# TAXONOMIC REVISION OF THE GENUS *CHONDROSTOMA* AGASSIZ, 1835 (PISCES, CYPRINIDAE).

by

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**ABSTRACT.** - The original description of the genus *Chondrostoma* is short and inadequate to differentiate it clearly from related genera. Therefore, a new diagnosis and description based on the main osteological and external morphological features is offered. After surveying forty-six taxa within *Chondrostoma*, it is concluded that the genus consists of only sixteen species with twenty-four subspecies ; among these, a new species and three new subspecies are described.

**RESUME.** - La description originale du genre *Chondrostoma* est insuffisante et quelque peu inadéquate pour différencier ce genre de ceux qui lui sont voisins. Par conséquent nous proposons une nouvelle diagnose et une nouvelle description fondées principalement sur l'ostéologie et les caractères morphologiques externes. Après avoir étudié quarante six espèces, sous espèces et variétés de *Chondrostoma*, nous en avons conclu que le genre est constitué seulement de seize espèces avec vingt quatre sous espèces, parmi lesquelles une espèce et trois sous-espèces sont décrites comme nouvelles.

Key-Words : *Chondrostoma*, Cyprinidae, taxonomy.

Since the description of the genus *Chondrostoma* