. The name *C. autumnalis* is often seen in European literature for a species from Lough Neagh, Ireland. The correct name of this species is *Coregonus pollan* (see Kottelat, 1997: 121).

Distribution. In Mongolia: native, migratory in Selenge, Delgermurun and Egiin Rivers. Outside Mongolia: Lake Baikal basin. Introduced in 1956–1957 in Lake Khuvsgul (Dulmaa, 1973: 61), where it is now established. The larvae came from the hatchery of Bolsherechinsk, Russia.

Coregonus peled

Salmo Peled Gmelin, 1789: 1379 (based on Lepechin, **1780: 226, pl. 12**; type locality: "Russia boreali" [Northern Russia: Pustozersk on Pechora River; Berg, 1948: 347])

Salmo Peled Walbaum, 1792: 74 (based on Lepechin, **1780: 226, pl. 12**; type locality: "Russia boreali" [Northern Russia: Pustozersk on Pechora River; Berg, 1948: 347]; spelled *pelcol* in text, *peles* in index p. 714, corrected to *peled* in emendanda)

Salmo cyprinoides Pallas, 1814: 412 (type locality: Russia: River Lena at Tungusis; junior homonym of *Salmo cyprinoides* Linnaeus, **1766: 514**)

Salmo Pelet Pallas, 1814: 412 (type locality: Russia: estuary of Yenisei)

Coregonus Syrok Valenciennes, in Cuvier & Valenciennes, 1848: 499 (based on *Salmo wimba* of Pallas, 1814: 409; type locality: Russia: Ob

River and other rivers of eastern Siberia, Pechora and lakes bordering Arctic Ocean, Lake Baikal, Tungusk)

Coregonus Rudolphianus Valenciennes, in Cuvier & Valenciennes, 1848: 531 (based on *Coregonus pelet* of Pallas, 1814: 412; type locality not stated, but Russia: River Yenisei)

Remarks on systematics. Russian authors (e.g., Reshetnikov et al., 1997) recognize 4 'forms', which partly occur in sympatry and which possibly are distinct species: 1) river peled; living in rivers, spawning in rivers, extending from Mezen to Yenisei drainages; 2) lake-river peled; in same drainages but absent from Ob River; 3) large lacustrine peled; spawning in lakes, reaching up to 440 mm SL; 4) dwarf lacustrine peled; living and spawning in lakes, reaching up to 250 mm SL, with a shallower body and several rows of small black spots on body. It is presently not clear, which of them is the 'true' *C. peled*.

Distribution. Not native to Mongolia. Since 1978 introduced from Ulan Ude (Buryatia, Russia) to Lakes Naiman (Uburkhangai aimag), Ulaagchnii Khar (Zavkhan aimag), Khongor-Ulen [a small lake near Bayan Ulgii aimag], and Thagaan (Darkhad depression) (Dulmaa, 1979: 203). Outside Mongolia: Arctic Ocean basin from Kolyma (eastern Siberia) westward to Mezen drainages.

Coregonus pidschian

Salmo Pidschian Gmelin, 1789: 1377 (available by indication to Pallas, 1776b: 705; type locality: not explicitly stated, but Russia: Siberia: River Ob, is implied by statement in the description of *Salmo nasus* in Pallas, 1776b: 705)

Salmo Polcur Pallas, 1814: 400 (type locality: Russia: Siberia: from the Arctic Ocean migrates to the River Ob somewhat above Berezov)

Coregonus sikus Cuvier, 1829: 308 (type locality: rivers of Norway)

Coregonus baicalensis Dybowski, 1874: 389, **pl. 7 figs. 1–3** (type locality: Russia: Lake Baikal)

? *Coregonus smitti* Warpachovski, 1901: 414, pl. 13 fig. 1 (type locality: Russia: Siberia: Lake Teletskoe)

Coregonus fluviatilis Isachenko, **1925: 3** (type locality: Russia: Yenisei drainage, Mana River)

Coregonus fera forma *inarensis* Järvi, 1928: 29, pl. 4 figs. 19–20 (type locality: Finland: Lake Inari at mouth of Rivers Juutuan and Niipi and at Virtaniemi, Lake Muddus)

? *Coregonus lavaretus pidschianoides* Pravdin, **1931: 232** (type locality: Russia: Karelia: Rivers Vyg and Kem) from Berg, 1948: 395

? *Coregonus lavaretus pidschianoides* Pravdin, **1931: 232** (nomen nudum according to Eschmeyer, 1998: 1338; locality: Russia: Vyg and Kem rivers, Karelian coast of the White Sea)

Coregonus lavaretus pidschian natio *bargusini* Krogius, **1933: 85** (infrasubspecific, name not available; locality: Russia: Barguzin River [tributary of Lake Baikal]) not seen, from Berg, 1948: 408

? *Coregonus lavaretus pidschian* natio *bergiellus* Svetovidov, 1934: 344 (infrasubspecific, name not available; locality: Russia: River Kara, Kara Bay)

? *Coregonus lavaretus pidschianoides* Pravdin & Berg, **1948: 13, fig. 12** (type locality: locality: Russia: Vyg and Kem rivers, Karelian coast of the White Sea) adapted from Eschmeyer, 1998: 1338

? *Coregonus lavaretus pidschianoides* natio *soldatovi* Pravdin, in Pravdin & Berg, **1948: 15, fig. 14** (infrasubspecific, name not available; Russia: Lake Kildin, Kola basin) from Berg, 1948: 398

C. lavaretus pidschian natio *delger-muren* Dulmaa, **1970** (infrasubspecific, name not available; locality: Mongolia: upper course of Delgermurun River) from Dulmaa, 1973: 59

Remarks on biology and systematics. *Coregonus pidschian* is usually treated as a subspecies of *C. lavaretus* in Russian literature. It is treated as a valid species here, following Bogutskaya & Naseka (2004: 141) and for reasons discussed in Kottelat (1997: 118). Berg (1948: 394) recognized a large numbers of local forms. They have been treated as synonyms (and anyway some had only invalid names) by most subsequent authors, but Bogutskaya & Naseka (2004) recognize some as specifically distinct.

The 'pidschian' population of the Selenge is not mentioned in the Russian literature I have accessed. Berg (1948) did not record *C. pidschian* from Lake Baikal, except (p. 408) for a 'natio *bargusini*' which ascends the Barguzin River [tributary of Lake Baikal] for spawning.

In his work on the fishes of Transbaikalia, Karasev (1987: 11) records that *C. pidschian* (as *C. lavaretus pidschian*) is present in the Lena drainage but missing in the Baikal basin. He records "*C. l. pidschian* natio *baicalensis*" from the Baikal basin. Berg (1948: 392) treated it as a subspecies of his *C. lavaretus* but records it only from Ol'khon Island and the Maloe More strait north of the island. Bogutskaya & Naseka (2004: 136) treat *C. baicalensis* as a valid species.

It is certainly premature to conclude that the Selenge population of *C. pidschian* is *C. baicalensis*, but this possibility should be investigated. If the above distribution pattern is correct, the Selenge 'pidschian ' is unlikely to be *C. pidschian*.

Berg (1948: 406) recognized a 'natio' *fluviatilis* from the middle and upper Yenisei which is possibly (one of) the species in the Darkhad depression; he did not mention Lake Baikal in its distribution. *Coregonus* '*pidschian*' is native to lakes of the Darkhad depression. *Coregonus peled* and *C. migratorius* were introduced from Ulan Ude in Russia, reportedly in 1985. *Coregonus migratorius* apparently did not establish; the last known observation (three individuals) was in 1997 (information obtained by Erdenebat M.).

Three 'forms' of *C. pidschian* were originally known from Lake Targan. There are a number of reports containing quite contradictory information, and I use here the information in the latest summary I found (Dulmaa, 1999; somewhat differing from the data in her 1973 and 1995 works). 1) The lake 'form', which lives in lakes and spawns in rivers. It starts migrating to Sharga River in mid-August and returns to the lakes in the second half of September. It feeds on bivalves and other benthic organisms. It reaches up to 60 cm long and has a fatty appearance and rounded body; 2) The river-lake 'form', which stays in lakes in spring and summer, enters the Shishkhed River in early October and remains there for some time after spawning and then returns to overwinter in lakes. It apparently feeds on plankton (cyclops); it is more slender. It reaches up to 53 cm (Erdenebat M., pers. comm., July 2005); 3) The dwarf 'form' is cited by Dulmaa (1999: 198) who does not provide any additional information on its biology.

The fishermen in Darkhad depression report that since the introduction of *C. peled*, the populations of *C. pidschian* (it is not known whether all forms or a single one), *Brachymystax lenok* and *Hucho taimen* decreased sharply and that *C. peled* now constitutes about 90 percent of the catches.

In Lake Dood Tsagaan, the catches of *C. pidschian* in 1997–2000 are said to have been 4000 kg in one day, with one 700 m seine, under ice; an analyzed catch consisted of 60 *C. peled*, 2 *C. migratorius*, and the rest was the native *C. pidschian*. By 2003, *C. pidschian* had sharply declined, with the same effort yielding only 300 kg, mostly *C. peled*. *Coregonus pidschian* prefers slow to strong current, while *C. peled* prefers standing waters (Erdenebat M., pers. comm., July 2005).

Presently it is not possible to determine if the two forms are conspecific. The differences in feeding and spawning habits suggest they might be distinct. Considering the decrease of the population mentioned above (and the risk of hybridization with the introduced *C. peled*) this should be investigated. (Although they normally have distinct spawning sites and periods, climatic variations and human alteration of the habitats could affect the spawning sites and periods).

The population of Rivers Egiin and Uur are strictly riverine; they spend the summer in backwaters, and spawn in the river.

Remarks on nomenclature. The author of *C. pidschian* is sometimes erroneously indicated as Pallas (1776b: 705). In that publication, Pallas consistently indicated in the headings both the Latin and local names. The local names were all preceded by the name of the language in which it was used. Thus the heading for pidschian reads "*Salmo* an *Lavareti* varietas? Ostiacis *Pidschian*. Samoiedis *Polcur*" [a *Salmo* variety related to *lavaretus*? Pidschian in Ostiac language, Polcur in Samoyed language]. The name *C. pidschian* clearly

is not available from Pallas (1776b), but is first available from Gmelin (1789).

Dulmaa (1973: 59) use the name *C. lavaretus pidschian* natio *delger-muren* for the population of River Delgermurun and refers to Dulmaa (**1970**), but this does not appear to be published information. As it appears in Dulmaa (1973: 59) the name is infrasubspecific, thus not available for zoological nomenclature (*Code* art. 1.3.4).

Distribution. In Mongolia: lakes and rivers of Gorlog drainage [upper Yenisei] in Darkhad depression (Shishhed, Sharga and Tengis systems) and in Selenge and its tributaries. Outside Mongolia: Arctic Ocean basin, from Finland (Lapland) to eastern Siberia, Alaska, Canada eastward to Mackenzie drainage.

Family Thymallidae
(graylings)

Thymallus arcticus

Salmo (*Truttac.*) *arcticus* Pallas, 1776b: 706 (type locality: Russia: Sob River, a tributary of the Ob, near Obdorsk [now Salekhard, lowermost Ob, 66°31'48"N 66°36'07"E] [see p. 35])

Salmo digitalis Bloch, in Schneider, 1801: 421 (unnecessary replacement name for *Salmo arcticus* Pallas, 1776b: 706)

Thymallus nikolskyi Kashchenko, 1899: 131 (type locality: Russia: Altai: Ryblushka, a settlement close to Cherga on Rybnusska stream, Katun drainage [Bogutskaya, pers. comm.]/Urusul River at Ongudai/Tcharysh River at Ust-Kan/ Katun River at Nizhnii Uimon/Lake Talmenie/ Tom River above Kusnetsk)

Thymallus nikolskyi var. *ongudajensis* Kashchenko, 1899: 134 (type locality: Russia: Altai: Urusul River at Ongudai)

Thymallus sellatus Kashchenko, 1899: 135, pl. 2 (type locality: Russia: Altai: Lake Tenga (Kenga), Urusul River drainage)

Thymallus arcticus arcticus natio *alchutovi* Johansen, **1945: 6** (infrasubspecific, name not available; locality: Russia: Lake Teletskoe)

Remarks on systematics. This species appears as *Thymallus arcticus* in Mongolian literature (e.g., Baasanjav & Tsendayush, 2001). Russian authors recognize a number of subspecies within *T. arcticus* (e.g. Berg, 1948: 422; Reshetnikov et al., 1997: 696) but more recently others (e.g., Bogutskaya & Naseka, 2004: 146) recognize several of these subspecies as distinct species: *T. baicalensis*, *T. brevipinnis*, *T. grubii*, *T. mertensii*, and *T. pallasi*.

Thymallus baicalensis inhabits Lake Baikal and the Selenge drainage. Berg (1948: 426) considered that there was a deepwater 'form' which is now also treated as the species *T. brevipinnis*. Bogutskaya & Naseka (2004) recognize the Selenge and Baikal 'subspecies' as a valid species (*T. baicalensis*) and the deepwater Baikal 'form' as another species, *T. brevipinnis*. The populations of the Amur drainage in Mongolia belong to *T. grubii*. This classification agrees with the results of molecular studies by Koskinen et al. (2002). This study shows *T. grubii* and *T. brevirostris* as very distinct lineages, and that the remaining populations placed in *T. arcticus* do not constitute a monophyletic lineage. It shows the populations from the Baikal drainage (including Selenge) as a distinct lineage, quite close to the populations from the Angara and middle Yenisei drainage. The Baikal drainage populations apparently are those called *T. baicalensis* by Bogutskaya & Naseka (2004). It is not clear whether they include the Yenisei populations in their *T. baicalensis*.

This study also shows that the *T.* '*arcticus*' populations from North America and the Lena drainage are distinct. The North American lineage had been called *T. signifer* by Russian authors (e.g. Reshetnikov et al., 1997: 696 [as a subspecies]). The name of the Lena lineage is not yet clear; Russian authors have used the name *T. pallasii* for it, but the status of the name depends on the identity of the types, which apparently has not been investigated. Berg (1948: 428) had included the Lena populations in *T. pallasii*. He recorded the type locality as Kolyma, but there is nothing in Cuvier & Valenciennes (1848: 448) allowing this conclusion to be reached; they only mention Russia as the origin.

Koskinen et al.'s (2002) study also shows samples of *T.* '*arcticus*' from Shishkhed River as very distinct from the other populations of *T.* '*arcticus*' and apparently closely related to *T. brevirostris*. Interestingly, this population is immediately distinguished from all other *Thymallus* in Mongolia by its colour pattern (see below). This lineage is considered a species distinct from the other *Thymallus* in Mongolia. Hereunder, it is called *Thymallus* sp. 1.

Two further groups of *Thymallus* populations have been referred to as *T. arcticus* in Mongolia; one in the Great Lakes Basin and one in the Irtysh headwaters on the southern slope of Altai (Khurimt, Songinot, Yolt; Baasanjav & Tsendayush, 2001). There is no information on the Irtysh populations either in Mongolia or China, except for a description and figure in Anonym, 1979: 13, fig. 6), and only limited for Kazakhstan (Mitrofanov et al., 1986: 214). I could not find usable information on the populations of the headwaters of the Khovd and Zavkhan drainages.

Berg (1948: 424, fig. 253) illustrates a specimen from the Irtysh at Ust-Kamenogorsk [now Öskemen] in Kazakhstan and Anonym (1979: fig. 6) figure a specimen in their book on fishes of Xinjiang. They do not give locality data for the figured specimen, but if the figure depicts a fish from Xinjiang, then it should be from Ertix, as this is the only Xinjiang drainage where they record the presence of this species (p. 63).

Beside the number of species now revealed among Mongolian *T.* '*arcticus*', a problem not yet solved is whether there are some 'real' *T. arcticus* in Mongolia. The species was described from the Sob, a tributary of the Ob, in Arctic Ural (Pallas, 1776b: 35). Berg (1948: 424) considered that the 'real' *T. arcticus* inhabits the Kara, Ob and Yenisei drainages, and the Great Lakes Basin of Mongolia. Data are not available to objectively decide which of the two Yenisei species mentioned above (if any) is conspecific with the Ob species; a reasonable guess could be that the lower Yenisei species is more likely to be *T. arcticus*, but this of course requires confirmation. This hypothesis is based on the observation that the lower part of both drainages constitutes the Western Siberian Plain and the respective *Thymallus* populations are relatively 'close', while the Shishked species is in high altitude headwaters entering the plain in an area diametrically opposite to the River Sob, and thus relatively 'far' from the type locality of *T. arcticus*. Again, this is a mere hypothesis which needs to be tested.

Whether all the populations of the Ob drainage (including Irtysh) are conspecific is another open question. Earlier authors had recognized several taxa among the Altai (upper Ob drainage) populations. The type locality of *T. thymallus* (River Sob) is very close to the mouth of the Ob, in the Arctic Ural, on the Polar Circle. Considering the distance, the types of habitats in-between, the topography and the distribution pattern of *Thymallus* species in Eastern Siberia, it is reasonable to expect that the *T.* '*arcticus*' from Altai, upper Irtysh and Great Lakes Basin could represent one or more additional species. As this is only a guess and is currently without supporting evidence, these populations of course are recorded here as *T. arcticus*.

Thymallus baicalensis

Thymallus Grubii var. *baicalensis* Dybowski, 1874: 391, **pl. 8 fig. 1** (type locality: Russia: Lake Baikal and Selenge and Angara rivers)

Thymallus arcticus baicalensis morpha *angarensis* Dorogostaisky, 1923: 77 (infrasubspecific, name not available; locality: Russia: River Angara)

Remarks on systematics. See under *T. arcticus*.

Distribution. In Mongolia: Selenge drainage. Outside Mongolia: Lake Baikal and tributaries.

Thymallus brevirostris

Thymallus brevirostris Kessler, 1879: 306 (type locality: Mongolia: a tributary of Daingol [Daingol Nuur = Lake Dayan, 48°23'00"N 88°50'00"E]/Dsapchyn River [Zavkhan River], a tributary of Lake Kara-Ussi [Lake Kar Us;

apparently error for Lake Khyar-gas]; also in Kessler, 1880: 266)

Phylogephyra altaica Boulenger, 1898: 330, fig. (type locality: China: south side of Altai Mountains)

Thymallus brevirostris kozovi Dashdorj, Dulmaa & Tsendayush, 1968: 40 (type locality: Mongolia: Lakes Khoton and Khorgon)

Thymallus brevirostris altaicus Dashdorj, Dulmaa & Tsendayush, 1968: 45 (type locality: Mongolia: Lakes Khoton and Khorgon; junior secondary homonym of *Phylogephyra altaica* Boulenger, 1898: 330)

Remarks on systematics. See under *T. arcticus*. Dashdorj et al. (1968) described *T. brevirostris kozovi* from Lakes Khoton and Khorgon, in the headwaters of the Khovd drainage. Their figure and data and those in Dulmaa (1973: 61, 9) do not enable to distinguish it from other populations of *T. brevirostris*. This taxon is not recognized in recent literature (e. g., Reshetnikov, 1997: 696; not mentioned Dulmaa, 1999, Bogutskaya & Naseka, 2004). Basaantjav & Tsendayush (2001: 41) and Sokolov (1983: 126) merely mention the name. All these authors comment that the graylings from Lakes Khoton and Khorgon in upper Khovd River grow much larger than those of other populations (up to 750 mm, vs. about 300 mm in others).

The name *T. b. kozovi* is used on p. 38 of Dashdorj et al. (1968) and the name *T. b. altaicus* on p. 45 (Russian summary). The two names are used for the same taxon and the same type series and respective precedence is determined by the first reviser. In this case, however, *T. b. kozovis* has precedence because *T. b. altaicus* is a secondary junior homonym of *Phylogephyra altaica* and therefore cannot be used.

Distribution. Mongolia: lakes and rivers of Great Lakes Basin. Outside Mongolia: upper head of Khovd [Cobdo] drainage in Russia.

Thymallus grubii

Thymallus Grubii Dybowski, 1869: 955, pl. 18 fig. 9 (type locality: Russia: Onon and Ingoda rivers, Amur River basin)

Remarks on systematics. See discussion under *T. arcticus*. Four 'forms' of *Thymallus* are present in the Amur drainage. Knizhin et al. (2004) distinguish three species among them; *T. grubii* (with two 'forms': Upper-Amur and yellow-spots), *T. burejensis* (large-scale 'form') and *T. sp.* (lower-Amur 'form'). The type series of *T. grubii* belongs to the Upper-Amur 'form'. Their analysis includes material of the Upper-Amur 'form' from the Onon and Ingoda rivers (type locality of *T. grubii*). The Onon material had been obtained from the Mongolian stretch.

The Upper-Amur and yellow-spot 'forms' are diagnosably distinct and have allopatric ranges. It is not clear why Knizhin et al. consider them conspecific, but it seems it is based on coefficients of differences (CD) results on a principal component analysis (PCA) of morphometric and meristic characters and on a mtDNA phylogeny. A PCA indicates similarity of shape; while a gross dissimilarity is a conclusive observation of distinctness, a similarity simply shows that the analysed character(s) cannot be used to distinguish groups. In fact their PCA of meristic characters shows only partial overlap. Similarly, CDs indicate degrees of similarity for given characters and are never an argument on their own for conspecificity to be concluded. The same also applies to trees showing haplotype phylogeny. The tree in Knizhin et al. shows a sister-group relationship between the Upper-Amur and yellow-spotted 'forms', but the small degree of divergence is inconclusive. Certainly Knizhin et al. (2004: 68) are right when they state "Morphologically and genetically, the Upper-Amur and yellow-spotted 'forms' are closely related" but this is not enough to continue this sentence by "and make up one species". "Closely related" does not automatically imply conspecificity. To me, their data shows that the two 'forms' are distinct lineages, apparently fulfilling the criteria of species under both the Evolutionary as well as Phylogenetic Species Concepts.

Distribution. In Mongolia: Onon and Kherlen drainages. Outside Mongolia: Upper and middle Amur drainage in Russia and China.

Thymallus nigrescens

Thymallus arcticus nigrescens Dorogostaisky, 1923: 76 (type locality: Mongolia: Lake Khuvsgul)

Remarks on systematics. See under *T. arcticus*.

This species is endemic to Lake Khuvsgul. It lives in the lake but enters tributary streams for spawning. There are two spawning periods, one in mid May to mid June in tributary streams, and the other one in July-August along the shores (Dulmaa, 1999: 209; Tugarina, 2002; Erdenebat M., pers. comm., 2005). Research is needed to determine if the individuals spawning at the different seasons and sites are morphologically and/or genetically distinct. This is especially relevant since, after the drought of 2002, only 20 out of 96 rivers with *T. nigrescens* spawning grounds are left, and they are now dry in May–July in dry years. If these two spawning populations do not mix and breed only among themselves, one of them might become lost unnoticed if its spawning or nursery grounds are dry in May.

Distribution. Endemic to Lake Khuvsgul.

Thymallus sp. 1

? *Thymallus arcticus dentatus* Gundriser, 1979b: 15 (type locality: Russia: Tuva: area of Lakes Kara-Khol in Kham-Syra River system, Bol'shoy Yenisei drainage)

Remarks on systematics. See under *T. arcticus.*

The *Thymallus* of the lakes in Darkhad depression (Yenisei drainage) have an orange caudal peduncle, dark body with indistinct yellowish area on middle of body, and indistinct black stripes. This sharp colour contrast between the anterior part of the body and the caudal peduncle is apparently not seasonal. This is also distinct in females, although paler and somewhat less contrasted. The pattern is even more contrasted in spawning males, with bluish and greenish patches on the body. This pattern is seen also in specimens from the Chuluut River [an upper tributary of Selenge], but much less contrasted (Erdenebat M., pers. comm., July 2005).

The nominal species *T. arcticus dentatus* described from the area of Lakes Kara-Khol, Yenisei drainage, is a name possibly available for the present species. However, it is described as having a "dark body with a row of small dark spots".

Distribution. Presently known only from Shishkhed River, Darkhad depression. Most likely occurs in upper Yenisei in Russia.

Family Esocidae
(pikes)

Esox lucius

Synonymy includes only nominal species whose type locality is in Asia

Esox Lucius Linnaeus, 1758: 314 (based on Artedi [1738: gen. 10 [53], syn. 26, spec. 52 [14], Esox rostro plagioplateo], Linnaeus [1746: 114, n. 304, idem], and Gronovius [1754: 9, n. 28, idem]; type locality: "in Europa")

Esox Reichertii var. *baicalensis* Dybowski, 1874: 392 (type locality: Russia: Siberia: all lakes and ponds of Lake Baikal basin [in Lake Baikal only at the mouth of the tributaries])

Esox Reichertii var. *baicalensis* Dybowski, 1874: 392 (type locality: Russia: Lake Baikal basin)

Esox lucius var. *atrox* Anikin, **1902: 109** (locality: Russia: Siberia: River Ob) from Berg, 1948: 458

Esox lucius bergi Kaganovskii, **1933: 4** (locality: Russia: Siberia: River Anadyr) from Berg, 1948: 458

Esox lucius lucius natio *wiliunensis* Kirillov, 1962: 37 (infrasubspecific, name not available; locality: Russia: Yakutia: River Vilyui basin)

Esox lucius aralensis Pivnev, **1985: 18** (type locality: Kyrgyzstan: Chu River basin)

Distribution. In Mongolia: Selenge drainage. Outside Mongolia: Most of Europe, Caspian Sea basin, Siberia eastward to Anadyr drainage (Bering Sea basin), North America.

Esox reichertii

Esox Reichertii Dybowski, 1869: 956 (type locality: Russia: all lakes of the Onon and Ingoda river systems [Lakes Tyrgituj, Sagtoj, Ustila, Baica and others], rare in rivers, Amur River basin)

Distribution. In Mongolia: Onon and Kherlen drainages. Outside Mongolia: Amur drainage and Sakhalin Island.

Family Cyprinidae
(carps, minnows)

Acheilognathus asmussii

Devario Asmussii Dybowski, 1872: 212 (type locality: Russia: Lake Chanka [Khanka]).

Acanthorhodeus asmussii amurensis Holcik, 1962: 169, fig. 3 (type locality: Russia: Lake Kabar, Amur River near Yelabuga, about 60 km from Khabarowsk)

Remarks on systematics. This species is usually placed in the genus *Acanthorhodeus* in the Russian literature (e.g., Reshetnikov et al., 1997: 698; Naseka & Bogutskaya, 2004: 280; Bogutskaya & Naseka, 2004: 40), which is considered a junior synonym of *Acheilognathus*, following Arai & Akai (1988).

Distribution. In Mongolia: Kherlen, Onon and Khalkh drainages, and Lake Buir. Outside Mongolia: Amur drainage in Russia and China; Korea.

Carassius carassius

Synonymy includes only nominal species whose type locality is in Asia

Cyprinus Carassius Linnaeus, 1758: 321 (based on Artedi [1738: gen. 4 [29], syn. 5, spec. 29 [4], Cyprinus pinnae dorsi ...], Linnaeus [1746: 122, n. 322, idem], Gronovius [1754: 3, n. 11, idem; 1746: 75, n. 55, Cyprinus hamburger; Wawerveen, Belgium]; type locality: Germany: Baden-Württemberg: Neckar River at Heidelberg, by neotype designation by Fricke, 1999: 23 [neotype withdrawal by Fricke, 2000: 639 not allowed by *Code*])

Carassius carassius jacuticus Kirillov, **1956** (locality: Yakutia, Siberia) from Kirillov, 1962

Remarks on systematics. The species is listed as possibly present in the Bulgan River, e.g., by Sokolov (1983: 199) and Baasanjav & Tsendayush (2001), but Sokolov explicitly stated that they did not examine specimens from Mongolia and considered records of its occurrence in Mongolia incorrect (e.g., record from the Selenge by Dashdorj & Demin, 1977: 154). Their description of the species is taken from Berg, 1949. I have examined specimens labelled as *C. carassius* from the Bulgan in the Zoological Museum in Berlin; unfortunately only the heads have been preserved and it is impossible to confirm the identification. The species is recorded in the Ertix [upper Irtysh] but not from its tributary Ulungur River [lower Bulgan] by Li et al. (1966) and Anonym (1979), while these authors record *C. gibelio* in both rivers. Kimura et al. (1992) figure a specimen from the lowermost Ulungur River. The species is tentatively recognized as present in Mongolia, but this requires confirmation.

Distribution. In Mongolia: Bulgan River. Outside Mongolia: in Europe from Rhine drainage eastwards (absent in Mediterranean basin, present in Black Sea basin); in Asia, Caspian basin and rivers flowing to the Arctic Ocean, eastwards to Kolyma drainage.

Carassius gibelio

Synonymy includes only nominal species whose type locality is in Asia

Cyprinus Gibelio Bloch, 1782: 71, pl. 12 (type locality: Churmark, Pommern, Schlesien and Preussen (Prussia, now Germany and Poland))

Carassius vulgaris var. *kolenty* Dybowski, 1877: 11 (type locality: Russia: River Amur basin)

Carassius auratus gibelio morpha *vovkii* Ioganzen, 1945: 12 (infrasubspecific, name not available; locality: Russia: Siberia: lakes of Baraba steppe and Narym region)

Remarks on systematics. This species was originally described from Europe. Its status is still not clear. Several authors consider it as a 'form' of the well-known goldfish (*Carassius auratus*), either a wild 'form' native to Europe or an introduced 'form', or as feral stock of introduced goldfishes, or as a result of hybridization. There is indication that the species might have been present in Europe before the first introduction of goldfishes from Japan, which would rule out the hypothesis of the feral goldfish (Kottelat, 1997).

The problem is made very complex and the original distribution in Europe will probably never be known exactly because of introduction, transplantation, confusion with *C. auratus* and complex modes of reproduction, with diploid populations of both sexes, as well as populations made of diploids and tetraploids, or female-only triploid populations. The species is now invasive throughout Europe and is a pest where it establishes. It seems that the invasive fishes result from populations stocked in eastern Europe and imported from Siberia and are likely to be conspecific with the Mongolian populations.

Although this may seem distant and of no interest in a Mongolian context, in fact it is relevant because the name of the species present in Mongolia depends on the identity of the populations originally present in Europe. The invasion from populations stocked in eastern Europe of a species earlier cryptic or poorly known in central Europe suggests that either the identification of the original *C. gibelio* presents some problem, or that the invasive populations are not conspecific with the original one. This problem is presently being investigated, and awaiting a solution, I retain the name *C. gibelio* for the species present in Mongolia.

Russian and Mongolian literatures consider the local *C. gibelio* as a subspecies of the goldfish *C. auratus*. The systematics of the genus *Carassius* in East Asia is confusing. The ancestor of today's domesticated goldfishes was introduced to Japan from China at a date between 1502 and 1748 (Okada, 1959–60: 531). Available data show that at least five genetically and morphologically distinct stocks are known in Japan which are considered as distinct species (Teitler & Fujita, 1993; Hosoya, in Nakabo, 1994: 212–213) and are treated as species here under the ESC. With the present data, the Mongolian populations cannot be considered as conspecific with the cultivated *C. auratus*.

The discussion by Vasil'eva & Vasil'ev (2000) cannot be followed as it is based on a heterogeneous assemblage of partly second-hand data on morphology, genetics, ecology, and zoogeography. Further, the authors have apparently been largely disserved by the translators and the editors of the journal and the paper is marred by linguistic problems, making it very difficult to understand. Without inclusion of European material, their discussion of the identity of *C. gibelio* does not make sense, as the type locality is in Europe.

Distribution. In Mongolia: Selenge, Onon and Kherlen drainages, and Lake Buir. Outside Mongolia: western limit in Europe not clear (see above), in Asia, extends eastwards at least to the Amur drainage, exact limits not clear.

Chanodichthys erythropterus

Culter erythropterus Basilewsky, 1855: 236, pl. 8 fig. 1 (type locality: China: rivers draining to Gulf of Tschili)

Culter ilishaeformis Bleeker, 1871: 67, pl. 10 fig. 1 (type locality: China: Yangtze River)

Culter Sieboldii Dybowski, 1872: 214 (type locality: Russia: middle course of Amur, Ussuri, Sungatschi and Chanka)

Culter aokii Oshima, 1919: 250, pl. 52 fig. 1 (type locality: Taiwan: Jitsugetsutan, Lake Candidius)

Remarks on nomenclature. For some time, the species identified as *Culter erythropterus* (or *Cultrichthys erythropterus*) and *Culter alburnus* have been interverted in the Chinese and Southeast Asian literature. I have not attempted to track the source of this interversion, but it goes back at least to Wu et al. (1964: 113) and is still going on (e.g., Chen, 1998: 182; Kottelat, 2001b: 21). See Bogutskaya & Naseka (1996: 21, 2004: 54)

for discussion. The species listed in the synonymy of *C.* "*erythropterus*" by Chen in fact are synonyms of *C. alburnus*. Correcting this error has an impact on the genus-level nomenclature.

The type species of *Culter* is *C. alburnus*. The type species of *Cultrichthys* is *C. brevicauda*. As *C. brevicauda* is a subjective junior synonym of *C. alburnus*, *Cultrichthys* is a subjective junior synonym of *Culter*. The species placed in *Erythroculter* by Berg (e.g., 1949: 804) and other Russian authors should be called *Chanodichthys* as this name is older than *Erythroculter*.

Distribution. In Mongolia: Lake Buir. Outside Mongolia: from Amur to Red River drainages (China to Vietnam); Taiwan; Hainan.

Chanodichthys mongolicus

Leptocephalus Mongolicus Basilewsky, 1855: 234, pl. 4 fig. 2 (type locality: "in winter, brought to Beijing frozen from Mongolia and Manchuria"; spelt *mongolensis* on pl. 4 fig. 2; first revisers [Bogutskaya & Naseka, 2004: 54] gave precedence to *mongolicus*)

Culter Mongolicus Basilewsky, 1855: 237 (type locality: "in winter, brought to Beijing frozen from Mongolia"; simultaneous secondary homonym of *Leptocephalus mongolicus* Basilewsky, 1855: 234, first reviser [Banarescu, 1972: 387] gave precedence to *Leptocephalus mongolicus*)

? *Culter Pekinensis* Basilewsky, 1855: 237 (type locality: China: streams draining to the Gulf of Tschili)

Culter rutilus Dybowski, 1872: 214 (type locality: Russia: Ussuri and Chanka)

Erythroculter mongolensis elongatus He & Liu, 1980: 483, fig. (type locality: China: Yunnan: Lake Chenghai)

Erythroculter mongolicus qionghaiensis Ding, 1990: 246, fig. 1 (type locality: China: Sichuan: Lake Qionghai, 27°53'N 102°18'E)

Distribution. In Mongolia: Lake Buir, and Onon and Kherlen drainages. Outside Mongolia: from Amur to Yangtze drainages.

Culter alburnus

Culter Alburnus Basilewsky, 1855: 236, pl. 8 fig. 3 (type locality: China: rivers draining to the Gulf of Tschili)

Culter brevicauda Günther, 1868: 329 (type locality: Taiwan)

Culter Kneri Bleeker, 1870: 252 (nomen nudum)

Culter Kneri Bleeker, 1871:14 (based on Culter erythropterus of Kner, 1867: 360, pl. 14 fig. 4; type locality: China: Shanghai)

Culter tientsinensis Abbott, 1901: 489, fig. (type locality: China: Hebei: River Pei-Ho at Tien-Tsin [Tianjin])

Remarks on nomenclature. See under *Chanodichthys erythropterus*.

Distribution. In Mongolia: Lake Buir and Onon and Kherlen drainages. Outside Mongolia: from Amur to Red River drainages, Taiwan, Hainan.

Ctenopharyngodon idella

Leuciscus idella Valenciennes, in Cuvier & Valenciennes, 1844: 362 (type locality: China)

Leuciscus Tschiliensis Basilewsky, 1855: 233 (type locality: China: Gulf of Tschili and tributary streams)

Ctenopharyngodon laticeps Steindachner, 1866a: 782, pl. 18 figs. 1–5 (type locality: China: Hong Kong)

Sarcocheilichthys teretiusculus Kner, 1867: 356 (type locality: China: Shanghai/waters near Tianjin and draining to Gulf of Tschili [Basilewsky's material])

Pristiodon siemionovii Dybowski, 1877: 26 (type locality: Russia: Amur River, Ussuri River, Sungacha River, Lake Khanka and Sungari River)

Distribution. There is a single record from Mongolia, around 1962 (Sokolov, 1983: 163), in Lake Buir; the species is widely cultivated in China, and this fish likely was stocked, or escaped, on the Chinese side of the lake. Outside Mongolia: native to East Asia, in lower and middle stretches of major rivers from Amur to Xi Jiang drainages.

Cyprinus rubrofuscus

Cyprinus rubro-fuscus La Cepède, 1803: 530, pl. 16 fig. 1 (type locality: China)
Cyprinus nigro-auratus La Cepède, 1803: 547, pl. 16 fig. 2 (type locality: China)
Cyprinus viridi-violaceus La Cepède, 1803: 547, pl. 16 fig. 3 (type locality: China)
Cyprinus anna-carolina La Cepède, 1803: 544, pl. 18 fig. 1 (type locality: not stated)
Cyprinus floripenna van Hasselt, 1823: 132 [translated in Alfred, 1961: 85], 1824: 375 (nomen nudum, Kottelat, 1987: 370)
? *Cyprinus flavipinnis* Valenciennes, in Cuvier & Valenciennes, 1842: 71, fig. 457 (type locality: Indonesia: Java: Buitenzorg [Bogor])
Cyprinus haematopterus Temminck & Schlegel, 1846: 189, 216, pl. 96 (type locality: Japan: large rivers of Kiusiu Island; junior primary homonym of *Cyprinus haematopterus* Rafinesque, 1820a: 6)
Cyprinus atro-virens Richardson, 1846: 287 (type locality: China: Canton)
Cyprinus flammans Richardson, 1846: 288 (type locality: China: Canton)
Cyprinus hybiscoides Richardson, 1846: 289 (type locality: China: Canton)
Cyprinus sculponeatus Richardson, 1846: 290 (type locality: China: Canton)
Cyprinus ? fossicola Richardson, 1846: 291 (type locality: China: Canton)
Cyprinus carpio var. *mürgo* Dybowski, 1869: 950 (type locality: Russia: Transbaikalia: Onon River; spelled *murgo* p. 946 [emendation as *muergo* (e.g. in Eschmeyer, 1998) is erroneous as the name is not derived from a German word; Dybowski explicitly stated it is the local vernacular name of the fish, *Code* art. 32.5.2.1])
Cyprinus carpio yuankiang Wu, Yang, Yue & Huang., 1963: 43 (type locality: China)
Cyprinus carpio triangulus Wu, Yang, Yue & Huang, 1963: 43 (type locality: China)

Remarks on systematics. There is no native *Cyprinus carpio* in Mongolia, only *C. rubrofuscus* (the *C. haematopterus* of Russian and Chinese literature) is native. *Cyprinus carpio* is native only to the Black, Caspian and Aral Seas basins, and it is introduced elsewhere. *Cyprinus carpio* has been used to produce hybrids with other species of the genus *Cyprinus*.

Although the diversity of the East Asian species of *Cyprinus* has long been documented in the Chinese literature (e.g., Wu et al., 1977; Yue, 2000), it is largely ignored, if not flatly negated, in western literature (e.g., Balon, 1995; Banarescu & Paepke, 2002), where it is often assumed that Asian carps are derived from introduced European carps and that the species recognized by Chinese authors are domesticated or feral forms. Kottelat (1997: 57; 2001a: 22, 2001b: 45) disagrees with this and commented that the domesticated carps in East Asia are one or more species distinct from the European one. The molecular data of Zhou et al. (2004) give support to this conclusion (although these authors did not note the taxonomic aspect of their results).

Remarks on nomenclature. The name *C. haematopterus* is used in the Russian and Chinese literature for the common Asian carp. This name (created by Temminck & Schlegel in 1846) is not valid for the Asian carp because it is a junior homonym of *Cyprinus haematopterus* created by Rafinesque in 1820 for a North American fish. The oldest name has priority and the youngest one is not valid. Anyway, *C. haematopterus* is not the earliest name given to this species; the earliest available name for the common Asian carp is *C. rubrofuscus*, a name created by La Cepède in 1803 (see Kottelat, 2001b: 45).

Distribution. In Mongolia, *C. rubrofuscus* is native in the Amur drainage (Onon, Kherlen). Introduced in the Selenge drainage in the mid-1940s, invasive. It is not known if the introduced stocks are pure *C. rubrofuscus*. Outside Mongolia: from Amur to Red River drainages, although it is probably impossible to determine its exact original range.

Eupallasella percnurus

Synonymy includes only nominal species whose type locality is in Asia
Cyprinus Percnurus Pallas, 1814: 299 (type locality: Russia: Siberia: lakes and swamps around River Lena)

Leuciscus dauricus Valenciennes, in Cuvier & Valenciennes, 1844: 149 (type locality: Russia: waters of Daouria [Transbaikalia]; based on Cyprinus rutilus of Pallas, 1814: 317)
Phoxinus jelskii Dybowski, 1869: 952 (type locality: Russia: Siberia: lakes of Darasun, But-Durutaj, Ila and Makhojtowa valleys [River Onon basin])
Leucaspius Fischeri Sabaneev, 1871: 277 (nomen nudum; locality: Russia: Siberia: east slope of Ural range)
Phoxinus perenurus var. *Dauricus* Dybowski, 1877: 17 (type locality: Russia: Transbaikalia: lake in basin of River Onon)
Phoxinus stagnalis Warpachowski, 1886: 76, fig. (type locality: Russia: Kazan Prov.: Lake Schumjer [in basin of River Malaya Kokschaga, Berg, 1949: 578])
Phoxinus Sabanejewi Warpachowski, 1887a: 535 (type locality: Russia: lakes on eastern slope of Urals range [district Schadrinsk, Tscheljabinsk; Berg, 1912: 199]; also in Warpachowski, 1887b: 688)
Phoxinus altus Warpachowski, 1887b: 535 (type locality: Russia: Siberia: tributaries of River Yenisei, Siberia [lower Tunguska, Berg; 1912: 199]; also in Warpachowski, 1867b: 688)
Phoxinus variabilis Warpachowski, 1887b: 535 (type locality: Russia: Siberia: tributaries of River Ob [River Tscharysch; Berg, 1912: 199]; also in Warpachowski, 1867b: 688)
Phoxinus percnurus mantschuricus Berg, 1907a: 204 (type locality: China: Amur drainage: Da-tschu-an, a tributary of River Sungari)
Phoxinus crucifer Gratzianow, **1907: 128** (type locality: Russia: Buryatia: vicinity of Troitskosavsk, River Selenge drainage/small lake at Bain Bulyk, 20 verst of Troitskosavsk)
Phoxinus percnurus sarykul Ruzskii, **1926: 112, fig.** (type locality: Russia: Siberia: Lake Sarykul, south of Chelyabinsk) from Berg, 1949: 575

Remarks on systematics. *Eupallasella percnurus* was earlier placed in *Phoxinus*. *Phoxinus* is quite a heterogeneous assemblage and a number of authors have tried to divide the species into a variety of genera (e.g., Dybowski, 1916; Gasowska, 1979; Howes, 1985). I follow Howes in recognizing *Eupallasella* and *Rhynchocypris* as valid. This is apparently also the conclusion reached by Bogutskaya & Naseka (2004: 92), except that they retain *Rhynchocypris* and *Eupallasella* as subgenera of *Phoxinus*. A recent molecular study suggests that *Eupallasella* should be included in *Rhynchocypris* (Sakai et al., 2006). As long as the interrelationships of the three genera are not established, I do not see reason to consider them congeneric.

Remarks on nomenclature. There has been disagreement in the correct spelling of the species' name, some authors using *percnurus* and others using *perenurus* (Kottelat, 1997: 59). In fact, Bogutskaya et al. (2005: 93) showed that the spelling using in the first copies of the book was *percnurus* and that the letter 'c' became damaged and was erroneously replaced by a letter 'e' by the typesetter. [In 1814 printing methods were not those of today].

Distribution. In Mongolia: Selenge and Amur drainages. Outside Mongolia: lakes in Arctic Ocean basin (from Northern Dvina to Kolyma drainages) and Pacific basins (from Amur to Korea and Japan); in Europe, disjunct distribution: lakes in Odra, Vistula, Dniepr, Volga drainages.

Gnathopogon strigatus

Leucogobio strigatus Regan, 1908: 59, pl. 2 fig. 2 (type locality: Korea: Chong-ju)
Gobio taeniatus mantschuricus Berg, 1914: 481, fig. 72 (type locality: Manchuria: River Schansi, tributary of River Hailin, at railway line, Sungari basin/River Ussuri downstream of Lontschakowskij)
Paraleucogobio soldatovi Berg, 1914: 486, fig. 74 (type locality: Russia: mouth of Ussuri River)

Remarks on systematics. Synonymy follows Bogutskaya & Naseka (2004: 63). Chen (1998: 308) placed this species in the genus *Paraleucogobio* while they considered that *Gobio taeniatus mantschuricus* is a valid species of *Gnathopogon*.

Distribution. In Mongolia: Lake Buir. Outside Mongolia: Amur drainage in Russia and China, Korea, River Liao in China.

Gobio acutipinnatus

Gobio gobio acutipinnatus Menshikov, 1939: 131, pl. (type locality: Kazakhstan: Lake Marka-kul, Irtysh basin)

Remarks on systematics. *Gobio acutipinnatus*, *G. cynocephalus* and many others have traditionally been treated as subspecies or synonyms of *G. gobio*, which was considered to be a species extending from Spain to northeastern China (e.g., Berg, 1949; Banarescu & Nalbant, 1973; Reshetnikov et al., 1997; Kottelat, 1997). Detailed examination of several of the populations in Europe has shown that *G.* "*gobio*" in fact is an assemblage of several species, and that some even belong to the genus *Romanogobio*. This is based on morphological as well as molecular characters (see, e.g., Doadrio & Madeira, 2004; Kottelat & Persat, 2005; Freyhof & Naseka, 2005; Yang et al., 2006). Chinese authors also recognize that the local *G.* "*gobio*" are also an artificial assemblage and recognize a number of species (e.g., Chen, 1998). They recognize *G. acutipinnatus* as a valid species, occurring in China in the Ertix drainage (Chinese name of the upper Irtysh).

Gobio acutipinnatus was originally described from Lake Marka-kul, a small lake in the Irtysh drainage, in Kazakhstan, close to the border with China. The Bulgan River [Ulungur in China] is a tributary of the Ertix. I have examined various samples of *Gobio* from the Bulgan and Ertix, and the syntypes from Lake Marka-kul in Zoological Institute, St. Petersburg, and I agree with Chen (1998: 294) that they belong to a distinct species. Records of both *G. gobio* and *G. g. cynocephalus* from the Bulgan in Baasanjav & Tsendayush (2001: 95, 96) refer to this species.

Gobio acutipinnatus is distinguish from other *Gobio* in Mongolia by the combination of the following characters: anus midway between pelvic-fin base and anal-fin origin; throat naked in front of pectoral-fin base; 12–16 [usually 14] scale rows around caudal peduncle; snout blunt; head depth about 1.5 times in its length; a mid-lateral row of 10–14 dark spots; 40–43 total lateral line scales.

Distribution. In Mongolia: Bulgan River. Outside Mongolia: Upper Irtysh drainage in China and Kazakhstan. Possibly present further downriver in Irtysh.

Gobio cynocephalus

Gobio fluviatilis var. *cynocephalus* Dybowski, 1869: 951 (type locality: Russia: Amur drainage: Onon and Ingoda rivers)

Gobio liaoensis Mori, **1927: 31** (type locality: China: Manchuria: Tai-tzu River, tributary of Liao River at Chiao-tao)

Remarks on systematics. Chen (1998: 293) treats *G. macrocephalus* as a valid species, while Banarescu & Nalbant (1973: 128) treat it as a junior synonym of *Gobio soldatovi* and Kim (1997: 217) treats it as a junior synonym of *G. cynocephalus*. The original description of *G. macrocephalus* by Mori (1930: 46) is not very informative but indicates that the head length is 3.6 times in SL; Chen (1998: 293) gives 3.3–3.8 for *G. macrocephalus* from Tumen (type locality), 3.8–4.2 for *G. soldatovi* and 3.8–4.2 for *G. cynocephalus*. Banarescu & Nalbant (1973: 128) give 3.6–4.3 for *G. soldatovi*. The figure of *G. cynocephalus* in Kim (1997: 217) shows the head length about 4.4 times in SL; the origin of the specimen is not stated. With the available data, I exclude *G. macrocephalus* from the synonymy of *G. cynocephalus* and consider it as a valid species.

Distribution. In Mongolia: Onon, Kherlen and Khalkhiin rivers, Lake Buir. Outside Mongolia: Amur drainage in Russia and China; River Liao He in China.

Gobio sibiricus

Gobio gobio sibiricus Nikolski, 1936: 470 (type locality: Kazakhstan: Akmolinskaya Oblat: Nura River, where it enters Lake Dzhanybek /Russia: Krasnoyarskiy Krai: Minusinskiy District: Yenisei, Minusinkaya channel)

? *Gobio gobio magnicapitata* Gundriser, 1967: 70 (type locality: Russia: Tuva: Lake Kara-Khol basin, Kham-Syra river system, Bol'shoy Yenisei drainage, 53.43°N 95.25°E [Gundriser, 1979a: 9])

Remarks on systematics. The map in Baasanjav & Tsendayush (2001: 99) shows *G. cynocephalus* at different localities in the Selenge drainage. It is not recorded in the Selenge by Sokolov (1983: 168). The map in Reshetnikov et al. (2002: 250) shows no species of *Gobio* in Lake Baikal basin (including Selenge). Banarescu & Nalbant (1973: 133) consider that the range of *G. cynocephalus* is restricted to the Amur drainage and northeastern China and (p. 125) that the earlier records of *G. cynocephalus* in the upper Yenisei and Baikal drainages are *G. gobio sibiricus*. Sideleva (2003: 10) records *G. g. cynocephalus* in Lake Baikal basin.

Nikolski (1936) described *G. g. sibiricus* on the basis of material from several localities in the Yenisei, Ob and Nura drainages. Berg (1949: 645) commented that the Yenisei and Nura specimens are not conspecific and he treated syntypes from the Yenisei (Minussinsk) as *G. g. cynocephalus* and syntypes from the Nura (a recently formed endorheic drainage, still occasionally connected with the Irtysh drainage) as *G. g. lepidolaemus*. Banarescu & Nalbant (1973: 125) examined material from Nura and treated the two populations as conspecific, as *C. g. sibiricus*, and distinct from *G. g. cynocephalus*. They, however, consider the Nura specimens as 'intergrades' between their *G. g. sibiricus* and *G. g. lepidolaemus*.

Banarescu & Nalbant (1973: 134) distinguished their *G. g. sibiricus* from *G. cynocephalus* by lateral line scale count (40–44 in *G. g. sibiricus*, vs. 43–48) and shape of dorsal fin (distal edge more-or-less straight, vs. distinctly 'notched' [concave]). Without access to specimens, the difference seems convincing and I treat them as distinct. I use the name *G. sibiricus* for the Yenisei and Ob populations. As there is a possibility that these two populations may be distinct from the Nura population, a lectotype designation will be needed to definitively fix the name to the Yenisei and Ob populations. Clearly, this would be premature at this stage.

It remains to compare material from the Yenisei and Selenge to confirm that they are effectively conspecific, but I tentatively accept it.

Distribution. In Mongolia: Selenge drainage. Outside Mongolia: Ob (except Irtysh), Yenisei and Nura drainages.

Gobio soldatovi

Gobio gobio var. *soldatovi* Berg, 1914: 461, fig. 63 (type locality: Russia: lower Amur River at Tscheptschiki [Chepchiki])

? *Gobio gobio tungussicus* Borisov, **1928: 105, 165, pl. 6 figs. 14–15** (type locality: Russia: Sakha-Yakutia: Lena River near Zhigansk)

Remarks on systematics. *Gobio soldatovi* was first recorded from Lake Buir by Baasanjav & Tsendayush (2001: 97). Berg (1949: 651), Nikolski (1956) and Banarescu & Nalbant (1973: 129) recorded it only from the lower Amur drainage (downriver of Khabarovsk). Reshetnikov et al. (1997: 701; 2002: 252) record it from the whole Amur drainage, but this includes the *G. s.* "*tungussicus*" of Nikolski (1956), Sokolov (1983), and Baasanjav & Tsendayush (2001: 171), which is not conspecific (see under *Gobio* sp. Onon) and, on the basis of the available data, the presence of the real *G. soldatovi* in the upper Amur remains to be confirmed.

If *G. soldatovi* is naturally absent from the upper Amur, the resulting range (Lena and lower Amur drainages) would be strangely disjunct and the synonymy and status of the nominal taxa *G. g. tungussicus* should be re-examined (see under *Gobio* sp. Onon).

Even if absent in upper Amur, the presence (and apparently recent discovery) of *G. soldatovi* in Lake Buir could be explained by introduction or accidental release, together with many other species, on the Chinese side of the lake. The natural habitat of the species in lower Amur is slow flowing and standing water.

Distribution. In Mongolia: Lake Buir. Outside Mongolia: Amur drainage in Russia and China; Sakhalin Island; ? Lena drainage in Russia.

Gobio tenuicorpus

Gobio gobio tenuicorpus Mori, 1934: 13, pl. 4 fig. 2a (type locality: China: Hopei: Hsing-lung-shan)

Remarks on systematics. Listed as *Gobio albipinnatus tenuicorpus* by Holcik & Pivnicka (1969: 7) and Sokolov (1983: 169), and "*Gobio albipinnatus* Mori, 1934" by Baasanjav & Tsendayush (2001: 94). *Gobio albipinnatus* is a different species from the Volga and Ural drainages, placed in the genus *Romanogobio* (Bogutskaya & Naseka, 2004: 70). *Gobio tenuicorpus* was also moved to *Romanogobio* by Banarescu & Nalbant (1973: 143), who considered *Romanogobio* as a subgenus of *Gobio*. *Romanogobio* is now considered as a valid genus (Bogutskaya & Naseka, 2004: 70), also including the former subgenus *Rheogobio* as a synonym (see Naseka & Freyhof, 2004). The genus *Romanogobio* includes species from the Black Sea and Caspian Sea basins and species from East Asia, a strange zoogeographic pattern; their actual relationships require further investigation. Indeed a molecular analysis of the relationships within Gobioninae shows *G. tenuicorpus* included in the *Gobio* lineage and clearly distinct from the *Romanogobio* lineage (Yang et al., 2006).

Gobio tenuicorpus is known from the Amur to the Luang Ho drainages. In the Amur drainage, it has a broadly disjunct range, with the lower and middle stretches on the one hand and Lake Buir on the other hand (e.g., Reshetnikov et al., 2002: 316). Sokolov (1983: 170) compared the data of Holcik & Pivnicka (1969: 7) with materials from the delta of stream Khalkhiin and with materials from Amur and found no morphological differences. Their description of the species is taken from Nikolski (1956: 185). It is not clear whether this disjunct range reflects a collecting bias, or reality. The data and drawing in Sokolov (1983: 170) are those of Nikolski (1956: 185) based on material from middle and lower Amur.

Distribution. In Mongolia: In River Khalkhiin and in Lake Buir. Outside Mongolia: from Amur to Luang Ho drainages.

Gobio sp. Onon

Remarks on systematics. Sokolov (1983: 171) and Baasanjav & Tsendayush (2001: 97) recorded *G. soldatovi tungussicus* from the Onon drainage in Mongolia. Reshetnikov et al. (1997: 701) considered that this 'subspecies' is restricted to the Lena drainage. Bogutskaya & Naseka (2004: 65) treated *G. g. tungussicus* as a synonym of *G. soldatovi*.

Without access to specimens, it is impossible to know which is the species reported by Sokolov (1983) and Baasanjav & Tsendayush (2001). The description and illustration in Sokolov are from Nikolski (1956) and based on specimens from "a small unnamed lake in the Shargol'dzhin River system (a tributary of Ingoda), in Bal'zinskoye Lake in the Tura River system, a tributary of Ingoda River, and in lake-like puddles of Onon River at Novo-Kazachinskoye", in Russia.

Gobio gobio tungussicus was originally described from the Lena River drainage (Borisov, **1928: 105**). Nikolski's figure of *G. s. tungussicus* shows a fish quite different from that of Borisov (reproduced in Berg, 1949: 646). It shows a deeper bodied fish, with a more slender caudal peduncle, a blunt snout and a colour pattern made of a row of blotches along the flank, while Borisov's drawing shows a dark longitudinal band. A topotype of *G. soldatovi* figured in Berg (1949: 650) looks similar to *G. s. tungussicus*. Bogutskaya & Naseka (2004: 65) consider them as synonyms.

On the basis of the published data, the fish figured by Nikolski (1956) as *G. s. tungussicus* is misidentified. I am unable to identify it as any of the species of *Gobio* recorded from the Amur in the Russian and Chinese literature.

Distribution. In Mongolia: Onon River drainage. Outside Mongolia: Onon and Ingoda drainages in Russia.

Hemibarbus labeo

Cyprinus labeo Pallas, 1776a: 207 (nomen nudum), 1776b: 703 (type locality: Russia: "streams flowing through Dauria and draining to the Amur" [p.207]/Dauria is mentioned p. 703 as

"Russis in Dauria [kon] (Equus)" which means "called [kon] (horse) by the Russians of Dauria"]; also in Pallas, 1778: appendix, p. 14)

Gobio barbus Temminck & Schlegel, 1846: 198, pl. 99 fig. 1 (type locality: Japan: Nagasaki; junior secondary homonym of *Cyprinus barbus* Linnaeus, 1758: 320, when placed in *Barbus* by Günther, 1868: 135)

? *Barbus abramoides* Brandt, in Maak, 1861: 196 (nomen nudum; locality: Russia, Ussuri)

Barbus schlegelii Günther, 1868: 135 (replacement name for *Gobio barbus* Temminck & Schlegel, 1846: 198)

Acanthogobio oxyrhynchus Nikolski, 1904: 358 (type locality: Russia: Lake Chanka at mouth of River Santacheza)

Pseudogobio chaoi Evermann & Shaw, 1927: 106 (type locality: China: Nanking)

Hemibarbus longianalis Kimura, 1934: 123, pl. 4 fig. 1 (type locality: China: Sichuan: Suining and Howchwan)

Remarks on systematics. The genus *Hemibarbus* was revised by Yue (1995; Yue, in Chen, 1998: 491).

Distribution. In Mongolia: drainages of Lake Buir and Rivers Onon, Kherlen and Khalkhiin. Outside Mongolia: from Amur to Mingjiang drainages (Russia, China) and Taiwan.

Hemibarbus maculatus

Hemibarbus maculatus Bleeker, 1871: 19, pl. 4 fig. 3 (type locality: China: Yangtze River; junior secondary homonym of *Barbus maculatus* Valenciennes, in Cuvier & Valenciennes, 1842: 195, when placed in Barbus by Günther, 1889: 224; these taxa are no longer considered congeneric and the substitute name [*Barbus semibarbus* Günther, 1889: 224] is not in use, so *Hemibarbus maculatus* is not rejected; *Code* art. 59.3)

Barbus semibarbus Günther, 1889: 224 (replacement name for *Hemibarbus maculatus* Bleeker, 1871: 19)

Hemibarbus joiteni Jordan & Starks, 1904: 241, pl. 64 (type locality: China: Pei Ho at Tientsin)

Acanthogobio paltschevskii Nikolski, 1904: 356 (type locality: Russia: Lake Chanka at mouth of River Santacheza)

? *Hemibarbus longibarbis* Fang, 1938: 269 (type locality: China: Kiangsi: Sau-hsui)

Remarks on systematics. The genus *Hemibarbus* was revised by Yue (1995; Yue, in Chen, 1998: 491).

Distribution. In Mongolia: drainages of Lake Buir and Rivers Onon, Kherlen and Khalkhiin. Outside Mongolia: from Amur to Yangtze drainages (Russia, China) and Taiwan.

Hemiculter leucisculus

Culter Leucisculus Basilewsky, 1855: 238 (type locality: China: streams draining to Gulf of Tschili)

Squaliobarbus annamiticus Tirant, 1883: 97 (type locality: Vietnam: River of Hué)

Culter Balnei Sauvage, 1884: 213, pl. 8 fig. 4 (type locality: Vietnam: vicinity of Hanoï)

Hemiculter Schrencki Warpachowski, in Warpachowski & Herzenstein, 1887: 46, pl. fig. 4 (type locality: China: Fu-Tschau [Fuchow]; also in Warpachowski, 1888: 18)

Hemiculter kneri Warpachowski, 1888: 17 (based on *Culter leucisculus* of Kner, 1867: 362; type locality: China: Shanghai)

Hemiculter kneri Kreyenberg & Pappenheim, 1908: 105 (based in part on *Culter leucisculus* of Kner, 1867: 362; type locality: China: Shanghai and Hankau; junior primary homonym of *Hemiculter kneri* Warpachowski, 1888: 17)

Parapelecus eigenmanni Jordan & Metz, 1913: 21, pl. 3 fig. 1 (type locality: Korea: Suigen, south of Seoul)

Cultriculus akoensis Oshima, 1920: 132, pl. 3 fig. 4 (type locality: Taiwan: Ako)

Hemicultur [sic] *clupeoides* Nichols, 1925c: 7 (type locality: China: Hunan: Lake Tungting)

Kendallia goldsboroughi Evermann & Shaw, 1927: 108 (type locality: China: Hangchow)

Remarks on systematics. Most records of the presence of *H. leucisculus* in Mongolia (Lake Buir) in fact are based on misidentification of *H. varpachovskii,* see list of citations in Sokolov (1983: 194). The two species are cited as present in Lake Buir by Baasanjav & Tsendayush (2001: 113),

Bogutskaya & Naseka (1996: 26) and Reshetnikov et al. (1997: 702).

Distribution. In Mongolia: Lakes Buir and Bayan. Outside Mongolia: from Amur to Red River drainages; Taiwan.

Hemiculter varpachovskii

Hemiculter varpachovskii Nikolski, 1904: 359 (type locality: Mongolia: Lake Buir)

Notes on systematics. This species was originally described from Lake Buir. It was later treated as a synonym of *Hemiculter leucisculus* (e.g., Berg, 1949: 365), as a subspecies of *Hemiculter bleekeri* (e.g., Wu et al., 1964: 89), as a subspecies of *Hemiculter leucisculus* (e.g., Sokolov, 1983: 194), as a synonym of *Hemiculter lucidus* (e.g., Bogutskaya & Naseka, 1996: 26), as a subspecies of *Hemiculter lucidus* (e.g., Chen, 1998: 170) or as a valid species (e.g., Baasanjav & Tsendayush, 2001: 112).

Baasanjav & Tsendayush (2001: 113) record the presence of a second species of *Hemiculter* in Lake Buir, as *H. leucisculus*. Bogutskaya & Naseka (1996: 26) and Reshetnikov et al. (1997: 702) record the presence of *H. leucisculus* and *H. lucidus* (including *H. varpachovskii* as a synonym) in Lake Buir. Sokolov (1983: 194) and Bogutskaya & Naseka (1996: 26) list a number of citations of *H. lucidus* as *H. leucisculus*. They consider that *H. leucisculus leucisculus*, *H. leucisculus lucidus* and *H. leucisculus varpachovskii* of Nikolski (1956: 290, 298, 301) are *H. lucidus* and that his *H. eigenmanni* in fact is *H. leucisculus*. To me the figures of *H. l. leucisculus* and *H. l. varpachowskii* show two distinct species.

The specimen I have examined from Lake Buir agrees with the description of *H. leucisculus varpachovskii* in Sokolov (1983: 194) and Chen (1998: 170, 484) and their drawings.

While Reshetnikov et al. (1997: 703) consider *H. lucidus* to be distributed from the Amur to southern China, Chen (1998: 484) report the presence of their two subspecies only in Lake Khanka [Xinkaihu; *H. lucidus lucidus*] and Lake Hulun Hu [Lake Dalai Nur, adjacent to Lake Buir; *H. lucidus varpachovskii*], that are at or very close to their respective type localities. The fish figured by Chen (1998: 169, 171) as *H. lucidus lucidus* and *H. lucidus varpachovskii* look quite different (head length, body depth, length of last simple dorsal ray) and do not appear conspecific. I tentatively retain *H. varpachovskii* as a valid species.

Distribution. In Mongolia: Khalkh River and Lake Buir. Outside Mongolia: Lake Hulun [Dalai Nur] in China and possibly upper Argun drainage in Russia and China.

Hypophthalmichthys molitrix

Leuciscus molitrix Valenciennes, in Cuvier & Valenciennes, 1844: 360 (type locality: not stated [China ?])

Leuciscus hypophthalmus Richardson, 1845: 139, pl. 63 fig. 1 (type locality: China: Canton)

Cephalus Mantschuricus Basilewsky, 1855: 235, pl. 7 fig. 3 (type locality: China: Beijing/Manchuria /Mongolia)

Hypophthalmichthys Basilewskii Kner, 1867: 350 (unnecessary replacement name for *Cephalus mantschuricus* Basilewsky, 1855: 235)

Abramocephalus microlepis Steindachner, 1869: 150 (type locality: China; also in Steindachner, 1870: 302)

? *Hypophthalmichthys Dabryi* Bleeker, 1871: 84 (not available, name listed in synonymy)

? *Hypophthalmichthys Dabryi* Bleeker, 1878: 210 (type locality: China: River Yang-tse-kiang)

Hypophthalmichthys Dybowskii Herzenstein, in Warpachowski & Herzenstein, 1888: 38 (type locality: Russia: Amur River/Amur River between Emoro and Chilusa [China: Fuchow; Berg, 1949: 846])

Pseudolaubuca clupeoides Duncker, 1904: 183, pl. 1 figs. 1–1a (type locality: Malaysia: Sungai Bungus near Kuala Lumpur [introduced])

Distribution. In Mongolia: not native. Outside Mongolia: from Amur to Xi Jiang [Pearl River] drainages.

Hypophthalmichthys molitrix was recorded a few times in Lake Buir (Sokolov, 1983: 205; Tsendayush, 1968) and a few were also caught from deep places in the upper part of Orshuun River and at the mouth of Khalkhiin River. This fish is commonly cultivated in China and these individuals have probably been stocked on the Chinese side of Lake Buir. It is unlikely to establish. Where introduced, *H. molitrix* usually survives only by stocking. Adults are migratory in large rivers. To successfully reproduce in the wild, they need to have large rivers, with deep water and a minimum speed; eggs are spawn at the surface and must remain drifting in the current until they hatch and the larvae settle. If the river is blocked or is too short, the eggs drop to the bottom and fail to develop.

Ladislavia taczanowskii

Ladislavia Taczanowskii Dybowski, 1869: 954, pl. 17 fig. 7 (type locality: Russia: Onon and Ingoda rivers)

Distribution. In Mongolia: in Rivers Onon, Balj and Khurkh. Outside Mongolia: Amur and Yalu drainages; Korea.

Leuciscus baicalensis

Squalidus baicalensis Dybowski, 1874: 388, **pl 5 fig. 1** (type locality: Russia: Lake Baikal [rare] and all its tributary streams)

Squalius suworzewi Warpachovski, **1889b: 17** (type locality: Kazakhstan: Irtysh River at Semipalatinsk) from Berg, 1949: 546

Squalius mehdem Warpachovski, 1897: 255, pl. 12 fig. 1 (type locality: Russia: Ob River at Atlym)

Remarks on systematics. The populations of dace (*Leuciscus* species) of Mongolia have been reported as *L. leuciscus baicalensis* by most authors (e.g., Sokolov, 1983: 142), as well as those from most of Siberia (e.g., Reshetnikov et al., 1997: 703, 2002: 277; Bogutskaya & Naseka, 2004: 85). Other authors consider them as a distinct species (e.g., Baasanjav & Tsendayush, 2001: 78, Luo, in Chen, 1998: 70 [but this is based only on populations from the Ertix drainage, whose identity is not yet clear, see below]).

I could not find studies of *L. leuciscus* sensu lato throughout its recorded range (Europe and northern Asia), posterior to that of Berg (1949). Berg recognized the Siberian populations as a subspecies *L. l. baicalensis* distinguished from the European *L. l. leuciscus* by a terminal mouth (vs. subterminal) and usually 9–10 branched rays in the anal fin (vs. 8). The mouth position recorded by Berg disagrees with his figure 313 which shows a fish from the Kolyma with a subterminal mouth, but much less than his figure 312 of a specimen from the Neva. Koch & Paepke (1998: 162) also considered that the populations of the Selenge have a subterminal mouth.

The difference in the number of branched anal-fin rays (9–10, vs. 8) is more significant. The number of anal-fin rays is usually very stable in species of the subfamily Leuciscinae, and differences in number of anal-fin rays have often been used as a reliable character for the diagnosis of species. Mitrofanov (2000) examined the variability of four meristic characters in *Leuciscus* populations from Kazakhstan and Europe and showed that they differ in the number of branched anal-fin rays and gill rakers. Unfortunately he did not give ranges but only mean values; nevertheless, as the number of examined individuals are high, and the values very distinctive, they show clear differences. The average number of branched anal-fin rays are between 7.5 and 8.1 for 7 European populations (11 to 226 specimens per population) and 9.2 to 10.3 for 16 populations of the Irtysh drainage in Kazakhstan (9 to 102 specimens per population. This corresponds to the 8 vs. 9–10 values indicated by Berg (1949).

Mitrofanov (2000) also recorded differences in gill-raker counts. The 7 European populations have mean values between 6.7 and 9.4, while the 16 Irtysh populations have mean values between 8.2 and 10.7.

These data show that the European and Siberian populations are diagnosably distinct and they are thus

distinct species, the European one being *L. leuciscus* and the Siberian one *L. baicalensis*. It remains to be shown that all Siberian populations are conspecific. The identity of the *Leuciscus* populations inhabiting the endorheic basins of Central Asia, from Aral to Balkash, requires clarification.

The analysis of the populations from westernmost Europe (Loire, Garonne and Adour drainages in France), earlier identified as *L. leuciscus*, shows that they are not conspecific with those from the rest of Europe (pers. obs.) and the same may possibly be the case when populations from the rest of the range are examined at a closer geographic resolution.

Distribution. In Mongolia: Selenge drainage. Outside Mongolia: rivers draining to the Arctic Ocean, from the Ob to the Kolyma.

Leuciscus dzungaricus

Leuciscus dzungaricus Paepke & Koch, in Koch & Paepke, 1998: 162, fig. 6 (type locality: Mongolia: Bulgan-Gol)

Remarks on systematics. This species was recently described from the Bulgan River shortly upstream of the Mongolia-China border (Koch & Paepke, 1998). Koch & Paepke distinguished it from *L. baicalensis* of the Selenge drainage in having, among others, more gill-rakers on the first gill arch (14–17, vs. 7–10). Berg (1949: 546) records 7–11 gill rakers in *L. baicalensis*, and this agrees with the data of Mitrofanov (2000) discussed above, under *L. baicalensis*.

Luo (in Chen, 1998: 70) records 9–12 gill rakers in the *L.* "*baicalensis*" specimens they examined from Lake Ulungur and the Ertix and Ulungur rivers, and this seems to show they are not conspecific with *L. dzungaricus*. Ulungur is the name of the Bulgan in China; it is a tributary of the Ertix. One reasonably expects that a species from the Bulgan stretch could also occur in the Ulungur stretch. If *L. dzungaricus* and *L. baicalensis* are effectively distinct, they possibly occur in sympatry and it cannot be ruled out that *L. dzungaricus* occurs in the uppermost part of Ulungur and *L. baicalensis* in the lowermost part of the Irtysh. Further downriver on the Irtysh (the name of the Ertix in Kazakhstan), V. P. Mitrofanov et al. (1987: 80) record 8–15 gill rakers in their *L.* "*baicalensis*" from the Irtysh and I. V. Mitrofanov (2000: 37) records mean values of 8.8–10.5 in 6 populations of the upper Irtysh drainage in Kazakhstan. Kimura et al. (1992: 94) examined 4 specimens of *Leuciscus* from the Ulungur, which they consider as possibly representing three species. They have 10–11 gill rakers.

Koch & Paepke (1998) mention other characters distinguishing the two species. *Leuciscus dzungaricus* has a terminal mouth (vs. subterminal in *L. baicalensis*), fewer vertebrae (usually 42, vs. 44), the presence (vs. absence) of a dense cover of small tubercles (or unculi ?) on the pectoral-fin rays, and some body proportions.

The figures in Anonym (1979: fig. 16) and Luo (in Chen, 1998: 70) show fishes more slender than the holotype of *L. dzungaricus*, with a slightly subterminal mouth. Luo records 41–42 vertebrae. The specimens reported by Kimura et al. (1992) have 42 or 43 vertebrae. The mouth appears terminal in their *L.* sp. 1, possibly subterminal in their *L.* sp. 2, and its position cannot be observed on their figure of *L.* sp. 3 but they report it as subterminal.

As the differences noted by Koch & Paepke allow to distinguish it from *L. baicalensis*, I consider *L. dzungaricus* as a distinct species, but clearly, direct examination and comparison of material from different localities along the Bulgan-Ertix-Irtysh is needed to confirm their distinctness, the limits of their ranges, and that the different authors used the same method for taking counts and measurements. The presence of two species in sympatry, or the existence of an introgression zone, or clinal variation within a single species should not be excluded.

Kimura et al. (1992) also record the presence of *L. bergi* in Ulungur River. It is distinguished from *L. baicalensis* and *L. dzungaricus* in having more

gill rakers on the first gill arch (22–24, vs. 7-–15). *Leuciscus bergi* was earlier known only from Lake Issy-Kul in Kirghizistan. Its presence in the Ulungur is surprising considering the very great distance between the two drainages, but, if confirmed, its presence in the Bulgan might be possible.

Distribution. In Mongolia: Bulgan River. Outside Mongolia: expected in Ertix drainage in China.

Leuciscus idus

Synonymy includes only nominal species whose type locality is in Asia

Cyprinus Idus Linnaeus, 1758: 324 (based on Linnaeus [1746: 121, n. 320, Cyprinus ... radiis 13], Artedi [1738: gen. 5 [6], syn, 14, spec. 6 [5], Cyprinus iride sublutea ...] and Gronovius [1754: 3, n. 13, idem]; type locality: "in Europae aquis dulcibus"; type material: NT)

Squalius oxianus Kessler, 1877: 124 (type locality: Uzbekistan: mouth of Amu Darya River and Kunja-Urgentsch in delta of Amu Darya River)

Idus oxianus Kessler, 1877: 129 (type locality: Uzbekistan: lower part of Amu Darya River)

Idus melanotus var. *orientalis* Sinitzyn, 1900: 45 (nomen nudum; Russia: Siberia: Lake Baikal) from Berg, 1912: 166

Leuciscus idus idus natio *sibiricus* Kirillov, **1958** (infrasubspecific, name not available; locality: Russia: Siberia: River Leny) from Kirillov, 1962: 47

Distribution. In Mongolia: Selenge drainage. Outside Mongolia: in Asia, from Ob to Lena drainages; Aral basin. In Europe, Baltic, Black, northern Caspian and North Sea basins, Atlantic basin southward to Loire drainage (France).

Reported from the Ertix in China (Anonym, 1979: 26; Kimura et al., 1992: 93; Luo, in Chen, 1998: 477) and thus presence in Bulgan River should not be excluded.

Leuciscus waleckii (Dybowski)

Idus Waleckii Dybowski, 1869: 953, pl. 16 fig. 5 (type locality: Russia: Onon and Ingoda rivers, Amur drainage)

Leuciscus farnumi Fowler, 1899: 179 (type locality: China: Tore River, tributary of Sungari River)

Leuciscus waleckii sinensis Rendahl, 1925: 197 (type locality: China: Shansi Prov.: Hoangho [Huang He River], Ping-lu-hsien/Honan Prov. [Henan]: Hsien-an-hsien; in title as *Leuciscus* (*Idus*) *waleckii sinensis*, on p. 197 as *Idus waleckii sinensis*)

? *Leuciscus mongolicus* Oshima, **1926: 103** (type locality: China: Jehol: Chih-fang [from Mori, 1934: 23]; secondary junior homonym of *Squalius mongolicus* Kessler, 1876: 21 when placed in *Leuciscus*; see also Oshima, 1929 (Abstracts): 83)

Leuciscus brevirostris Mori, **1927: 31** (type locality: China: Manchuria: Hun River, tributary of Liao River)

Leuciscus waleckii tumensis Mori, 1930: 44 (type locality: Korea: Mo-san and Kai-nei)

Leuciscus (*Idus*) *waleckii* Joholensis Kimura, 1934: 13, pl. 3 fig. 1 (type locality: "Eastern Mongolia" [China: Hebei Prov.]: Cheng-the [Chengde], River Je-Ho)

? *Leuciscus oshimae* Fowler, 1958: 12 (replacement name for *Leuciscus mongolicus* Oshima, **1926: 103**)

? *Leuciscus jeholi* Howes, 1984: 291 (unnecessary replacement name for *Leuciscus mongolicus* Oshima, **1926: 103**, a junior secondary homonym of *Squalius mongolicus* Kessler, 1876: 21 when placed in Leuciscus)

Remarks on systematics. The *Leuciscus* population from Tumen River (border between China and Korea) is considered as a distinct subspecies *L. w. tumensis* by Luo (in Chen, 1998: 67), as a synonym of *L. waleckii* by Kim (1997: 251), and as probably a valid species *L. tumensis* by Bogutskaya & Naseka (2004: 86). Populations from upper Huang Ho earlier referred to as *L. waleckii* are considered as a distinct species *L. chuanchicus* by Luo (in Chen, 1998: 68).

Howes (1984: 289) established the genus *Genghis*, with *Squalius mongolicus* Kessler, 1876 as type species. Howes' *Genghis mongolicus* is considered to be misidentified *L. chuanchicus* by Luo (in

Chen, 1998: 68), who treated it as a species of *Leuciscus*; they listed *L. mongolicus* as a synonym of *L. waleckii*. This would make *Genghis* a junior synonym of *Leuciscus*. Howes listed a number of characters distinguishing his *Genghis* from *Leuciscus* and which suggest that the identity of the type species of *Genghis* is not yet clear.

Also there seem to be confusion as to the identity of *L. waleckii* and *L. mongolicus*. Indirectly, Howes (1984: 291) considered that the drawing of *Idus waleckii* in Dybowski (1869: pl. 16 fig. 5) shows a species distinct of that of *Squalius mongolicus* in Kessler (1876: pl. 2 fig. 2). Indeed, the two differ in head shape, shape of caudal peduncle and eye size. The size of the eye is the character used in Luo's (in Chen, 1998: 478) key to distinguish *L. waleckii* from *L. chuanchicus* (6 times or less in head length, vs. 6 or more). Berg (**1912: 92, 110**, 1949: 547) and Banarescu (1970: 48) considered that *S. mongolicus* and *S. chuanchicus* are synonyms. Bogutskaya (1994: 617) examined the holotypes of *S. mongolicus* (ZISP 2472) and *S. chuanchicus* (ZISP 2483) and found them to be distinct species. Berg (**1912: 92, 110**) gave precedence to the name *S. mongolicus* over the name *S. chuanchicus.*

The type locality of *Squalius mongolicus* is given as "a southern Lake Dalai-nor (no outlet)" by Berg (1949: 547), as "Dalai Nor, Huang-Ho drainage" by Banarescu (1970: 47), and as "Hu-lun [Dalai-Nor] Lake, China" by Eschmeyer (1998: 1114). There are a number of lakes named Dalai Nor in Mongolia and northern China. Hu Lun is one of them, in Amur drainage, and connected with Lake Buir in Mongolia. In fact, the type locality seems to be the Dalai Nur located at 43°18'00"N 116°37'00"E, as is clear from the map in Przewal'skii (1876) whose expedition collected the specimens. It is in an endorheic basin in Liaoning Province of China. It is not connected with Huang He drainage. Maps suggest it might have had an earlier connection with Amur or Liao drainages.

Distribution. In Mongolia: in Rivers Kherlen, Onon, Balj, Adraga, Khalkh, Orshuun, and Numrug, and in Lake Buir. Outside Mongolia: from Amur to Huang Ho drainages.

Microphysogobio anudarini

Microphysogobio tungtingensis anudarini Holcik & Pivnicka, 1969: 8, figs. 1–3 (type locality: Mongolia: Lake Buir-Nur [Lake Buir])

Remarks on systematics. The *Microphysogobio* species from Lake Buir was described as *M. tungtingensis anudarini* by Holcik & Pivnicka (1968: 8). Banarescu & Nalbant (1973: 263) considered it one of five subspecies of *M. tungtingensis*. The other subspecies were *M. t. amurensis*, *M. t. suifuensis*, *M. t. uchidai* and *M. t. tungtingensis*.

Microphysogobio t. suifuensis from the middle and upper Yangtze is considered a valid species by Banarescu (1992: 326) and as a synonym of *M. kiatingensis* by Yue (in Chen, 1998: 358); this will not be discussed here, as all authors agree at least that it is not *M. tungtingensis*. *Microphysogobio t. uchidai* from Korea is considered as a subspecies of *M. tungtingensis* by Banarescu (1992: 326), as a valid species by Kim (1997: 244) and as a synonym of *M. yaluensis* by Kim & Yang (1999: 6). This later conclusion is followed here.

Microphysogobio t. amurensis from the Amur drainage is considered as a synonym of *M. tungtingensis* by Bogutskaya & Naseka (2004: 68) and Reshetnikov et al. (2003: 283), as a subspecies by Banarescu (1992: 326) and Reshetnikov et al. (1997: 703), as a valid species by Baasanjav & Tsendayush (2001: 104), and as a valid species in the genus *Rostrogobio* by Yue (in Chen, 1998: 372). *Microphysogobio t. anudarini* from Lake Buir is treated as a synonym of *M. amurensis* by Baasanjav & Tsendayush (2001: 104) and Sokolov (1983: 181; but placed in *Rostrogobio*) but is overlooked in the Chinese literature. *Microphysogobio t. tungtingensis* inhabits the lower Yangtze.

Yue (in Chen, 1998: 358, 372) places the Yangtze and Amur populations in two different genera. In the key (p. 490) she distinguishes them by the position of the oval pads in the lower lip (close together in *Microphysogobio*, vs. slightly separate in *Rostrogobio*), the scalation of the belly (naked only in front of the pectoral fins, vs. naked in

front of the pelvic fins), and the shape of the caudal peduncle (short and deep, vs. slender). Without other information and without access to comparison material, it is difficult to see these characters as distinguishing two genera and I retain both in *Microphysogobio*. But these characters and the figures and descriptions of the two populations in Yue (in Chen, 1998) show two species grossly distinguished by snout shape, body depth, shape of caudal peduncle, lateral line scale counts; added to the widely disjunct ranges, they are distinct species.

Holcik & Pivnicka (1969: 10) report the following differences between the Lake Buir (*anudarini*) and the Amur populations (*amurensis*): three simple anal-fin rays in Lake Buir, vs. two in Amur [this last count is most likely erroneous]; distance between anus and anal-fin origin 17.8–19.6 % SL, vs. 23.0–29.5; and "some other features". The data for the Amur population are from Nikolski (1956). In the four specimens from Lake Buir that I examined the distance between the anus and the anal-fin origin is 19.0–20.8 % SL. On the basis of this difference, I tentatively retain *M. anudarini* as a distinct species, pending examination and direct comparison with material of *M. amurensis*.

Berg (1949: 669) reported the distribution of *M. amurensis* as "middle and lower Amur as far upstream as Blagoveshchensk and further" but it has since been collected in Shilka, Ingoda and Onon systems in Russia (N. Bogutskaya and A. Naseka, pers. comm.).

Distribution. In Mongolia: Lake Buir. Outside Mongolia: Probably in Lake Hu-Lun, China, and possibly elsewhere in upper Amur drainage.

Oreoleuciscus

Oreoleuciscus Warpachowski, 1889a: 27 (type species: *Chondrostoma potanini* Kessler, 1879: 306, by subsequent designation by Berg, **1912: 81**). Gender masculine.

Acanthorutilus Berg, **1912: 81** (type species: *Oreoleuciscus dsapchynensis* Warpachowski, 1889a: 61, by original designation). Gender masculine.

Remarks on systematics. The genus *Oreoleuciscus* is almost endemic to Mongolia. Outside Mongolia, it is known only in the Russian part of the Lake Uvs basin, and in the upper reaches of Chuya (near Kosch-Agach) and Chulyshman rivers, two tributaries of Ob River in Tuva (Russia).

The taxonomical history of *Oreoleuciscus* is intricate. It has been investigated by various authors with various successes, and with very different and often conflicting theoretical approaches. It is not the place here to discuss all these studies in detail and I will only give a very raw summary.

In recent years, some Russian and Mongolian authors recognized a single species with a variety of forms, or morphs, or ecotypes. These are mainly ecologically-orientated publications, and this probably explains the problems with the taxonomic concepts and with the nomenclature. I could not find information on the species concept they used or a definition of what they call a 'form'. Others have recognized some of these "forms" as valid species.

Sokolov (1983: 146–154; 1985: 87–120) recognized a single species, *O. potanini*, with 4 'forms': dwarf, herbivorous, piscivorous and sharp-snout. Baasanjav & Tsendayush (2001: 69–77) recognized 3 species, *O. potanini* (for the herbivorous 'form'), *O. pewzowi* (for the piscivorous 'form') and *O. humilis* (for the dwarf 'form'); they do not mention the sharp-snout 'form'. Bogutskaya (2001) reviewed the literature, the systematics and the nomenclature of the genus and provided morphological and anatomical descriptions. She recognized three species: *O. humilis* (for the dwarf 'form'), *O. potanini* (for the herbivorous and the sharp-snout 'forms') and *O. angusticephalus* (for the piscivorous 'form'). Bogutskaya did not have access to usable material of the sharp-snout 'form' and this is apparently the reason why she did not recognize it as distinct.

My examination of a variety of specimens and of the literature makes me largely agree with the

taxonomic and nomenclatural conclusions of Bogutskaya (2001). She recognized two species (*O. potanini*, *O. angusticephalus*) in the lakes and rivers of the Great Lakes Basin and one species (*O. humilis*) in the Gobi Lakes Valley, Lake Uvs basin and isolated localities of the Selenge drainage. The material I examined includes samples with a modified dorsal fin that constitute a distinct species, for which *O. dsapchynensis* seems to be the valid name (see below for reservations). Unfortunately, I have not been able to access material of the sharp-snout 'form' figured by Sokolov (1983: 151) and Golubtsov et al. (1999: 891); its striking, unique morphology makes it difficult to decide whether it is conspecific with *O. dsapchynensis* or belongs to an additional species. For the time being, I tentatively treat it as conspecific with *O. dsapchynensis*.

Bogutskaya's conclusions are supported by morphological data. Sokolov (1983) summarized the then available information on the biology of the different 'forms'. The presence in sympatry (in different combinations in different lakes) of *O. potanini*, *O. angusticephalus*, *O. dsapchynensis* and/or the sharp-snout 'form', with different feeding habits, and habitat preferences are additional indications that they are distinct species.

But the situation is possibly more complex in the lakes of the Great Lakes Basin. Although I have not examined as much material as Bogutskaya did, those specimens I examined are additional to hers and partly from other localities and they suggest that the exact distribution of the different species still requires investigation, and that the populations of some lakes escape the pattern presently recognized. For example, some samples from Lake Airag share the diagnostic characters of *O. humilis* (see below), a species otherwise not known in the Great Lakes Basin. Lakes Uureg (an endorheic basin adjacent to Khovd drainage and Lake Uvs basin) and Achit have populations sharing some of the characters of *O. dsapchynensis*.

Some of the authors who contributed to the study and discussion of 'forms' of *Oreoleuciscus* (e.g., Sokolov, 1983, 1985; Borisovets et al., 1985; Dgebuadze, 1985; Golubtsov et al., 1999) also studied the Lake Tana barbs in Ethiopia (e.g., Mina et al., 1996, 1998) where they also considered as 'forms' or 'morphotypes' what a later taxonomic analysis demonstrated to be a species flock of 15 species (Nagelkerke, 1997; Nagelkerke & Sibbing, 1997, 2000). If 'form' and 'morphotype' have consistent definitions in their different works, this suggests that use of appropriate taxonomic procedures to the study of the *Oreoleuciscus* 'forms' case *might* lead to a greater taxonomic diversity.

Oreoleuciscus angusticephalus

Oreoleuciscus angusticephalus Bogutskaya, 2001: 35, fig. 7 (type locality: Mongolia: channel between Lakes Khirgis-Nur [Lake Khyar-gas] and Airik-Nur [Lake Airag])

Remarks on biology and systematics. This is the piscivorous 'form' of Sokolov (1983: 149, 1985: 99) and the *O. pewzowi* of Baasanjav & Tsendayush (2001: 72) and various authors. Bogutskaya (2001: 28) showed that the holotype of *O. pewzowi* in fact is a specimen of *O. potanini*, thus the name *O. pewzowi* is a junior synonym and cannot be used for the piscivorous 'form'. There was no other name available for this species and a new name (*O. angusticephalus*) had to be created.

The biology of *O. angusticephalus* is reported by Sokolov (1983: 147, 1985: 88) and summarized by Bogutskaya (2001: 40). It is an exclusively lacustrine species, reaches a size up to 1000 mm SL, matures around 200–240 mm SL, and lives up to at least 40 years. Juveniles feed on plankton, adults prey on fishes. The species spawns in May-June.

Distribution. Endemic to Mongolia: lakes of the Great Lakes Basin (Khar-Us, Khar, Nogoon, Khyargas, Achit, Tolbo, Uureg and Tal).

Oreoleuciscus dsapchynensis

? *Leuciscus Pewzowi* Herzenstein, 1883: 244 (nomen nudum; locality: Mongolia: Tchon'-Kharikha [Tchon-Kharnkha on Herzenstein's

map; Tchonocharajch-Gol, channel between Lakes Khar and Khar-Us])

? *Oreoleuciscus Pewzowi* Warpachowski, 1889a: 41, pl. 1 fig. 2 (type locality: Mongolia: Tschon-Charicha [Tchon-Kharikha; Tchonocharajch-Gol, channel between Lakes Khar and Khar-Us])

? *Oreoleuciscus Pewzowi* var. *altus* Warpachowski, 1889a: 45, pl. 1 fig. 3 (type locality: Mongolia: River Tatche-teli [Tatchen-Tel, a channel between Lake Khar and Zavkhan River])

? *Oreoleuciscus Pewzowi* var. *longicaudus* Warpachowski, 1889a: 48, pl. 3 fig. 3 (type locality: Mongolia: River Tatche-teli [Tatchen-Tel, a channel between Lake Khar and Zavkhan River])

Oreoleuciscus dsapchynensis Warpachowski, 1889a: 61, pl. 2 fig. 2 (type locality: Mongolia: Dsapchyn River [Zavkhan River])

Remarks on biology and systematics. I tentatively identify as *O. dsapchynensis* material from Lake Airag that I examined in Museum für Naturkunde in Berlin (ZMB). Diagnostic features include the narrow head with long snout, a relatively large eye flushed with the dorsal profile of the head, frontal with a well marked shelf above orbit, the simple dorsal-fin rays very long, rigid almost to tip, segmented only close to tip, branched rays 1–2 rigid, not separated by membranes or only by narrow membranes, and slender caudal peduncle longer than head. The narrow head, the large eye, the shelf, the length of the caudal peduncle, the structure of the last simple ray are visible in the figure of the holotype of *O. dsapchynensis* in Warpachowski (1889a: pl. 2) or described by Bogutskaya (2001: 29). The shape of the anterior branched dorsal-fin rays is not very distinct in my copy of Warpachowski's plate, but the membranes seem narrower than in the figures of the other species. I tentatively conclude that the holotype of *O. dsapchynensis* is conspecific with this ZMB material.

Oreoleuciscus sp. 'sharp snout' or 'long nose' figured by Sokolov (1983: 151) and Golubtsov et al. (1999: 891) has a uniquely shaped head among *Oreoleuciscus* populations and it is very difficult to follow Sokolov et al. in treating it as mere 'form' of *O. potanini*, without a proper demonstration (and without a clear definition of the word 'form'). This 'form' is found only in Lakes Khar-Us, Khar, Nogoon. On the other hand, it has some similarity with the *O. dsapchynensis* that I examined from Lake Airag. Unfortunately I have not been able to examine material of the sharp snout 'form' from Lakes Khar-Us, Khar or Nogoon and cannot conclude on their conspecificity with *O. dsapchynensis*.

The biology of *O. dsapchynensis* is described by Sokolov (1983: 150, 1985: 110). It reaches a maximum size of 280 mm and matures around 110 mm. It inhabits lakes and the lowermost part of River Khovd. It spawns in May-June. It feeds on phytoplankton, plants (especially *Chara*) and invertebrates.

The figures of *O. pewzowi*, *O. p. longicaudus* and *O. p. altus* in Herzenstein (1889: pl 1) show fishes with relatively large eye, flushed with dorsal profile of head, relatively slender caudal peduncle, and slightly falcate dorsal fin. But the branched dorsal rays seem 'normally' shaped, with membranes between them. Bogutskaya (2001: 32, 33) already discussed their head shape and other details and commented that some of them might be hybrid between *O. potanini* and *O. angusticephalus*. Apparently, the material of the sharp-snout 'form' available to her was not enough to suggest the hypothesis that they represent a distinct species. I tentatively include these 3 nominal species in the synonymy of *O. dsapchynensis*.

Distribution. Endemic to Mongolia, presently known only from Lake Airag and Zavkhan River. The sharp-snout 'form' is found only in Lakes Khar-Us, Khar, Nogoon.

Oreoleuciscus humilis

Oreoleuciscus humilis Warpachowski, 1889a: 50, pl. 2 fig. 3 (type locality: Mongolia: Ulaangom [in basin of Lake Uvs])

Oreoleuciscus humilis var. *phoxinoides* Warpachowski, 1889a: 54, pl. 2 fig. 4 (type locality:

Mongolia: Ulaangom [in basin of Lake Uvs]/ Russia: Tuva: Kosch-Agach)

? *Oreoleuciscus pewzowi* natio *polybranchialis* Gundriser, 1962: 250, figs. 1–2 (infrasubspecific, name not available; locality: Russia: Tuva: Lake Tere-Khol, south of Erzinskiy District [Uvs basin])

? *Oreoleuciscus potanini* infraspecies *fluviatilis* Gundriser, 1962: 252, fig. 3 (type locality: Russia: Tuva: Erzin River (tributary of Tess-Khem) at Erzin, also Naryn and Tess-Khem rivers [Lake Uvs basin])

Remarks on biology and systematics. Two 'eco-morphological forms' are recognized in *O. humilis*, dwarf 'form' and lake 'form' (Sokolov, 1983: 148, 1985: 88; summarized by Bogutskaya, 2001: 21). The dwarf 'form' occurs in shallow lakes and their tributaries. It reaches a maximum length of 210 mm SL, matures at about 70 mm, and feeds mainly on invertebrates. The lake 'form' inhabits only lakes. It reaches up to 550 mm SL, matures at about 200 mm SL; by about 200 mm SL, it becomes piscivorous. Both 'forms' spawn in river deltas and in flood plains during floods, in June-August, but the dwarf 'form' slightly earlier than the lake 'form'.

In the lakes of the Gobi Lakes Valley, which may dry out periodically, the two 'forms' disappear from the lakes and only the dwarf 'form' survives in the rivers from which it would re-invade the lakes once they are filled again, and re-develop the two 'forms' (Dgebuadze, 1995). The actual data supporting this hypothesis have apparently not been published, and a number of questions remain unanswered, at least to the reader. Especially, it would be very useful to have a detailed list of the observation sites, the dates at which observations have been made at each site, and the details of the observations. The list of localities and dates on p. 239 suggests the above scenario is based on isolated visits at the different lakes and rivers and that they were not all visited the same year (e.g., Lake Bon Tsagaan: summer time of wet period of 1975, 1982 and 1983, summer time of dry period of 1986 and 1988; and its tributary Baidrag River: summer time of wet period of 1975, 1979, 1980 and 1982, summer time of dry period of 1988).

The phenomenon is very interesting and a precise description of the yearly cycles at precise localities is needed to test this hypothesis and to show that the pattern is exactly the same in the different lakes. An explicit description of the ontogeny of the two 'forms' and of the morphology of the juveniles (separately for each lake basin) should confirm that the juveniles of the two 'forms' cannot be distinguished.

Although the species is not present in the Great Lakes Basin according to Bogutskaya (2001), I have examined specimens from Lake Airag (ZMB 24046, 29051) that agree with *O. humilis* in having flexible simple dorsal rays and 7½ branched dorsal-fin rays.

Distribution. In Mongolia: basin of Lake Uvs (e.g., Tes River, Lake Sangiin Dalai); lakes and rivers of Gobi Lakes Valley (Lakes Taatsyn Tsagaan, Boon Tsagaan and Orog, Baydrag and Ongiin rivers); a few isolated populations in Selenge drainage (e.g. Lake Ust). Outside Mongolia: basin of Lake Uvs; upper Chuya River near Kosch-Agach, Tuva (Ob drainage), but this last locality needs confirmation by fresh material.

Oreoleuciscus potanini

Chondrostoma Potanini Kessler, 1879: 306 (type locality: Mongolia: "Quellzuflussen des Daingol" [source tributaries of Daingol Nuur = Lake Dayan, 48°23'00"N 88°50'00"E]; repeated in Kessler, 1880: 267)

Leuciscus latifrons Herzenstein, 1883: 244 (nomen nudum; locality: Mongolia: Ulaangom [erroneous, Bogutskaya, 2001: 33])

Oreoleuciscus Potanini var. *recurviceps* Warpachowski, 1889a: 38, pl. 3 fig. 2 (type locality: Mongolia: probably Naryn River in upper Kungui system [Khüngiy] [Bogutskaya, 2001: 23])

Oreoleuciscus similis Warpachowski, 1889a: 57, pl. 2 fig. 1 (type locality: Mongolia: Dsapchyn River [Zavkhan River])

Oreoleuciscus Herzensteini Warpachowski, 1889a: 65, pl. 1 fig. 1 (type locality: Mongolia: upper Kungui River [Khüngiy River])

Oreoleuciscus gracilis Warpachowski, 1889a: 68, pl. 1 fig. 4 (type locality: Mongolia: Ulaangom [erroneous, Bogutskaya, 2001: 33])

? *Oreoleuciscus choerocephalus* Warpachowski, 1889a: 72, pl. 3 fig. 4 (type locality: Mongolia: Lake Airik Nor [Lake Airag]; misspelled once *hoerocephalus* in caption to pl. 3)

Oreoleuciscus ignatowi Nikolski, 1903: 188 (type locality: Russia: Tuva: Lake Tschoëbok-kul [Tscheibok-kol or Choebak-kol, Baschkaus drainage], Altai Range)

Oreoleuciscus warpachowskii Dulmaa, 1999: 213 (nomen nudum)

Remarks on biology and systematics. Biology is described by Sokolov (1983: 148, 1985: 112) and summarized by Bogutskaya (2001: 33). This species inhabits lakes and stretches of rivers with slow currents. It feeds mostly on aquatic vegetation and invertebrates, but larger individuals also eat fishes. Maximum known size about 500 mm SL. Mature around 180 mm SL, but much smaller in some populations. They spawn in May-August, in rivers and along lake shores.

The name *Oreoleuciscus warpachowskii* is cited by Dulmaa (1999: 213) but to my knowledge this name does not exist. It is a nomen nudum in this paper. It is probably an error from the use of the generic name *Oreoleuciscus* and the name of its nomenclatural author Warpachowski.

Bogutskaya (2001) includes the sharp-snouted 'form' in her *O. potanini*. I consider that it is a distinct species, *O. dsapchynensis*.

Distribution. In Mongolia: lakes and rivers of the Great Lakes Basin and Khovd and Zavkhan drainages (Lakes Khar, Khar-Us, Nogoon, Dorgon, Airag, Kyar-gas, Telten, Bayan, Hoton, Horgon, Horomdog, Dayan; Rivers Khovd, Zavkhan, Khüngiy). Outside Mongolia: upper reaches of Chuya (near Kosch-Agach) and Chulyshman, two tributaries of Ob River in Tuva.

Phoxinus cf. *phoxinus*

? *Cyprinus isetensis* Georgi, 1775b: 621 (available by indication to Lepechin, 1771a: 491, pl. 26 figs. 2–3; type locality: Russia: Siberia: Catharinopolis)

? *Cyprinus Galian* Gmelin, 1789: 1421 (based on Lepechin, 1771a: 491, pl. 26 figs. 2–3; **1772: pl. 9 figs. 4–5**; type locality: Russia: Siberia: Catharinopolis)

Remarks on systematics. A number of species earlier placed in *Phoxinus* are now in the genera *Rhynchocypris* and *Eupallasella*, partly following Howes (1985).

The species *P. phoxinus* has traditionally been considered as extending throughout Europe and northern Eurasia, reaching eastwards to Anadyr and Korea (Berg, 1949; Kottelat, 1997), but recent studies have shown that the European populations in fact represent several species (Kottelat, unpublished). A detailed study of Asian populations is missing. My examination of material of *P.* "*phoxinus*" from the Selenge and Kherlen drainages shows that they are immediately distinguished from the various European species known to me by a more slender caudal peduncle and also by general appearance. These two populations also differ from each other, suggesting that they are distinct species. But, considering that *Phoxinus* are possibly the most common fish in Mongolia, present in most water bodies, and with a wide, continuous range in northern Asia, it is impossible to reach conclusions on their distinctness or conspecificity without examining and comparing material from many more localities in the same drainages. Meanwhile they can only be treated as conspecific.

These populations are not conspecific with the European species which is now called *P. phoxinus* but their actual name is not clear. A number of nominal species now treated as synonyms of *P. phoxinus* have been described from Asia and the identity of each has to be investigated. The earliest name proposed for Siberian *Phoxinus* outside Altai are *Cyprinus isetensis* (and its objective synonym *C. galian*), described using material from Ekaterinenburg. Without material I cannot comment on whether it is distinct from *P. phoxinus* or not, or from the Selenge and Kherlen populations. I therefore retain all as *P.* cf. *phoxinus*.

The Altai populations are discussed under *P. ujmonensis*. I have not researched the status of the Balkash population for which the name *P. laevis balchaschanus* would be available; it is not unreasonable to expect that it would be distinct. Dulmaa (1973: 64, table) lists the presence of the genus *Phoxinus* in the Great Lakes depression. Baasanjav & Tsendayush (2001: 87) explicitly state that there is no *Phoxinus* in that basin.

Distribution. In Mongolia: Selenge, Onon, and Kherlen drainages, lakes of Darkhad depression. Outside Mongolia: exact range and number of species not clear, see discussion above.

Phoxinus ujmonensis

? *Cyprinus rivularis* Pallas, 1773: 717 (type locality: Russia: Siberia: small streams in the Altai range [p. 616: Zmeinogorsk (51°11'N 82°14'E), basin of Alei River])

Phoxinus laevis ujmonensis Kashchenko, 1899: 144 (type locality: Russia: Altai: River Katun at Nizhnii Uimon, Ob drainage)

Phoxinus laevis mikrosquamatus Kashchenko, 1899: 145 (type locality: Russia: Altai: Lake Karalachinskoie in Argut drainage [a tributary of Katun River])

Phoxinus saposchnikowi Kashchenko, 1899: 146 (type locality: Russia: Altai: lake on plateau of Ukëk, source of River Kalguty, in Argut drainage [a tributary of Katun Argut River])

Phoxinus czekanowskii sedelnikowi Berg, 1908: 226 (type locality: Kazakhstan: Lake Saissan [Zaisan], upper Irtysh basin, Karasuat-Busen)

Remarks on systematics. A number of nominal species of *Phoxinus* have been described from the Altai region (upper Irtysh and upper Ob drainages). Until recently, they have been considered as synonyms of *P. phoxinus*. See under *P.* cf. *phoxinus* for discussion.

Two populations of *Phoxinus* are known from China. Chinese authors (e.g. Luo, in Chen, 1998: 76, 478) use the name *P. phoxinus* for the Amur population (*P.* cf. *phoxinus* above) and the name *P. ujmonensis* for the population of the Ertix (the name of the upper Irtysh in China). Sokolov (1983: 157) and Baasanjav & Tsendayush (2001: 86) record *P. phoxinus* from the Bulgan, a tributary of the Ertix. I have not seen material from the Bulgan in Mongolia, but I have examined in the Institute of Zoology, Chinese Academy of Sciences, Beijing, material from the Ulungur (the name of the Bulgan in China) at Ertai, about 80 km downstream of the Mongolia-China border, which I assume are conspecific with those of the Mongolian stretch.

I compared the Bulgan material side by side with material from the Selenge drainage (Alag Tsar). Although time was not sufficient to make comparison on a large number of characters on many specimens, striking differences were observed. They differ in having a deeper body (20.4–25.8 % SL in the Ertix material, vs. 16.4–20.2 in the Selenge material), deeper caudal peduncle (9.1–10.8 % SL, 2.5–2.8 times in its length, vs. 7.2–8.5 and 3.2–3.6, respectively), possibly less developed sexual dimorphism, and may have a different colour pattern in life. I consider that they are different species.

It is presently impossible to know how many of the five nominal species described from the Altai are valid, and which will be the valid name for the Bulgan species. In order to avoid creating greater confusion I follow current usage and retain P. *ujmonensis*. *Phoxinus laevis mikrosquamatus* and *P. saposchnikowi* are presently considered as simultaneous junior subjective synonyms of *P. ujmonensis*, and precedence is given to *P. ujmonensis*. *Cyprinus rivularis* is a potential senior synonym, but this can be clarified only when fresh material from the type locality and additional samples from the upper Irtysh become available.

It also remains to be checked whether the Ertix material is conspecific with the material from Altai (Ob drainage). The figure of the lectotype in Berg (1949: 592, fig. 349) shows a fish with a more slender body (body depth 16 % SL; depth of caudal peduncle 10 % SL, 2.8 times in its length).

Distribution. In Mongolia: Bulgan drainage. Outside Mongolia: upper Irtysh and upper Ob drainages in China, Kazakhstan and Russia.

Pseudaspius leptocephalus

Cyprinus leptocephalus Pallas, 1776a: 207 (nomen nudum), 703 (type locality: Russia: "stony and fast flowing streams draining to the eastern Ocean" [Onon River, p. 207])

Distribution. In Mongolia: in Rivers Onon, Kherlen and Khalkhiin; Lake Buir (rare). Outside Mongolia: Amur drainage, Sakhalin Island.

Pseudorasbora parva

Leuciscus parvus Temminck & Schlegel, 1846: 215, 216, pl. 102 fig. 3 (type locality: Japan: Nagasaki)

Leuciscus pusillus Temminck & Schlegel, 1846: 216, pl. 102 fig. 4 (type locality: Japan: Nagasaki)

Fundulus virescens Temminck & Schlegel, 1846: 225, pl. 102 fig. 6 (type locality: Japan: Nagasaki)

Micraspius mianowskii Dybowski, 1869: 954 (type locality: Russia: Onon and Ingoda basins [numerous localities listed])

Pseudorasbora altipinna Nichols, 1925c: 5 (type locality: China: Sichuan: Yen-ching-kao)

Pseudorasbora fowleri Nichols, 1925c: 5 (available by indication to *Aphyocypris chinensis* of Fowler, 1924c: 383, fig. 1; type locality: China: Anhwei: Ningkwo [Suancheng])

Pseudorasbora depressirostris Nichols, 1925c: 5 (type locality: China: Shansi: Chin-ssu)

Pseudorasbora monstrosa Nichols, 1925c: 6 (type locality: China: Fukien: near Yenping)

Pseudorasbora parva parvula Nichols, 1929: 8, fig. 5 (type locality: China: Shantung: Tsinan)

Pseudorasbora parva tenuis Nichols, 1929: 10, fig. 6 (type locality: China: Shantung: Tsinan)

Distribution. In Mongolia: in Rivers Onon, Kherlen, Ulz, Khalkh, and Orshuun and in Lake Buir. Outside Mongolia: from Amur drainage to northern Vietnam; Japan; Taiwan; Hainan.

Rhodeus sericeus

Cyprinus sericeus Pallas, 1776a: 208 (nomen nudum), 704 (type locality: Russia: Dauria [Onon River; p. 208])

Remarks on systematics. *Rhodeus amarus* has long been considered a subspecies of the East Asian *R. sericeus* (e.g., Holcik & Duyvené de Wit, 1964; Arai & Akai, 1988: 211). The two species are broadly disjunct, *R. amarus* occurring (roughly) in central and eastern Europe and northern Asia Minor, and *R. sericeus* in the Amur basin and Sakhalin Island. They are treated here as distinct species because they are distinct lineages separated for an estimated 2 to 4 million years (Holcik & Jedlicka, 1994: 160) by about 4000 km and they are diagnosable (Kottelat, 1997: 75).

Distribution. In Mongolia: in Lake Buir and in Rivers Kherlen, Onon, Khalkh and Orshuun. Outside Mongolia: from Amur drainage to southern China, Sakhalin Island.

Rhynchocypris

Rhynchocypris Günther, 1889: 225 (type species: *Rhynchocypris variegata* Günther, 1889: 225, by monotypy). Gender feminine.

Lagowskiella Dybowski, 1916: 101, 106 (as subgenus of *Phoxinus* Rafinesque, **1820b: 236**; type species: *Phoxinus lagowskii* Dybowski, 1869: 953, by original designation; subjective simultaneous synonym of *Czekanowskiella* Dybowski, 1916: 102, 109; first reviser [apparently Howes, 1985: 63] gave precedence to *Lagowskiella*). Gender feminine.

Czekanowskiella Dybowski, 1916: 102, 109 (as subgenus of *Phoxinus* Rafinesque, **1820b: 236**; type species: *Phoxinus czekanowskii* Dybowski, 1869: 953, by original designation; subjective simultaneous synonym of *Lagowskiella* Dybowski, 1916: 101, 106; first reviser [apparently Howe, 1985: 63] gave precedence to *Lagowskiella*). Gender feminine.

Moroco Jordan & Hubbs, **1925: 180** (type species: *Pseudaspius bergi* Jordan & Metz, **1913: 22** by original designation). Gender masculine.

Rhynchocypris czekanowskii

Phoxinus Czekanowskii Dybowski, 1869: 953 (type locality: Russia: Onon and Ingoda rivers, Amur drainage [Ila Bukdurga on Table; lakes

in valley of Ili River; Berg, 1949: 579]; spelled *crebanowskii* in Table, an obvious inadvertent error [also corrected in Dybowski, 1872: 222])

Phoxinus Strauchi Warpachowski, 1887a: 534 (type locality: Russia & Kazakhstan: tributaries of Irtysh River [near Tyumen; Berg, 1949: 579]; also in Warpachowski, 1887b: 687)

Phoxinus sublaevis Warpachowski 1887a: 535 (type locality: Russia: tributaries of Lena River [Vilyui River; Berg, 1949: 579]; also in Warpachowski, 1887b: 689)

Phoxinus czekanowskii ignatowi Berg, **1907a: 209** (type locality: Kazakhstan: mouth of Seletny River into Lake Seletytengiz [Berg, 1949: 581])

Phoxinus czekanowskii czerskii Berg, **1912: 225, pl. 1 figs. 6, 6a** (type locality: Russia: Lake Khanka basin)

Phoxinus czekanowskii suifunensis Berg, 1932: 361 (type locality: Russia: Suifun and Kangauz [rivers near Vladivostok])

Remarks on systematics. Species of *Rhynchocypris* were earlier placed in *Phoxinus*. *Phoxinus* is quite a heterogeneous assemblage and a number of authors have tried to recognize and name a number of lineages (genera or subgenera) within the genus (e.g., Dybowski, 1916; Gasowska, 1979; Howes, 1985). I partly follow Howes, but I treat *Rhynchocypris* and *Lagowskiella* as synonyms. This is apparently also the conclusion reached by Bogutskaya & Naseka (2004: 92), except that they retain *Rhynchocypris* and *Eupallasella* as subgenera of *Phoxinus*. A recent molecular study suggests that *Eupallasella* should be included in *Rhynchocypris* (Sakai et al., 2006). As long as the interrelationships of the three genera are not established, I do not see reason to consider them congeneric and I see no reason to retain the subgenus classification which implies close relationships between the different subgenera.

The identity of a number of species placed in *Rhynchocypris* is obscure. The small size of most species and their non-descript colour pattern possibly explains a number of problems and confusions. Without abundant material of a number of species from a number of localities throughout their ranges it is probably impossible to elucidate their taxonomy. In Mongolian waters, the first problem is to know how many species are present, and only then to decide about their names.

Rhynchocypris czekanowskii was originally described from the Onon drainage. Material from Kherlen River (Amur drainage) is figured by Travers (1989: 196).

Distribution. In Mongolia: Rivers Tuul, Onon and Kherlen, and Lake Buir. For Mongolia, this is the first record of the species outside the Amur drainage. Outside Mongolia: Arctic Ocean basins, from Kara to Kolyma; Amur drainage in Russia and China.

Rhynchocypris lagowskii

Phoxinus lagowskii Dybowski, 1869: 952, pl. 15 fig. 4 (type locality: Russia: Onon and Ingoda rivers, Amur River drainage)

Remarks on systematics. There is apparently some confusion as to the identity of *L. lagowskii* and some species of *Rhynchocypris*.

The species identified and figured as *R. steindachneri* in Travers (1989: 197) is apparently a large adult of *R. lagowskii*. It has the general body shape figured by Dybowski (1969: pl. 15) for the types of *L. lagowskii*, except for the fleshy rostral process, which Howes use as an autapomorphy of *Rhynchocypris*. But Dybowski already reported "nose protruding, swollen during spawning season". The photograph in Travers (1989) also agrees with other published figures of *L. lagowskii*, e.g. in Luo (in Chen, 1998: 85; Howes, 1985: 65, fig. 5d) and with the keys in Chen (1988), Shedko (2001: 233). Further, *R. steindachneri* is a species native to Japan and Korea and never reported north of Tumen River (Kim, 1997: 280; Fujita et al., 2005).

Travers (1989: 198) also recorded *R. costata* from Mongolia. He does not provide information on these specimens, merely stating the characters distinguishing them from *R. steindachneri* in Howes (1985). He comments that the vertebrae numbers distinguish the two species that Howes

identified under that name, but it is not clear whether this character had been checked on the Mongolian specimens.

Rhynchocypris costata was earlier treated as a synonym of *R. oxycephalus*. Howes recorded 36 vertebrae in his *R. oxycephalus*, 37–38 in his *R. steindachneri* and 42–44 in his *R. costata*, which clearly indicates that he examined at least two different species. Luo (in Chen, 1998) records 40–42 vertebrae in *R. lagowskii*; this is the highest vertebrae number he records for all Chinese *Rhynchocypris*. Howes also recorded 40–44 vertebrae in his *R. lagowskii*. A number of Travers' *R. costata* were collected together with his *R. steindachneri* and I suspect that they too are *R. lagowskii*. This can only be confirmed by examination of the specimens.

The type locality of *R. costata* is Duolun [42°11'09"N, 116°28'39"E], Inner Mongolia, Luan He drainage [draining to the Gulf of Bohai, Yellow Sea]. The species (or probably its valid senior synonym *R. oxycephalus*) is not expected to be present in Mongolia. For the time being, there is no reason to list it as part of the Mongolian fauna.

Distribution. In Mongolia: Onon and Kherlen drainages, Lake Buir; Selenge drainage: Kharuukhiin stream (Khara Bukhin, a left-hand tributary of Tuul River) (Hensel & Dashdorj, **1978**, cited by Sokolov, 1983) and Tuul (Holcik & Pivnicka, 1969: 6). Outside Mongolia: upper Lena and Amur drainages, in Russia and China.

Rutilus rutilus

Synonymy includes only nominal species whose type locality is in Asia

Cyprinus Rutilus Linnaeus, 1758: 324 (based on Linnaeus [1746: 124, n. 329, Cyprinus ... radiis 12], Artedi [1738: gen. 3 [10], syn. 10, spec. 10 [3], Cyprinus iride pinnis ...], Gronovius [1754: 2, n. 8, idem; 1746: 74, n. 51, idem, n. 52, Cyprinus Rex van Ruy: Waverveen, Belgium]; type locality: "in Europae lacubus")

Cyprinus lacustris Pallas, 1814: 314 (type locality: Russia: Siberia as far as River Lena, Lake Baikal [Berg, 1949: 499])

Rutilus rutilus lacustris natio *menschikowi* Kirillov, 1962: 40 (not available because infrasubspecific; locality: Russia: Yakutia: Vilyui River drainage)

Remarks on systematics. The Siberian populations of *Rutilus rutilus* have been considered as a distinct subspecies *R. r. lacustris* (e.g., by Berg, 1949: 499; Sokolov, 1983: 140; Luo, in Chen, 1998: 89) or species *Rutilus lacustris* (e.g., by Baasanjav & Tsendayush, 2001: 66). Bogutskaya & Naseka (2004: 88) consider *R. lacustris* as a junior synonym of *R. rutilus*. Reshetnikov et al. (1997: 705; 2002: 319) do not mention the name but the maps shows its distribution included in that of *R. rutilus*. The characters used by Berg to distinguish his subspecies *R. r. rutilus* and *R. r. lacustris* are minor and show much overlap, and do not justify recognizing them as distinct taxa. Holcik & Skorepa (1971) and Ruban & Libosvarsky (1987) did not find differences. For the time being there is thus no reason to retain *R. r. lacustris* as distinct.

Distribution. In Mongolia: Selenge drainage; might be present in Bulgan River as it is recorded further downriver in China. Outside Mongolia: from Europe north of Pyrenees and Alps, eastward to Lena drainage, Aral Sea basin.

Sarcocheilichthys soldatovi

Chilogobio soldatovi Berg, 1914: 492, figs. 76–77 (type locality: Russia: Lower Amur, Lake Tschlja /Amur, downriver of Tscheptschiki/Amur, 10 versts [earlier Russian unit of length equivalent to 1.07 km] upriver of Chabarowsk/Amur, 6 versts downstream of Chabarows /Amur, mouth of Maginskaja Protoka/Ussuri, at confluence with Buldsin/River Kamenuschka upstream of Scheremetewa, Ussuri system)

Remarks on systematics. This species appears as *Chilogobio czerskii* in Sokolov (1983: 176) and as *Sarcocheilichthys nigripinnus czerckii* [sic] in Baasanjav & Tsendayush (2001: 99). *Sarcocheilichthys czerskii* is treated as a subspecies of *S. nigripinnis* by Banarescu & Nalbant (1973: 46) and as a valid species by Naseka (1996: 156), Reshetnikov et al. (1997: 705, 2002: 321), Yue

(in Chen, 1998: 279) and Bogutskaya & Naseka (2004: 71). Naseka (1996: 155), Bogutskaya & Naseka (2004: 71) and Reshetnikov (1997: 705, 2002: 325) recognize *S. soldatovi* as a distinct species whose range largely overlaps that of *S. czerskii*, except that only *S. czerskii* is present in Mongolia (Reshetnikov et al., 2002: 321). Berg (1914, 1949: 661) distinguished the two species by body shape and mouth position, subterminal in *S. czerskii* and inferior in *S. soldatovi*. In 1949 (p. 663) he recorded the presence of *S. soldatovi* in Lake Buir. The single specimen I examined from Lake Buir clearly has an inferior mouth, and a relatively slender body as illustrated by Berg; it is *S. soldatovi*. The description and figure in Sokolov (1983: 177) are from Nikolski (1956).

Distribution. In Mongolia: Lake Buir. Outside Mongolia: from Amur to Liaoning drainages (not in central and southern Korea).

Saurogobio dabryi

Saurogobio Dabryi Bleeker, 1871: 27, pl. 5 fig. 1 (type locality: China: ? Yangtze River)

G*obiosoma amurensis* Dybowski, 1872: 211 (type locality: Russia: Amur River drainage)

P*seudogobio productus* Peters, 1881: 1035, pl. fig. 6 (type locality: Hong Kong)

Pseudogobio drakei Abbott, 1901: 486, fig. (type locality: China: Hebei Prov.: Tien-Tsin [Tianjin]: Pei-ho River)

Longurio athymius Jordan & Starks, 1905: 197, fig. 3 (type locality: Korea: Chemulpo)

? *Saurogobio longirostris* Wu & Wang, 1931: 229, fig. 4 (type locality: China: Szechwan)

? *Saurogobio dabryi chenghaiensis* Dai & Yang, 2002: 307, fig. 1 (type locality: China: Yunnan: Lake Chenghai, 26°27'-26°38'N 100°38'-100°49'E)

Distribution. In Mongolia: Lake Buir. Outside Mongolia: from Amur to Xi Jiang [Pearl River] drainages; Korea.

Squalidus chankaensis

Squalidus chankaënsis Dybowski, 1872: 215 (type locality: Russia: Lake Chanka [Khanka]; original spelling *chankaënsis* must be emended into *chankaensis*, *Code* art. 32.5.2.1)

Gobio ussuriensis Berg, 1914: 473, figs. 70–71 (type locality: Russia: Lower Amur drainage, River Ussuri at mouth of River Bira)

Gobio ussuriensis morpha *brevicirris* Berg, 1914, 476, fig. 70 (infrasubspecific, not available; locality: Russia: Ussuri drainage, River Viti)

Gobio ussuriensis morpha *longicirris* Berg, 1914, 476, fig. 71 (infrasubspecific, not available; locality: Russia: Ussuri drainage, River Viti)

Distribution. In Mongolia: Lake Buir. Outside Mongolia: Amur drainage in Russia and China.

Tinca tinca

Synonymy includes only names based on material from European localities; thus only original description listed here:

Cyprinus Tinca Linnaeus, 1758: 321 (based on Artedi [1738: gen. 4 [27], syn. 5, spec. 27 [4], Cyprinus mucosus ...] and Linnaeus [1746: 122, n. 321, Cyprinus ... ossiculorum 11]; type locality: "in Europae stagnis, lacubus")

Distribution. In Mongolia: Bulgan River. Outside Mongolia: native in most of Europe, naturally absent only in Ireland, Scandinavia north of 61°30'N, eastern Adriatic basin and western and southern Greece where it is now introduced. In Asia, native eastward to western Yenisei drainage south of 60°N.

Family Nemacheilidae
(stone loaches)

Members of the family Nemacheilidae were earlier placed in the family Cobitidae and more recently in the family Balitoridae (or its synonym Homalopteridae; Kottelat, 1988). They are now considered as a distinct family on the basis of molecular studies. Many species have been placed in the genus *Nemacheilus* (also misspelled *Noemacheilus*, *Nemachilus*, etc.) but real *Nemacheilus* species live only in Southeast Asia. Several species from Europe and northern Asia have been called *Orthrias*, but this name is not valid; the correct

genus name for these fishes is *Barbatula*. Some authors still use *Orthrias* but their argument for using the name contradicts the International Code of Zoological Nomenclature.

I have examined material of *Barbatula* from a number of localities in the Amur and Selenge drainages and from the Gobi Lakes Valley. This material suggests that there are a number of unnamed species in Mongolia, most with restricted distribution ranges. In several cases two species may occur in sympatry. As a revision of the Central Asian species of the genus *Barbatula* is supposed to be published soon by others, there is no point entering into a detailed discussion of these species at this point. I include in the list below two unnamed species present in the Mongolian material I examined.

Another genus present in Mongolia is *Triplophysa*. The genus is distributed throughout Central Asia, and is very diverse, most species inhabiting a relatively small range. As for *Barbatula*, examination of various materials from Mongolia and northern China shows that there are a greater number of species than reported in the literature. Definitive identification or formal description of the unnamed species is not possible without more extensive sampling, and without material of the numerous species described from adjacent areas for comparison. I include in the list below an unnamed species present in the Mongolian material I examined.

Furthermore, the exact limits and species composition of *Barbatula* and *Triplophysa* are not clear. *Triplophysa* obviously is a heterogeneous assemblage and some species of *Triplophysa* seem to have more affinities with *Barbatula* than with other *Triplophysa*.

Barbatula compressirostris

Nemachilus compressirostris Warpachowski, 1897: 270, pls. 11 figs. 1–3 (type locality: lakes in N. W. Mongolia)

? *Nemachilus cobdonensis* Gundriser, 1973: 77 (type locality: Russia: Tuva: Lakes Khintiktig-Khol [50.35°N 89.83°E] and Ak-Khol Khol [50.25°N 89.6°E] and River Mogen-Buren, basin of River Kobdo [Khovd in Mongolia])

? *Barbatula barbatula* morpha *tigris* Gundriser, **1975** (infrasubspecific, name not available) from Prokofiev, 2003: 695

? *Orthrias golubtsovi* Prokofiev, 2003: 698, fig. 1 (type locality: Russia: Tuva: Chedi-Tei River, outflow of Ak-Khol Lake, Mogen-Buren drainage part of Kobdo drainage, about 60 km west of Mugur-Aksy)

Remarks on systematics. The species reported as *Noemacheilus barbatulus* by Baasanjav & Tsendayush (2001: 124), as *Barbatula toni* by Reshetnikov et al. (1997: 707; 2002: 356 [but figure shows a *Triplophysa*]), and as *Nemachilus barbatulus toni* by Sokolov (1983: 207) probably include all the species of *Barbatula* recognized here.

Nemachilus compressirostris was the first species of *Barbatula* recorded from western Mongolia. It was originally based on two specimens from "lakes in northwestern Mongolia" (Warpachowski, 1887). Warpachowski also commented that the species came from the same lakes as *Oreoleuciscus potanini*. These specimens were obtained for the Nizhniy Novgorod Fisheries Exhibition in 1896. The species is now considered to be a synonym of *B. toni* (e.g., Vasil'eva, in Reshetnikov et al., 1998: 95); its identity is not discussed by Prokofiev (2003). Sokolov (1983: 209) reported the presence of *B. toni* in the Khovd drainage in Mongolia, which may refer to *B. compressirostris*, *B. cobdonensis* or *B. golubtsovi*, but this can be established only on the basis of specimens. Also, it cannot be excluded that *B. cobdonensis* or *B. golubtsovi* are synonyms of *B. compressirostris*.

I have examined the syntypes of *B. compressirostris* (ZISP 11298). They seem to have been partly dried at some time, which is already suggested by the figure in Warpachowski (1897: pl. 11 fig. 1). The head and snout shape figured by Warpachowski (1897: pl. 11 fig. 1) is identical to that of the holotype of *B. golubtsovi* figured by Prokofiev (2003: fig. 1). This is certainly not enough to conclude that *B. golubtsovi* is a synonym of *B. compressirostris* but this hypothesis should be investigated.

Barbatula golubtsovi is presently known only from Lake Ak-Khol and its outflow Chedi-Tei River in Mogen-Buren drainage, part of the Kobdo [Khovd] drainage, about 60 km west of Mugur-Aksy (Russia: Tuva). It is diagnosed (among other characters) by the presence of numerous skin projections on the whole body. The skin of the syntypes of *B. compressirostris* is smooth but the specimens have not been preserved in an optimal way and the skin has been abraded so that no conclusion can be reached. The other diagnostic characters listed by Prokofiev (2003: 698) can be checked only on the skeleton.

Sokolov (1983: 209) reports 44–47 vertebrae in material of their *B.* '*toni*' from the Khongor-Ulen River [upper Khovd drainage in Bayan-Ulgii aimag] and Prokofiev (2003: 700) comments that this agrees with the counts in *B. golubtsovi* (45–47).

Barbatula cobdonensis was described from Lakes Ak-Khol (50.25°N 89.6°E) and Khindiktig-Khol (50.35°N 89.83°E) in Tuva Republic, Russia. These lakes are connected to the River Mogen-Buren and are located about 40 km upstream of the Mongolia-Russia border. The Mogen-Buren becomes Bökhmörön in Mongolia and enters Lake Achit.

Prokofiev (2003: 700) comments that the original description of *B. cobdonensis* by Gundriser (1973: 77) is apparently based on two species, which he identifies as *B. toni* and *B. golubtsovi*, which he had also identified in the material he examined from Khovd drainage in Tuva. He described *B. golubtsovi*, distinguished by the presence of 'coarse tubercles'. He further comments that the identification of *B. cobdonensis* remains uncertain and that it cannot be excluded that a third species is present in Khovd drainage. He concludes in deciding that *B. cobdonensis* is a 'nomen nudum'. Judging from all the data he mentions from Gundriser's description, the name is not a nomen nudum. At best it could be a nomen dubium, but after examining material from the area where the nominal species was collected and reaching his conclusions, there is absolutely no point in leaving the case as a nomen dubium. In the absence of type material and in case of real ambiguity, the designation of a neotype would have immediately and definitively cleared the problem.

Barbatula cobdonensis has not yet been formally reported in Mongolia. I have examined photographs of a *Barbatula* species from Khovd River (Erdenebat M., pers. comm.) which is possibly this species, based on the appearance and patterning more similar to that of *B. cobdonensis* on the figure in Gundriser (1979c) than that of *O. golubtsovi* on the figure in Prokofiev (2003). This should be confirmed by examination of specimens. Considering the geographic isolation of the Khovd population and the endemicity pattern observed in the genus in adjacent areas (each basin or sub-basin inhabited by one or more endemics, a pattern further observed in most Nemacheilidae), I hypothesise that *B. compressirostris* and/or *B. cobdonensis* are specifically distinct from topotypical material of *B. toni* (see below).

In fact it is expected that two species of *Barbatula* are present in the Mongolian part of the Khovd drainage.

I have observed 'tubercles' similar to those described by Prokofiev in *B. golubtsovi* in *B. sturanyi* from Lake Ohrid (Europe) and a number of species in Mongolia and China. Several samples include specimens with and without 'tubercles'. They are also present in some Mongolian species of *Triplophysa*.

Distribution. In Mongolia: Khovd River drainage. Outside Mongolia: probably Cobdo [Khovd] River drainage in Tuva Republic, Russia.

Barbatula dgebuadzei

Orthrias dgebuadzei Prokofiev, 2003: 700, fig. 2 (type locality: Mongolia: Zag River, basin of Baidrag River)

Remarks on systematics. *Barbatula dgebuadzei* is endemic to Mongolia. It is formally recorded (on the basis of identified specimens) from Zag River (Prokofiev, 2003) and Tuy River (pers. obs.,

based on far from optimally preserved material). The records of *B. toni* from other lakes and rivers of the Gobi Lakes Valley (e.g., Dgebuadze, 1995) are referred to *B. dgebuadzei* by Prokofiev. Considering the isolation of the basins, I think that the populations of the different lakes should first be compared based on fresh material before reaching this conclusion.

Distribution. Endemic to Mongolia. In lakes and rivers of the Gobi Lakes Valley.

Barbatula toni

? *Nemacheilus nudus* Bleeker, 1865: 12 (type locality: Mongolia [p. 13, but 'brought from China' on p. 14; see below])

Cobitis toni Dybowski, 1869: 957 (type locality: Russia: "common in both river systems" [Rivers Onon and Ingoda, Amur drainage])

Nemachilus pechiliensis Fowler, 1899: 181 (type locality: China: Pechili Prov. [Nei Mongol]: Tan Lan Ho, tributary of Shu Lan Ho, about 30 miles NE of Lama-Miau or Dolon-Nor [Duolun, Inner Mongolia])

Orthrias oreas Jordan & Fowler, 1903: 769, fig. 2 (type locality: Japan: Hokkaido: Chitose, in Iburi)

Nemacheilus sibiricus Gratzianow, 1907: 167, 168 (type locality: Russia: Altai: Bija [Biya] River near Bijsk [Biysk])

Nemacheilus barbatulus tomianus Ruzskii, 1920: 36, figs. 1–2 (type locality: Russia: basins of the Rivers Tom', Ob [Katun', Cherga, Ursul and Charysch rivers] and Yenisei [Abakan and Minusinka rivers])

Barbatula toni fowleri Nichols, 1925b: 3 (type locality: China: Chihli [Hebei] Prov.: Eastern Tombs)

Nemacheilus barbatulus markakulensis Men'shikov, 1939: 141, fig. (type locality: Kazakhstan: Lake Marka-kul, Irtysh drainage)

Barbatula toni kirinensis Tchang, 1932: 115, fig. 2 (China: Kirin [Jilin Province])

Remarks on systematics. *Barbatula toni* has been considered as a valid name for a species or a subspecies whose range extends throughout northern Asia, from the Urals to Japan (e.g., Chen, 1989: 29; Reshetnikov, 2002: 356; Prokofiev, 2003). A number of nominal species are considered to be synonyms of *B. toni*. My examination of type material or topotypical material of a number of them shows that a number of these synonyms in fact are valid species of *Barbatula* and even some are *Triplophysa*.

Dybowski (1869) originally described *B. toni* from the Rivers Onon and Ingoda (upper Amur drainage) and there is thus a reasonable likelihood that at least the Onon populations in Mongolia will retain the name. The populations referred to *B. toni* from the Kherlen and Selenge drainages are tentatively retained in *B. toni* but this requires confirmation, especially since several species of *Barbatula* occur in sympatry in at least the Selenge drainage. The specimens which I examined and identified as *B. toni* show great variation in body shape and appearance but I have not seen enough samples to reach conclusions on the taxonomic significance of this variability. Prokofiev (2003: 702) figured specimens of *B. toni* from the Onon which can be considered topotypical.

In recent years, Chinese and Korean authors (e.g., Zhu, 1989: 29; Wang et al., 2001: 168; Kim, 1997: 283) have used the name *B. nuda* for the *B. toni* of earlier authors. This is not without creating a number of problems. The type locality is usually listed as Mongolia. Indeed, Bleeker (1864: 13) indicated the type locality as Mongolia, which at his time could have meant present day's Mongolia, Inner Mongolia, or some other place in northern China. But on p. 14, he wrote "described from a single specimen and brought from China by the missionary David". This holotype still exists (preserved in the collection of the Muséum National d'Histoire Naturelle in Paris–MNHN 1450, Bertin & Estève, 1948: 98) but I have not had the opportunity to examine it and to compare it side by side with the Mongolian and Chinese material.

Armand David (27 September 1826–10 November 1900; for a biography, see Boutan, 1993) travelled in 'southern Mongolia' in 1866. As Bleeker

described *B. nuda* in 1864, the specimen must have been collected earlier. In 1862, David visited the "Siwantze", 25 km NE of Kalgan. In 1863, he explored the mountains bordering the west of the plain of Beijing. In 1864, he travelled in Jehol, north-east of Beijing. Jehol is a former Chinese province that included part of today's Hebei, Shanxi and Nei Mongol provinces. This excludes present Mongolia as type locality.

I have examined a number of samples identified as *B. nuda* from northern China in the collections of the Institute of Zoology, Chinese Academy of Sciences, in Beijing. They turned out to represent several species of *Barbatula* and *Triplophysa*; at some localities, two species occur in sympatry. Names are available for some of them, but others are apparently still undescribed. Until the holotype of *B. nuda* can be identified with one of these species, I see no reason to use the name to replace *B. toni*. Also, it would first be necessary to compare material from northern China with material from the upper Amur to decide if one (and which one) of these species is conspecific with *B. toni*.

[Prokofiev (2003: 703) comments that the type locality of *B. toni* is possibly China because ZISP has a specimen received in the 18th century [sic; that is 1701–1800 ?] from MNHN, identified as *N. nudus* and with locality data "Setschun occid." I assume the material was received in 19th century if it had a name created in 1864. I do not see reason to speculate on the origin of a specimen on the sole ground that the name on its label is used on another label from the same museum; by that time MNHN had already received several collections from China, including various nemacheilines (noteworthy are the collections of P. Dabry de Thiersant; see Dabry de Thiersant, 1872; Sauvage & Dabry de Thiersant, 1874). This ZISP 4471 specimen was already mentioned by Herzenstein (1888: 21) who gave the locality as "Sse-tschuan occid." [western Sichuan]. There is no record of *B. nudus* from Sichuan in today's Chinese literature (e.g., Ding, 1994)]. Anyway, David first arrived in Sichuan in 1868].

Distribution. In Mongolia: Onon, Kherlen and Selenge drainages. Outside Mongolia: all rivers flowing to the Arctic and Pacific Oceans between the Ob and the Huang He.

Barbatula sp. Tuul

Remarks on systematics. An unnamed species of *Barbatula* reaching at least 140 mm SL. The colour pattern evolves with increasing age and size from mottled to irregular blotches with paler middle area. Anterior and posterior nostrils conspicuously separate. Caudal fin truncate or with slightly concave posterior edge. Dorsal-fin origin behind pelvic-fin origin.

Distribution. Presently known only from the Selenge drainage in Mongolia (Tuul, Yeruu). Expected in Selenge drainage in Russia.

Barbatula sp. Egiin

Remarks on systematics. An unnamed species of *Barbatula*, with body entirely covered by soft skin projections, with adjacent nostrils, slightly emarginate caudal fin, dorsal-fin origin above pelvic-fin origin, deep body and stout and short caudal peduncle. The largest examined specimen is 45 mm SL but this is probably not its maximum size.

Distribution. Presently known only from the Selenge drainage in Mongolia (Egiin River). Possibly endemic to Mongolia.

Other *Barbatula* species recorded in Mongolian waters

Dulmaa (1973: 55) and Sokolov (1983: 209) mention that *Barbatula toni* is present in the Bulgan River, but do not provide any data which would allow to decide of the identity of this population.

Barbatula toni is also reported from the Ertix and Ulungur drainages (Xinjiang) by Anonym (1979: 48, 66, fig. 41). This is apparently the species described as *B. altayensis* by Zhu (1992: 241) from a tributary of the Ertix at Altay.

A specimen identified as *B. nuda* [the name used in China for the *B. toni* of Russian authors, see

above] from the Ertix in Altay (Xinjiang, China) is figured in Kimura et al. (1992). It does not seem to be conspecific with *B. altayensis* and I could not identify it as a species known to me.

I have examined the type series of *B. altayensis* in the Institute of Hydrobiology in Wuhan as well as material which seems to be the species figured by Kimura et al. It is likely that one of these two species, or both, is the *B. toni* recorded from the Bulgan by Dulmaa (1973) and Sokolov (1983) but without specimens it is impossible to conclude and this is the reason why I do not formally list *B. altayensis* in the fauna of Mongolia.

ZISP 12576 is a sample from "Lake Alik-Nur, Burkhan-Budda, Mongolia" collected in 1900 by Kozlov and Kaznakov and identified as *B. compressirostris*. Burhan Buubay Uul is a mountain located at about 45°40'N 96°43'E. I cannot find an Alik-Nur, but there is Alag-Nuur about 150 km west of Burhan Buuday Uul. The map in Przewal'skii (1876) shows Alak-Nor at about 44°N 95°E and a later map (Przewal'skii, 1883) shows apparently the same lake (but named Alyk-nur) at about 45.5°N 95°E. I am not aware of any fish collection obtained in this area since 1900.

Lefua costata

Diplophysa costata Kessler, 1876: 29, pl. 3 fig. 4 (type locality: "Mongolia: Lake Dalai-Nor at 43°N" [Berg, 1949: 887], apparently China: Liaoning, Lake Dalai Nur, 43°18'00"N 116°37'00"E)

Nemacheilus dixoni Fowler, 1899: 181 (type locality: China: Pechili Prov. [Nei Mongol]: Tan Lan Ho, tributary of the Shu Lan Ho, about 30 miles NE of Lama-Miau or Dolon-Nor [Duolun, Inner Mongolia])

Elxis coreanus Jordan & Starks, 1905: 201, fig. 7 (type locality: Korea: Gensan)

Lefua andrewsi Fowler, 1922: 1 (type locality: China: Shing Lung Shan, Eastern Tombs)

Remarks on systematics. Naseka & Bogutskaya (2004) showed that the *L. costata* of Russian authors (e.g., Berg, 1949: 887; Reshetnikov et al., 1997: 707, 2002: 358) contains at least two species. Molecular data on Japanese and Korean populations show that additional, unnamed species of *Lefua* exist (Sakai et al., 2003). The type locality of *L. costata* is Lake Dalai Nur in Liaoning (China). There are several Dalai-Nur (or alternative spellings). Berg (1949: 887) commented that this Dalai Nur is located at 43°N. This is apparently the one at 43°18'00"N 116°37'00"E [not to be confused with the one called Hu-Lun in Chinese and adjacent to Lake Buir].

Distribution. In Mongolia: streams Azargiin, Tamcagiin Bulag, Shine Usnii of Lake Buir basin (Baasanjav & Tsendayush, 2001: 127). Outside Mongolia: from Amur to Huang He drainages; Sakhalin Island.

Triplophysa gundriseri

Nemacheilus dorsalis humilis Gundriser, 1962: 253, fig. 4 (type locality: Russia: Tuva Republic: Tes-Khem River, 25 km northwest of Erzin, 50°27'N 95°01'E [original type locality: Russia: Tuva: Erzin and Tes-Khem rivers]; junior homonym of *Nemachilus humilis* Lin, 1932: 515)

Triplophysa gundriseri Prokofiev, 2002: S47 (replacement name for *Nemacheilus dorsalis humilis* Gundriser, 1962: 253)

? *Triplophysa gundriseri chandagaitensis* Prokofiev, 2002: S55, fig. 4a (type locality: Russia: Tuva Republic: Chandagaity River in Chandagaity village, 50°44'N 92°08'E)

Remarks on systematics. This species was reported from Tesiin River and Lake Sangiin Dalai as *Noemacheilus strauchii* by Holcik & Pivnicka (1969: 12) and from the Tes-Khem [Tesiin] in Russia as *Nemacheilus dorsalis humilis* by Gundriser (1962, 1979c) and Prokofiev (2002). Prokofiev also described a subspecies *T. g. chandagaitensis* from the Chandagaity River [Khara-Modo-Gol], another tributary of Lake Uvs-Nuur; it is not clear whether they constitute one or two species.

Triplophysa strauchii is a species originally described from Lake Balkash basin [Kazakhstan]. Several nominal species have been considered to be synonyms of *T. strauchii* by Berg (1949: 851):

Nemachilus ruzskyi and *N. strauchii reuniens* also from Lake Balkash basin, *N. ulacholicus*, *Diplophysa strauchi ulacholica* var. *pedaschenkoi* (a non-available infrasubspecific name) and *N. strauchi dorsaloides* from Lake Issyk-kul basin, *N. strauchi zaisanicus* from Lake Zaisan basin. Considering that these basins are very isolated from each other, this synonymy need to be re-examined. Species of the *Triplophysa strauchii* group have a typical body shape, with a relatively deep body in front of the anal fin, and a short and shallow caudal peduncle, with contrasted dark spots on the body more or less aligned in vertical rows.

The figure of "*Noemacheilus strauchi*" in Baasanjav & Tsendayush (2001) shows a species similar to *T. strauchii* but more slender. It is not known if it is based on an actual specimen or on a figure from literature.

Distribution. In Mongolia: Tesiin River and Lake Sangiin-Nuur. Outside Mongolia: basin of Lake Uvs-Nuur in Tuva Republic, Russia.

Triplophysa sp. Tuul

Remarks on systematics. An unnamed species, apparently belonging to the genus *Triplophysa*, with the body entirely covered by soft skin projections, no scales, a complete lateral line, a deeply emarginate caudal fin, a slender body and caudal peduncle. The largest examined specimen is 67 mm SL but this is probably not its maximum size.

Distribution. Mongolia: Tuul River.

Other *Triplophysa* species recorded in Mongolian waters

Baasanjav & Tsendayush (2001: 124) report the presence of "*Noemacheilus stoliczkai*" in Lake Sangiin Dalai, Tesiin River, and "maybe in Bulgan". There is no way to know to which species they refer. Their figure apparently is based on fig. 595 in Berg (1949: 865) of a specimen from the distant Chu River in (Kazakhstan). It is puzzling that the recorded distribution is the same as they report for their *T. strauchii* (except for the "maybe in Bulgan").

Triplophysa stolickai [note correct spelling] was originally described from Lake Tso Morari, a small endorheic basin in Rupshu (Kashmir), surrounded by the Indus River drainage. A number of nominal species described since have been considered to be synonyms of *T. stolickai*. They have been collected in localities extending from the Helmand basin (Afghanistan), northern Pakistan, upper Amu-Darya River (Aral Sea basin), Tarim basin, and upper Huang He. That a single species occupied a range extending across all drainages of High Asia, with a number of endorheic basins seems highly unlikely. Some of the figures accompanying the descriptions show very different fishes.

Family Cobitidae
(spiny loaches)

Cobitis melanoleuca

Cobitis taenia melanoleuca Nichols, 1925a: 3 (type locality: China: Shansi: Chin-ssu)
Cobitis taenia granoei Rendahl, 1935: 332, figs. 5–6 (type locality: Russia: Irtysh River near Omsk)
Cobitis taenia sibirica Gladkov, 1935: 73 (type locality: Russia: Lake Turgoïak, southern Urals)
Cobitis granoei olivai Nalbant, Holcik & Pivnicka, 1970: 121 (type locality: Mongolia: Archangaj Co.: Lake Ögijn-nuur and Narijn River, an upper right tributary of Orkhon River, Selenge drainage)

Remarks on systematics. The taxonomy of the northern Asian species of *Cobitis* is not yet clear. The synonymy of *C. melanoleuca* and *C. granoei* follows Nalbant (1993: 108), but a convincing demonstration is still needed. It is quite astonishing to have a species of *Cobitis* with such a huge range extending from the Black Sea basin to the Amur and Huang He drainages. It seems likely that a pattern of a mosaic of species may be discovered, as happened for the European species in recent years (see, e.g., Nalbant, 1993; Kottelat, 1997; Freyhof et al., 2000).

Nalbant et al. (1970) described *C. granoei olivai* based on material from the Orkhon system.

Their figures suggest a species with a mid-lateral series of a few small blotches (their figure 2), or somewhat elongated, poorly contrasted, and somewhat connected by a dark stripe (their figure 1) differing from the large blotch pattern (see figures) illustrated by most authors for Chinese, Korean and Siberian populations (e.g., Anonym, 1979: fig. 43; Chen, 1987: 39; Liu & Qin, 1987: 190; Berg, 1949: 892; Kim, 1997: 310). I have examined material from the Kherlen, Selenge and Bulgan drainages and could not find differences. The samples from the Egiin (Selenge) and the Tuul rivers (Orkhon) each include specimens with the smaller and poorly contrasted pattern and specimens with the large and bold pattern (see figures). To me, these are the kind of differences expected within a population, and often related with the turbidity, or substrate, or the way the individual specimens have been handled before fixation. Presently there is no data to justify retaining *C. granoei* as a distinct taxon.

Specimens of *C. melanoleuca* with the small spot pattern have also been figured from China (e.g., Shaanxi: Nichols, 1943: 198; Anonym, 1992: 78, fig. 3–81; Nalbant, 1993: 103; Hebei: Wang et al., 2001: 176) and Korea (e.g., Kim, 1997, pl. 25).

Sokolov (1983: 210) and Baasanjav & Tsendayush (2001: 125) recognized the presence of two subspecies in Mongolia, which they distinguished as *C. t. taenia*, with the head length greater than the length of the caudal peduncle, and *C. t. sibirica*, with the head length about equal to the length of the caudal peduncle. They reported both from the Selenge drainage and only their '*C. t. taenia*' from the Kherlen and Onon drainages. All the specimens I have examined show a reverse situation; the Selenge drainage specimens have the head longer than the caudal peduncle, while it is only slightly longer or as long in the specimens from the Kherlen drainage.

Vasil'ev & Vasil'eva (1994: 67) reported differences in karyotype between the populations from the Volga and those from Baikal-Selenge drainages. Later, Vasil'eva (in Reshetnikov et al., 1997: 708) considered the Baikal-Selenge populations as a distinct subspecies, for which the name *C. m. olivai* would be available. Vasil'eva refers to Vasil'ev & Vasil'eva (1994–a short conference abstract) for supporting karyological data. With the published data, this reasoning is flawed. While the karyotypes of the Volga and Selenge populations effectively differ and suggest they represent different taxa, this does not allow recognition of a taxon peculiar to the Selenge and Baikal. Without information on the karyotypes of populations adjacent to the Selenge (from the rest of the Yenisei drainage as well as from the basins surrounding Mongolia), the identity of the populations in intermediate areas cannot be assessed. If two species are involved, it is likely that the Baikal-Selenge populations will be conspecific with some other Siberian or East Asian ones and one of the three senior synonyms listed above could have precedence as a name for this species.

Specimens from the Ertix River (Xinjiang, China) are figured in Anonym (1979: fig. 43) and Kimura et al. (1992).

Distribution. In Mongolia: Kherlen, Onon, Khalkhiin, Selenge and Bulgan drainages; Lakes Ugii, Khuvsgul and Buir. Outside Mongolia: from the Don drainage eastwards to Amur and Huang He drainages (China).

Iksookimia lebedevi

Cobitis lebedevi Vasil'eva & Vasil'ev, 1985: 464, fig. 1A (type locality: Russia: Amur River near Elabuga)

Remarks on systematics. Kottelat & Lim (1992: 216), Nalbant (1993: 105) and Reshetnikov et al. (1997: 707; 2002: 360) considered *I. lebedevi* as a synonym of *I. choii*. *Iksookimia choii* is endemic to Kum River drainage, a very small area in Korea. Kim et al. (1999: 377) and Bogutskaya & Naseka (2004: 104) treat *I. lebedevi* as a valid species.

Distribution. In Mongolia: Kherlen River (Vasil'eva, **1994**; Reshetnikov, 1997). Outside Mongolia: Amur drainage in China and Russia.

Misgurnus mohoity

Cobitis fossilis var. *mohoity* Dybowski, 1869: 957 (type locality: Russia: Transbaikalia: Onon and Ingoda rivers)
? *Misgurnus maculatus* Bleeker, 1873: 146 (nomen nudum; locality: China)
? *Misgurnus spilurus* Bleeker, 1873: 146 (nomen nudum; locality: China)
Nemachilus bipartitus Sauvage & Dabry de Thiersant, 1874: 16 (type localities: North China & Central China)
Misgurnus cestoideus Kessler, 1876: 34 (type locality: China: Liaoning Prov.: Dalai Nur [43°18'00"N 116°37'00"E])
Cobitis adjan Dybowski, in Sinicyn, 1900: 49 (nomen nudum)
Ussuria leptocephala Nikolski, 1904: 362 (type locality: River Ussuri / River Cherulu in eastern Mongolia)
Misgurnus erikssoni Rendahl, 1922: 3 (type locality: China: Nei Mongol: Djaggaste)

Remarks on systematics. Systematics follows Vasil'eva et al. (2001, 2003). The Mongolian populations were identified as *M. anguillicaudatus* in earlier literature.

Distribution. In Mongolia: Rivers Onon, Kherlen, Ulz and Khalkh; Lake Buir and Selbe River. Outside Mongolia: Amur drainage; northeastern China.

Family Siluridae
(wels, catfishes)

The inclusion of *S. soldatovi* in the Mongolian fauna by Baasanjav & Tsendayush (2001: 130) is based on a single specimen collected in 1956 in Lake Buir and identified by Bord & Tsendayush. Otherwise, the species is known only in lowermost Amur, below Khabarovsk. I consider it as either a misidentification, or resulting from an introduction or accidental release, or escapee on Chinese side of Lake Buir.

Silurus asotus

Silurus Asotus Linnaeus, 1758: 304 (type locality: Asia)
Silurus dauuricus Pallas, 1787: 359, pl. 11 fig. 11 (type locality: Russia: Dauuria: Onon, Ingoda and Argun drainages)
Silurus punctatus Cantor, 1842: 485 (type locality: China: Chusan Island; primary junior homonym of *Silurus punctatus* Rafinesque, 1818a: 355)
Silurus xanthosteus Richardson, 1845: 133, pl. 56 figs. 12–14 (type locality: China: Chusan Island and Canton)
Silurus japonicus Temminck & Schlegel, 1846: 226, pl. 104 fig. 1 (type locality: Japan: Higo, Satzuma and Nagasaki)
Silurus cinereus Dabry de Thiersant, 1872: 189, pl. 47 fig. 1 (type locality: China: Yang-tse-kiang [Yangtze River])
Silurus bedfordi Regan, 1908: 61, pl. 2 fig. 3 (type locality: South Korea: Kimhoa and Chong-ju)
Parasilurus asotus var. *longus* Wu, 1930b: 255, fig. 1 (type locality: China: Tchekiang: creek on the hill of Tian-Tai)

Remarks on systematics. The genus *Parasilurus* is a junior synonym of *Silurus* (see Kobayakawa, 1989).

Distribution. In Mongolia: in Lake Buir and in Rivers Orshuun, Khalkh, Onon, Kherlen and their tributaries. In 1932, introduced into Lake Shashka, from where it entered River Selenge and rapidly invaded rivers of this drainage, until Rivers Orchon, Kharaa, Tuul, Eyruu, and Lake Ugii. Outside Mongolia: from the Amur drainage to central Vietnam; Japan; Taiwan.

Family Lotidae
(burbots)

Lota lota

Synonymy includes only nominal species whose type locality is in Asia.

Gadus Lota Linnaeus, 1758: 255 (based on Linnaeus [1746: 109, n. 292, Gadus dipterygius ... aequalibus], Artedi [1738: gen. [spec.] 22, syn. 38, Gadus dorso ... ore cirrato, spec. 107, Silurus ciro in mento unico]; type locality: "in lacubus Europaeis")

Lota vulgaris var. *obensis* Anikin, **1902: 108** (type locality: Russia: Siberia: River Ob) from Berg, 1949: 943

Lota lota asiatica Kirillov, 1972: 279 (type locality: Russia: Yakutia)

Distribution. In Mongolia: rivers and lakes of Selenge drainage, in Lake Khuvsgul and its tributaries, Lakes Ugii, Terkhiin Tsagaan; rivers and lakes of Amur drainage, in upper reaches of Rivers Onon, Kherlen, Khalkhiin; Lake Buir. Outside Mongolia: northern Eurasia, from France to River Lena, Black and Caspian Seas basins. Populations from eastern Siberia and North America earlier referred to *L. lota* represent a distinct species, *L. maculosa*.

Family Percidae
(perch, perches)

Perca fluviatilis

Synonymy includes only nominal species whose type locality is in Asia

Perca fluviatilis Linnaeus, 1758: 289 (based on Linnaeus [1746: 106, n. 285 (sic; 284)], Artedi [1738: gen. 39 [74], syn. 66, spec. 74 [39], Perca lineis utrinque ...] and Gronovius [1754: 42, n. 96, idem]; type locality: "in Europae lacubus imprimis")

Perca fluviatilis zaissanica Dianov, **1955** (type locality: Kazakhstan: Lake Zaisan) from Svetovidov & Dorofeyeva, 1963: 637

Perca fluviatilis intermedius Svetovidov & Dorofeyeva, 1963: 639 (type locality: Russia: Siberia: River Kolyma)

Remarks on systematics. The population from Lake Zaisan was regarded as a distinct subspecies by Dianov (**1955**). Its status should be investigated, in connection with the populations from the Ertix and Bulgan drainages.

Distribution. In Mongolia: Selenge drainage: Rivers Ider, Delgermurun, Orkhon, Tuul, Eyruu, and their tributaries, Lakes Ugii, Terhiin Thagaan, Khuvsgul and Khagiin Khar; Bulgan River; absent in rivers and lakes of Darkhad depression. Outside Mongolia: throughout Europe to northernmost extremity of Scandinavia; in Siberia, in rivers draining to Arctic Ocean eastward to Kolyma.

Family Cottidae
(sculpins, bullheads)

Cottus sibiricus is listed in the Mongolian fauna by Baasanjav & Tsendayush (2001: 141). They comment that the species is possibly present in Selenge and possibly in Bulgan River. The map in Reshetnikov et al. (2002: 170) does not show it present in Lake Baikal basin and Selenge drainage, neither is it recorded by Sideleva (2003). There is no actual record of the species in Mongolia. To my knowledge, there is no record of any species of *Cottus* in Bulgan River, but the presence of *C. dzungaricus* should be expected.

The taxonomy of the Siberian *Cottus* species is not settled. The recent revision of the European species by Freyhof et al. (2004) has shown that the single 'widespread' species *C. gobio* recognized by most authors in fact is an aggregate of at least 14 species. A similar situation is most likely to appear when the Siberian populations are examined in detail. As presently recognized, *C. sibiricus* extends from the Ob to the Lena drainages. The type series of *C. sibiricus* includes material from the Yenisei. Berg (1949: 1148) also mentions the Irtysh at Ust-Kamenogorsk as part of the type locality but without supporting data.

There is no actual record of *Cottus* in Bulgan River in Mongolia, but the genus is known from the Ertix River (Xinjiang, China) and its tributary Ulungur,

the downstream name of the Bulgan. The Ertix is the upper Irtysh. The subspecies *C. sibiricus altaicus* was described based on material from the Ertix (Li et al., 1966: 49). It is presently not possible to know if the syntype(s) (?) of *C. sibiricus* from the Irtysh [if they exist, see above] could be conspecific with *C. s. altaicus*. A lectotype designation for *C. sibiricus* will probably be needed.

The Xinjiang *C. s. altaicus* is a primary junior homonym of *C. poecilopus altaicus*, described from the Katun drainage [Ob drainage] in Altai by Kashchenko (1899: 151). The junior homonym *C. s. altaicus* has to be replaced by a new name; it is not possible to retain it under art. 23.9.1 of the *Code* as the name *C. altaicus* of Kashchenko has been used as a valid name after 1899 (e.g., Sinicyn, 1900: 55). I establish *Cottus dzungaricus* as a new replacement name for *Cottus altaicus* Li et al., 1966. *Cottus altaicus* belongs to the *C. poecilopus* group and is considered to be a valid species by Bogutskaya & Naseka (2004: 185, 188) and Ostroshabov & Naseka (2005).

For the time being, I tentatively accept that all syntypes of *C. sibiricus* are conspecific. *Cottus dzungaricus* is distinct from *C. sibiricus* as described by Berg (1949: 1148). I examined the holotype and 31 specimens of *C. dzungaricus* from the Ertix and Ulungur, at Fu Hai, Fu Yun, Ke Ke Tuo Hai and Ertai (IZCAS 50059–75, 50268–288, 55073–077, 56824). Ertai is on the Ulungur, about 80 km downriver of the Mongolia-China border and it is very likely that the species is also present in Mongolia (it seems impossible that the suitable habitat is missing). *Cottus dzungaricus* is easily distinguished from *C. sibiricus* in having a naked body (vs. body entirely covered by prickles).

Cottus szanaga

Cottus szanaga Dybowski, 1869: 949, pl. 14 fig. 1 (type locality: Russia: Onon River and its tributaries, Amur River basin)

Remarks on systematics. Recorded from Mongolia as *C. poecilopus* by Sokolov (1983: 223) and Baasanjav & Tsendayush (2001: 141). *Cottus szanaga* had been considered a synonym of *C. poecilopus* by Berg (1949: 1143). Holcik & Pivnicka (1969: 18) described topotypical material from the Onon River in Mongolia and considered *C. szanaga* as a valid species. Sokolov (1983) commented that there is no difference in meristic and morphometry between European and Amur and Onon populations of their *C. poecilopus* and that Holcik & Pivnicka's decision to consider *C. szanaga* as valid was done without comparison (which is not true, these authors compared the two species).

Bogutskaya & Naseka (2004: 188) consider *C. szanaga* as a valid species. *Cottus poecilopus* is described from Europe and is redescribed by Freyhof et al. (2005: 167) who did not include *C. szanaga* in its synonymy.

I could examine only very briefly and without optical equipment a single specimen about 50 mm SL from the Onon drainage in the Institute of Biology, Mongolian Academy of Sciences. The first dorsal fin is very low, much lower than on figures in Sokolov (1983) and Baasanjav & Tsendayush (2001). The pelvic fin has about 4 dark bands on the first ray. Prickles were not distinct but might be present.

Distribution. In Mongolia: Onon drainage. Outside Mongolia: Amur drainage.

Leocottus kesslerii

Cottus Kesslerii Dybowski, 1874: 384, **pl. 2 fig. 1** (type locality: Russia: Lake Baikal and Angara, Irkut and Selenge Rivers)

Cottus trigonocephalus Gratzianov, **1902: 32** (type locality: Russia: Lake Baikal: Ushkan Island)

Cottus kessleri var. *nudus* Dybowski, **1908: 545** (type locality: Russia: Lake Baikal)

Cottus kessleri bauntovi Taliev, **1946: 744, fig. 2** (type locality: Russia: Buryatia: Lake Baunt, east of Lake Baikal, Vitim River drainage) *Paracottus* (*Leocottus*) *kessleri lubricus* Taliev, **1955: 250, figs. 97–98** (type locality: Russia: Lake Baikal)

Paracottus kessleri arachlensis Tarchova, **1962: 103** (type locality: Russia: Lake Arakhlei, Lake Baikal Basin)

Paracottus kessleri gussinensis Tarchova, **1962: 108** (type locality: Russia: Lake Gusinor, Lake Baikal Basin)

Distribution. In Mongolia: lower Selenge drainage (Dgebuadze & Dulmaa, 1996: 33). Outside Mongolia: Lake Baikal and small lakes in its basin; lower Selenge, Angara and Baingol Rivers.

Mesocottus haitej

Cottus haïtej Dybowski, 1869: 949, pl. 14 fig. 2 (type locality: Russia: Onon and Ingoda Rivers and their tributaries; spelling *haïtej* must be emended in *haitej*, *Code* art. 32.5.2.1)

Distribution. In Mongolia: Onon drainage. Outside Mongolia: Amur drainage; northern Sakhalin; Yaludzyan drainage.

Family Odontobutidae
('sleepers')

Perccottus glenii

Perccottus Glenii Dybowski, 1877: 28 (type locality: Russia: Golovechka [Ussuri drainage; Berg, 1948: 1056])

Eleotris pleskei Warpachowski, in Warpachowski & Herzenstein, 1888: 19, pl. fig. 2 (type locality: Russia: Lefu River [Ilistaya] near Nikolajewka, Khanka Lake basin)

Eleotris Dybowskii Herzenstein & Warpachowski, in Warpachowski & Herzenstein, 1888: 21 (type locality: China: swamp near Chingan [Khingan] mountains, Amur River basin)

Distribution. In Mongolia: Lake Buir; in Russia, invasive in Selenge River and likely to arrive in Mongolia soon. Outside Mongolia: from Amur drainage to northeastern China, Korea. Introduced, accidentally or not, in other areas of Russia, very invasive and gluttonous, dangerous for the native fauna.

Unidentifiable Records

A 'black bream' was collected in 2002 in Lake Buir (Erdenebat M., pers. comm., 2005). Without more information, specimen or photograph, it is impossible to comment on its identity. It could possibly be *Parabramis pekinensis* or *Megalobrama terminalis*, both of which are cultivated in China.

Accounts of Species Recorded from Adjacent Areas

The following species are known from areas immediately adjacent to Mongolia and their presence in Mongolia might be expected either as permanent or temporary inhabitants, isolated populations, or vagrant individuals.

Amur drainage

Family Gasterosteidae
Pungitius sinensis
Present in Dalai Nor according to Berg (1949: 968).

Family Bagridae
Pseudobagrus herzensteini
Present in Onon drainage (Berg, 1949: 918). Map in Reshetnikov (2002b: 21) shows it immediately adjacent to Mongolia. Earlier placed in genera *Macrones* or *Leiocassis*. Generic position follows Mo (1990: 135).

Irtysh (Ertix) drainage

The following species are unknown in the Bulgan River in Mongolia but are recorded in the Chinese part of the Irtysh drainage (Ertix and Ulungur Rivers) (Li et al., 1966; Anonym, 1979; Kimura et al., 1992; pers. obs. of material in the Institutes of Hydrobiology and Zoology of the Chinese Academy of Sciences, in Wuhan and Beijing respectively). Some of them are probably restricted to the downstream part (especially Lakes Ulungur Hu and Ji Hu). Most of them are present in the Selenge drainage in Mongolia. Mention of *A. ruthenus* in the Ertix in Anonym (1979) is based on Berg's (1948: 77) records from 'Irtysh' (see Li et al., 1966: 53) and it is not retained here.

Family Acipenseridae
Acipenser baerii (see above)

Family Salmonidae
Hucho taimen (see above)
Brachymystax lenok (see above)

Family Coregonidae
Stenodus nelma

Family Esocidae
Esox lucius (see above)

Family Cyprinidae
Abramis brama

Often reported as *A. b. orientalis*. I have not researched the status of this 'subspecies'.

Aspiopsis merzbacheri

Not previously reported from Ertix drainage, but I examined material from Burqin (47°43'00"N 86°53'00"E) on the Ertix downriver of Lake Ulungur Hu in the Institute of Hydrobiology in Wuhan. Appears usually as *Leuciscus merzbacheri* in the literature. Generic placement follows Howes (1984).

Carassius carassius (see above)
Carassius gibelio (see above)
Leuciscus idus (see above)
Rutilus rutilus (see above)

Family Nemacheilidae
Barbatula altayensis (see above)
Barbatula sp. (see above)

Family Lotidae
Lota lota (see above)

Family Percidae
Perca fluviatilis (see above)
Gymnocephalus cernuus
Appears often as *Acerina cernua* in the literature.

Family Cottidae
Cottus dzungaricus (see above)

Recommendations

The present evaluation of the systematics and nomenclature of the freshwater fishes of Mongolia shows that, although not very diverse, this fauna is still very poorly known and its diversity underestimated. The first, most obvious, work that should be undertaken is a survey of the whole country.

Some priority areas should be surveyed:

- Bulgan River: there is almost no information on the local fauna; because it is the only water body in Mongolia belonging to the Irtysh drainage it is potentially inhabited by species not found elsewhere in the country, as suggested by the existing information on the fauna of the Ertix drainage in China (Bulgan is a tributary of Ertix);
- Khovd drainage and lakes of the Great Lakes Basin, because of their high level of endemicity, the potential for the discovery of several additional species, and the need to understand the status and distribution of the *Oreoleuciscus* species, forms, or population;
- Onon drainage;
- springs of the Gobi Lakes Valley and along the Mongolia-China border: there is historical information that some are inhabited by fishes and this should be verified (see under "Other *Barbatula*").

Attention should especially be given to small size species (Nemacheilidae, Cobitidae, Cottidae, *Phoxinus*, *Rhynchocypris*) as close comparison of various populations shows that a number of additional species are likely to be found. These small-sized species often have very restricted distribution ranges and several of the wide-ranging species presently recognized are expected to be, in fact, artificial aggregates of a number of species with smaller ranges.

Considering the important scientific interest of *Oreoleuciscus*, their systematics should absolutely be revisited, based on large scale surveys, well-preserved material and modern concepts. Morphological as well as molecular methods should be applied. Their ecology should be revisited once their taxonomy is understood. This could also be the topic of one or several academic research projects.

The taxonomy of *Brachymystax* should be resolved, but this will not be feasible without access to material from Russia, China, Kazakhstan and Korea. The status of several populations of *Thymallus* and *Coregonus* should be examined, especially in the case of sympatric 'forms'.

Comparison material from adjacent areas of China and Russia will be needed to solve a number of the taxonomic problems concerning the Mongolian fish fauna.

Future introductions or stocking with non-native fishes should absolutely be preceded by an Impact Assessment, following international standards (e.g., FAO, 1996). The impact of past introductions should be critically reviewed. The level of endemicity of the Mongolian fish fauna was earlier underestimated and what was viewed as possibly a minor impact on widely distributed species in fact could have been a major impact on a narrow endemic. In particular, the introduction of fish-eating and other predatory species should be avoided.

Several species with economical importance are now shown to be in fact assemblages of several distinct species. Fisheries policies should take this into account in management and legislation. Transbasin stocking should be forbidden as in many cases this may introduce a species into a new drainage, with the resulting problem of competition with the native species and the risk of hybridization.

There is an obvious need for training in techniques and methods for fish sampling, preservation, examination and identification, as well as in practical aspects of taxonomy. It does not mean that there is a need for full-time researchers working on fish taxonomy, but a reasonable understanding of the methods, procedures, results, expectations, and use of the data is necessary.

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Zugmayer, E. 1912. On a new genus of cyprinoid fishes from High Asia. A*nnals and Magazin of Natural History*, Ser. 8, 9 (54): 682.

Zugmayer, E. 1913. Wissenschaftliche Ergebnisse der Reise von Prof. Dr. G. Merzbacher im zentralen und östlichen Thian-Schan 1907/8. II. Fische. *Abhandlungen der Mathematisch-Physikalischen Klasse der Königlich Bayerischen Akademie der Wissenschaften*, 26 (4): 1–18, 1 pl.

Appendix 1

Nomenclatural information on species mentioned in the text but not belonging to the Mongolian fauna.

Family Petromyzontidae

***Lethenteron camtschaticum* (Tilesius, 1811)**

Petromyzon marinus Camtschaticus Tilesius, 1811: 240, pl. 9 (type locality: Japan: Jeddo and Yokohama, by neotype designation [originally "portus Divi Petri et Pauli Camtschatici" (Russia: Kamchatka: Petropavlovsk Kamtchatskii)])

Petromyzon Japonicus Martens, 1868: 3, pl. 1 fig. 2 (type locality: Japan: Jeddo and Yokohama)

Family Acipenseridae

***Huso dauricus* (Georgi, 1775)**

Acipenser dauricus Georgi, **1775a: 352** (type locality: Russia: Amur, Argun, Schilka and Onon Rivers)

Family Salmonidae

***Brachymystax tsinlingensis* Li, 1966**

Brachymystax lenok tsinlingensis Li, 1966: 92, fig. (type locality: China: Shaanxi: Chow-Tze-Hsien, How-Chen-Tze, in Tsinling range [Qin Ling])

Family Coregonidae

***Coregonus autumnalis* (Pallas, 1776)**

Salmo autumnalis Pallas, 1776a: 32, 1776b: 705 (type locality: Russia: ascends Pechora and Yenisei Rivers /Lake Baikal from which it enters Angara River and Tuba River to Lake Madsharein [see Berg, 1948: 342 for more details])

***Coregonus clupeoides* La Cepède, 1803**

Coregonus clupeoïdes La Cepède, 1803: 698 (type locality: Scotland: Island Inchtonachon, Lochlomoud [Loch Lomond]; syntypes: LU)

***Coregonus lavaretus* (Linnaeus, 1758)**

Salmo Lavaretus Linnaeus, 1758: 310 (type locality: France: Lake Bourget, by neotype designation by Kottelat, 1997: 104)

***Coregonus pollan* (Thompson, 1835)**

Coregonus Pollan Thompson, 1835: 78 (type locality: UK: Northern Ireland: Lough Neagh)

***Coregonus sardinella* (Pallas, 1814)**

Salmo clupeoides Pallas, 1814: 410 (type locality: Russia: Siberia: Kolyma River from mouth to Srednekolymsk and further upstream, Alazeya, Indigirka at Zashiversk, and Arctic Ocean [Berg, 1948: 328; Valenciennes, in Cuvier & Valenciennes, 1848: 517 also mentions Irtysh, which is not mentioned by Pallas]; junior secondary homonym of *Coregonus clupeoides* La Cepède, 1803: 698 when placed in *Coregonus*)

***Prosopium cylindraceum* (Pennant, 1784)**

Salmo cylindraceus Pennant, 1784: ciii, xxxvii (type locality: Russia: Lena, Indigirfka [Indighirka], and Kowyma [Kolyma] Rivers)

Family Thymallidae

***Thymallus brevipinnis* Svetovidov, 1931**

Thymallus arcticus var. *brevipinnis* Svetovidov, **1931: 85** (type locality: Russia: Lake Baikal)

***Thymallus burejensis* Antonov, 2004**

Thymallus burejensis Antonov, 2004: 443, fig. 2 (type locality: Russia: Bureye River [a tributary of Middle Amur]; holotype: MGU P-20928)

***Thymallus mertensii* Valenciennes, 1848**

Thymalus [sic] *Mertensii* Valenciennes, in Cuvier & Valenciennes, 1848: 453 (type locality: Russia: Kamchatka)

***Thymallus pallasii* Valenciennes, 1848**

Thymalus [sic] *Pallasii* Valenciennes, in Cuvier & Valenciennes, 1848: 448 (type locality: Russia)

***Thymallus signifer* (Richardson, 1823)**

Coregonus signifer Richardson, **1823: 711, pl. 26** (type locality: Canada: rivers north of Great Slave Lake)

Family Cyprinidae

Abramis brama (Linnaeus, 1758)

Abramis brama bergi Grib & Vernidub, **1935: 112** (type locality: Aral Sea at Muinak / Lake Yaskhan in Uzboi/River Sary-su; junior primary homonym of *Abramis sapa bergi* Belyaev, **1929**) from Berg, 1949: 774

Abramis brama orientalis Berg, 1949: 774 (replacement name for *Abramis brama bergi* Grib & Vernidub, 1935)

Aspiopsis merzbacheri Zugmayer, 1912

Aspiopsis merzbacheri Zugmayer, 1912: 682 (type locality: China: Manas River near Manas city, northwest of Urumtschi [Urumqi] on northern slopes of Thian-Shan range; also in Zugmayer, 1913: 13, pl.)

Barbus barbus (Linnaeus, 1758)

Cyprinus Barbus Linnaeus, 1758: 320 (based on Artedi [1738: gen. [spec.] 4, syn. 8, Cyprinus maxilla superiore longiore ...], Gronovius [1754: 5, n. 20. idem; 1756: 3, n. 20, idem] and on data from the then unpublished Linnaeus, 1764: 107 [from Spain]; type locality: River Ijssel at Deventer, Netherlands [by lectotype designation by Kottelat, 1997: 48; original locality: "in Europa australis")

Genghis Howes, 1984

Genghis Howes, 1984: 289 (type species: *Squalius mongolicus* Kessler, 1876: 21, by original designation). Gender masculine.

Gobio macrocephalus Mori, 1930

Gobio gobio macrocephalus Mori, 1930: 46 (type locality: Korea: Kai-nei/Kei-Ko)

Gobio tungussicus Borisov, 1928

Gobio gobio tungussicus Borisov, **1928: 105, 165, pl. 6 figs. 14–15** (type locality: Russia: Sakha-Yakutia: Lena River near Zhigansk)

Leuciscus chuanchicus (Kessler, 1876)

Squalius chuanchicus Kessler, 1876: 23 (type locality: China: Huang He River)

Squalius mongolicus Kessler, 1876: 21, pl. 2 fig. 2 (type locality: China: Liaoning Prov.: Lake Dalai-Nor [endorheic lake at 43°18'00"N 116°37'00"])

Luxilus cornutus (Mitchill, 1817)

Cyprinus haematopterus Rafinesque, 1820a: 6 (type locality: USA: New York: streams falling into the Hudson River)

Microphysogobio amurensis (Taranetz, 1937)

Rostrogobio amurensis Taranetz, 1937: 114 (type locality: Russia: middle and lower Amur River and Khanka Lake)

***Microphysogobio kiatingensis* (Wu, 1930)**

Pseudogobio kiatingensis Wu, 1930a: 70, fig. 1 (type locality: China: Sichuan: Kiating [Lo-Shan], upper Yangtze drainage)
Pseudogobio suifuensis Wu, 1930a: 71, fig. 2 (type locality: China: Sichuan: Suifu)

***Microphysogobio tungtingensis* (Nichols, 1926)**

Pseudogobio tungtingensis Nichols, 1926: 4, fig. 4 (type locality: China: Hunan Prov.: Huping, Tungting Lake)

***Microphysogobio yaluensis* (Mori, 1928)**

Pseudogobio yaluensis Mori, **1928: 59** (type locality: Korea: Yalu River at Tsao-ho-kou)
Microphysogobio tungtingensis uchidai Banarescu & Nalbant, 1973: 264, fig. 139 (type locality: South Korea: Sinch'on-ni, 35°16.5"N 128°50.7'E, about 25 km west-northwest of Pusan)

***Phoxinus phoxinus* (Linnaeus, 1758)**

Cyprinus Phoxinus Linnaeus, 1758: 322 (based on Artedi [1738: syn. 12, Cyprinus tridactylus ...]; type locality: "in Europa")
? *Phoxinus laevis* var. *balchaschana* Kessler, 1879: 283 (type locality: Kazakhstan: River Ajagus [Ayaguz] near Sergiopol [Ayaguz], Lake Balkash basin; also in Kessler, 1880: 234)

***Rhynchocypris oxycephalus* (Sauvage & Dabry, 1874)**

Pseudophoxinus oxycephalus Sauvage & Dabry de Thiersant, 1874: 11 (type locality: China: Pékin [Beijing], Si-wan, and southern Shen-si)
Leuciscus costatus Fowler, 1899: 180 (type locality: China: Pechili [Nei Mongol]: Tan lan Ho River, tributary of Shu lan Ho, approximately 30 miles northeast of Lama-miau or Dolon-nor [Duolun, Inner Mongolia])

***Rhynchocypris steindachneri* (Sauvage, 1883)**

Phoxinus Steindachneri Sauvage, 1883: 148 (type locality: Japan: Lake Biwa)

***Sarcocheilichthys nigripinnis* (Günther, 1873)**

Gobio nigripinnis Günther, 1873: 246 (type locality: China: Shanghai)

***Sarcocheilichthys czerskii* (Berg, 1914)**

Chilogobio czerskii Berg, 1914: 490, fig. 75 (type locality: Russia: Sintukha, Lake Khanka basin)

Family Nemacheilidae
(stone loaches)

***Barbatula altayensis* Zhu, 1992**

Barbatula altayensis Zhu, 1992: 241, figs. 1-2 (type locality: China: Xinjiang: Kelang He River, a tributary of the Ertix River, near Altay City, 47°52'N 88°06'E)

Barbatula sturanyi (Steindachner, 1892)

Nemachilus Sturanyi Steindachner, 1892a: 131 (type locality: FYROM: Lake Ohrid at Pestani, between Ohrid City and Naum monastery; also in Steindachner, 1892b: 378, pl. 2 fig. 3)

Triplophysa stolickai (Steindachner, 1866)

Cobitis stolickai Steindachner, 1866b: 793, pl. 14 fig. 2 (type locality: India: Kashmir: Rupshu: rivulets in the vicinity of Lake Tso Morari)

? *Nemachilus dorsonotatus plagiognathus* Herzenstein, 1888: 33, pl. 5 fig. 5, pl. 7 fig. 2 (type localities: China: Lake Kuku-nor, eastern Mongolia [Qinghai Hu, China]/Eastern Zaidam [Tsaidam]/spring at Galmyk/Gan-ssu/Dabsun-gobi [apparently Caka Yanhu 36°42'00"N, 99°06'00"E, Dalai Dabassu on map in Przewal'skii, 1876]/Chami [Hami, Xinjiang; 42°48'00"N, 93°27'00"E]/Lake Alak-nor [Alag Hu]/Chuan-che R. near Gomi [upper Huang He about 50 km upriver of Guide]; syntypes: ZISP 7252 [1], ZISP 7306 [2], ZISP 7312 [5], ZISP 7315 [2], ZISP 7319 [more than 6], ZISP 7371 [1], ZISP 7853 [2], ZISP 7854 [1], ZISP 7855 [1])

Triplophysa strauchii (Kessler. 1874)

Diplophysa Strauchii Kessler, 1874: 58, pl. 8 fig. 40 (type locality: Kazakhstan: River Ili, tributary of Lake Balkash, and Ich-Balya River)

Nemachilus ulacholicus Anikin, 1905: 3, 18 [of reprint] (type locality: Kirghizistan: Lake Issyk-kul at the mouth of Ulakhol River)

Diplophysa strauchi ulacholica var. *pedaschenkoi* Berg, 1931b: 312, fig. 2 (an infrasubspecific name, not available)

Nemachilus strauchi zaisanicus Menschikov, **1937: 437** (type locality: Kazakhstan: Karasu River at Akdzhar, Tarbagatai District, basin of Lake Zaisan, 40 km from the lake) from Berg, 1949

Nemacheilus strauchi dorsaloides Turdakov, 1947: 155 (type locality: Kirghizistan: Tyupsky Bay of Lake Issyk-kul, USSR)

Nemachilus ruzskyi Nekrashevich, 1948: 121 (type locality: Kazakhstan: Lake Alakul, east of Lake Balkash)

Nemachilus strauchi reuniens Turdakov, 1952: 57 (type locality: Kirghizistan: Irisu River, tributary of Karkara River [tributary of Charyn River, Lake Balkash basin])

Family Cobitidae
(spiny loaches)

Iksookimia choii (Kim & Son, 1984)

Cobitis choii Kim & Son, 1984: 50, fig. 1 (type locality: South Korea: Chungcheongbug-do Prov.: Miheo-cheon stream, a tributary of Geum River at Yeocheon-ri, Ochang-myon, Cheongwon-gun)

Misgurnus anguillicaudatus (Cantor, 1842)

Cobitis anguillicaudata Cantor, 1842: 485 (type locality: China: Chusan Island)

Family Siluridae
(wels, sheatfishes)

***Silurus soldatovi* Nikolski & Soin, 1948**

Silurus soldatovi Nikolski & Soin, **1948: 1359, fig. 1** (type locality: Russia: Khabarovskyi Krai: Amur River, Lake Kabar at Elabuga)

Family Bagridae
(bagrid catfishes)

***Pseudomystus herzenszeini* (Berg, 1907)**

Macrones herzensteini Berg, 1907b: 421 (type locality: Russia: mouth of Onon River)

Family Gasterosteidae
(sticklebacks)

***Pungitius sinensis* (Guichenot, 1869)**

Gasterosteus sinensis Guichenot, 1869: 204, pl. 12 fig. 4 (type locality: China [Yangtze River])

Family Percidae
(perches)

***Gymnocephalus cernuus* (Linnaeus, 1758)**

Perca Cernua Linnaeus, 1758: 294 (based on Linnaeus [1746: 107, n. 286, Perca ... radiis 27], Artedi [1738: gen. 40 [80], syn. 68, spec. 77 [40], Perca dorso monopterygio capite ...], Gronovius [1754: 41, n. 94, idem]; type locality: "in Europae lacubus")

Family Cottidae
(sculpins)

***Cottus altaicus* Kashchenko, 1899**

Cottus poecilopus altaicus Kashchenko, 1899: 151 (type locality: Russia: Altai: Sema River at Cherga/Ryblushka, a settlement, close to Cherga, on Rybnuskka stream, Katun system/Katun River at Nizhnii Uimon)

***Cottus dzungaricus* Kottelat, 2006**

Cottus sibiricus altaicus Li & Ho in Li, Tai, Chang, Ma & Ho, 1966: 49, fig. 2 (type locality: China: Altai, northern Sinkiang; junior primary homonym of *Cottus poecilopus altaicus* Kashchenko, 1899: 151)

Cottus dzungaricus Kottelat, 2006 (see above) (replacement name for *Cottus sibiricus altaicus* Li & Ho in Li, Tai, Chang, Ma & Ho, 1966: 49)

Cottus poecilopus Heckel, 1837

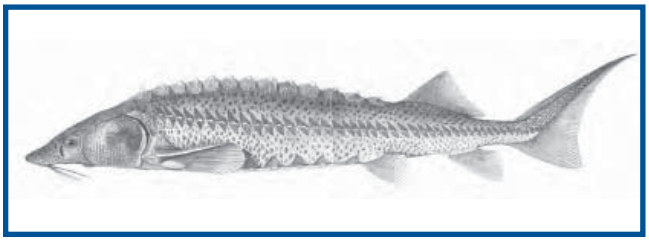
Cottus poecilopus Heckel, 1837: 145, pl. 8 figs. 1-2 (type locality: Slovakia: a hill stream [probably Cerveny; Kottelat, 1997: 169] of the Carpathes [Vysoké Tatry], near Grossschlagendorf [Vel'ky Slavkov] near Käsmark [Kezmarok], Upper Hungary [now Slovakia], Vistula basin)

Cottus sibiricus Warpachowski, 1889

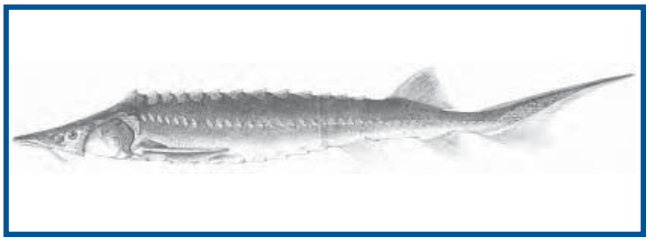
Cottus sibiricus Warpachowski, **1889a: 12** (type locality: Russia: River Yenisei at Minusinsk and Abokak [Abakan] [Berg, 1949: 1148 also mentions River Irtysh off Ust-Kamenogorsk, but without evidence])

Appendix 2: Figures

Lethenteron reissneri Image: M. Kottelat



Acipenser baerii Source: Berg, 1911



Acipenser schrenckii Source: Berg, 1911

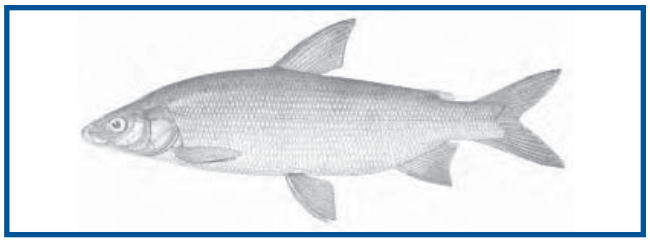
Hucho taimen Image: Z. Hogan

Hucho taimen juvenile Image: M. Kottelat

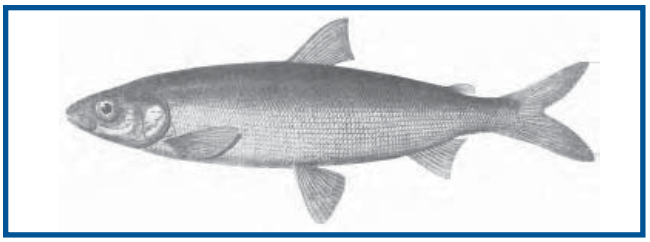
Brachymystax lenok Image: J. Schöffmann

Brachymystax sp. juvenile Image: M. Kottelat

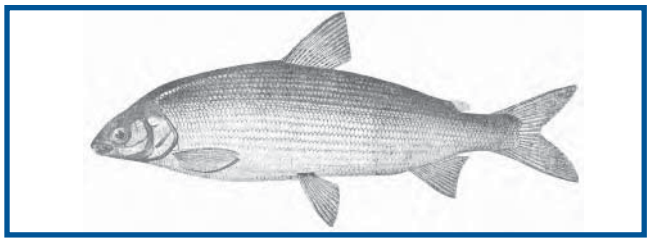
Brachymystax cf. *tumensis* Image: J. Schöffmann



Coregonus chadary Source: Berg, 1932



Coregonus migratorius Source: Berg, 1932



Coregonus pidschian Source: Berg, 1932

Thymallus cf. *arcticus* Image: M. Kottelat

Thymallus baicalensis Image: J. Schöffmann

Thymallus brevirostris Image: J. Schöffmann

Thymallus grubii Image: J. Schöffmann

Thymallus nigrescens Image: M. Kottelat

Thymallus sp. 1 Image: Erdenebat M.

Esox lucius Image: M. Kottelat

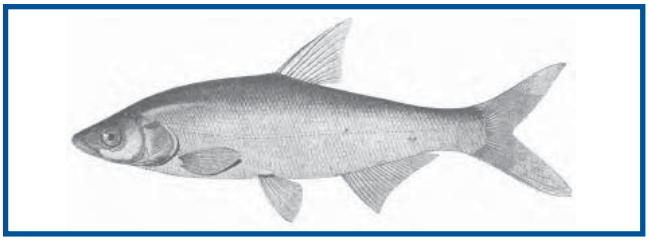
Esox reichertii Image: Erdenebat M.

Acheilognathus asmussii Image: Erdenebat M.

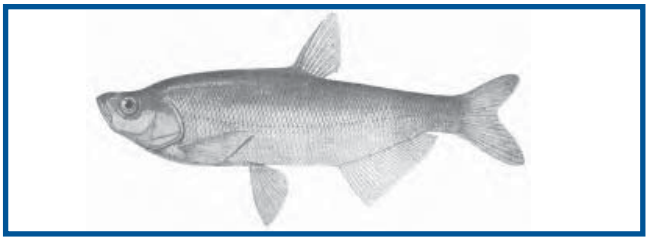
Carassius carassius (?) Image: M. Kottelat

Carassius gibelio Image: Erdenebat M.

Chanodichthys erythropterus Image: M. Kottelat



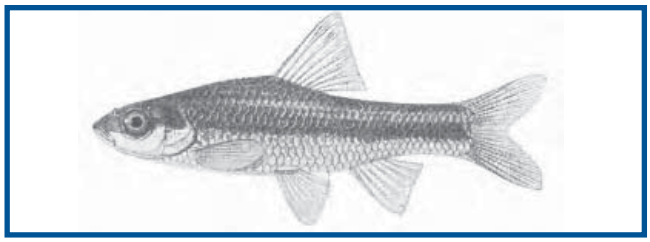
Chanodichthys mongolicus Source: Berg, 1932



Culter alburnus Source: Berg, 1932

Cyprinus rubrofuscus (?) Image: M. Kottelat

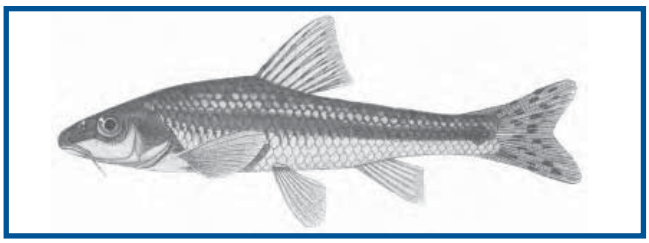
Eupallasella percnurus Image: M. Kottelat



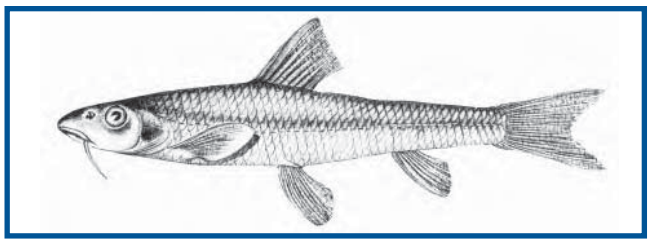
Gnathopogon strigatus Source: Berg, 1914

Gobio acutipinnatus Image: M. Kottelat

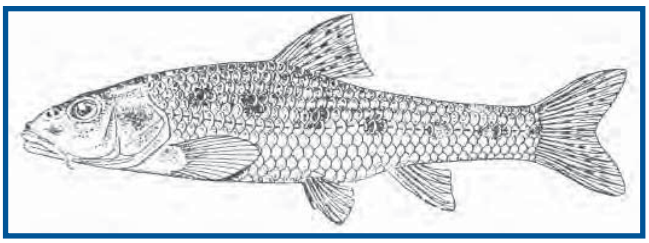
Gobio cynocephalus Image: M. Kottelat



Gobio soldatovi Source: Berg, 1911



Gobio tenuicorpus Source: Mori, 1934



Gobio sp. Onon Source: Nikolski, 1956

Hemibarbus labeo Source: Berg, 1914

Hemibarbus maculatus Image: M. Kottelat

Hemiculter leucisculus Image: M. Kottelat

Hemiculter varpachovskii Image: M. Kottelat

Ladislavia taczanowskii Image: M. Kottelat

Leuciscus baicalensis Image: Erdenebat M.

Leuciscus dzungaricus Image: M. Kottelat

Leuciscus idus Image: M. Kottelat

Leuciscus waleckii Image: M. Kottelat

Microphysogobio anudarini Image: M. Kottelat

Oreoleuciscus angusticephalus Image: M. Kottelat

Oreoleuciscus dsapchynensis Image: M. Kottelat

Oreoleuciscus humilis Image: M. Kottelat

Oreoleuciscus potanini Image: M. Kottelat

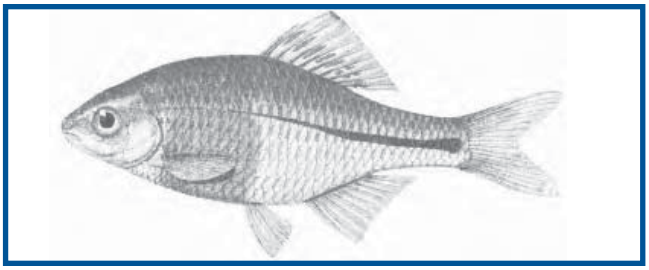
Phoxinus cf. *phoxinus* Image: M. Kottelat

Phoxinus ujmonensis Image: M. Kottelat

Pseudaspius leptocephalus Image: Erdenebat M.

Pseudorasbora parva female Image: M. Kottelat

Pseudorasbora parva male Image: M. Kottelat



Rhodeus sericeus Source: Berg, 1932

Rhynchocypris czekanowskii Image: M. Kottelat

Rhynchocypris lagowskii Image: M. Kottelat

Rutilus rutilus Image: M. Kottelat

Sarcocheilichthys soldatovi Image: M. Kottelat

Saurogobio dabryi Image: M. Kottelat

Squalidus chankaensis Image: M. Kottelat

Tinca tinca Image: M. Kottelat

Barbatula compressirostris Image: M. Kottelat

Barbatula dgebuadzei Image: M. Kottelat

Barbatula toni Image: M. Kottelat

Barbatula sp. Tuul Image: M. Kottelat

Barbatula sp. Egiin Image: M. Kottelat

Barbatula altayensis Image: M. Kottelat

Lefua costata Image: M. Kottelat

Triplophysa gundriseri Image: M. Kottelat

Triplophysa sp. Tuul Image: M. Kottelat

Cobitis melanoleuca Image: M. Kottelat

Cobitis melanoleuca Image: M. Kottelat

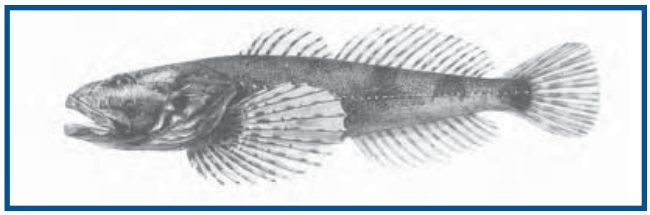
Misgurnus mohoity Image: M. Kottelat

Silurus asotus Image: M. Kottelat

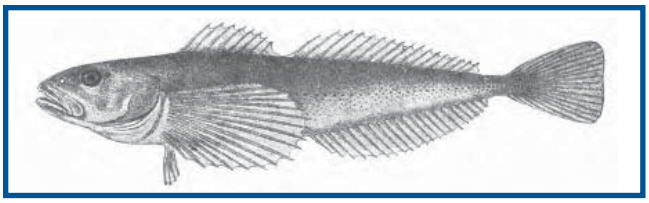
Lota lota Image: M. Kottelat

Perca fluviatilis Image: M. Kottelat

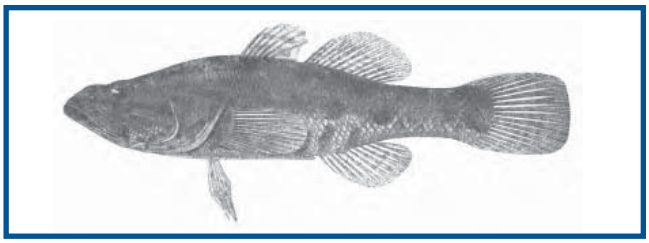
Cottus szanaga Image: M. Kottelat



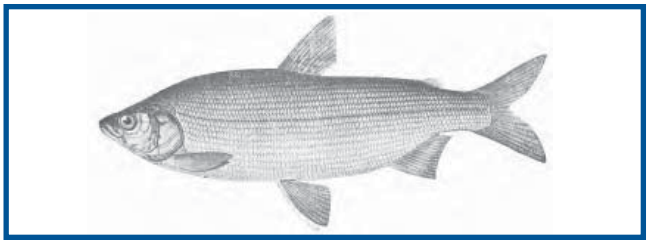
Mesocottus haitej Source: Berg, 1909



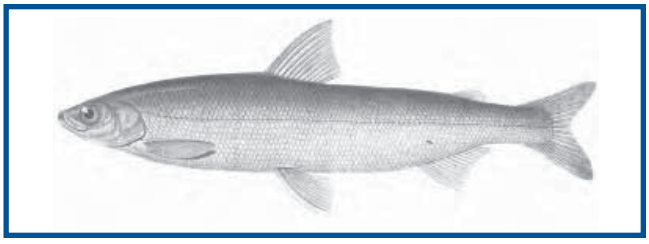
Leocottus kesslerii Source: Berg, 1932



Perccottus glenii Source: Berg, 1932



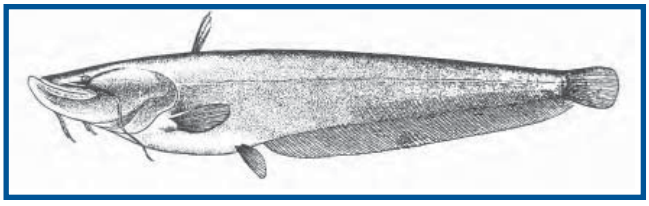
Coregonus peled Source: Berg, 1932



Coregonus sardinella Source: Berg, 1932

Ctenopharyngodon idella Image: M. Kottelat

Hypophthalmichthys molitrix Image: M. Kottelat



Silurus soldatovi Source: Nikolski, 1954

Addendum

While this report was going to press, funding became available for a brief period of fieldwork, unfortunately too late to have the results included here. The present addendum is written in Khovd in the middle of my field trip and mentions a few raw observations on the material obtained. It was decided to include the photographs, although the identifications of several samples are very tentative, made in the field, without access to any literature. Further, a number of species apparently new to science have been observed.

Oreoleuciscus dsapchynensis
Material obtained in Airag Lake agrees with my hypothesis that it is a valid species.

Oreoleuciscus humilis
Material collected at several localities, including at the type locality (Ulaangom), suggests that several discrete species are confused under this name. Material from Baydrag River seems to include two species in sympatry.

Oreoleuciscus angusticephalus
Material from Lakes Airag and Khyargas does not seem to be conspecific.

Barbatula (?) *compressirostris*
A species quite similar to the figure in the original description was observed at many localities in the Khovd River drainage. It agrees with the original description of *B. golubtsovi*, treated as a synonym of *B. compressirostris* (see above).

Carassius carassius
Presence in Bulgan River is confirmed.

Barbatula altayensis
Presence in Bulgan River is confirmed. At least one other species of *Barbatula*, still unidentified, is also observed in Bulgan River.

Barbatula dgebuadzei
Observed only in Baydrag River.

Thymallus, Phoxinus and *Cottus* were not observed in Bulgan River.

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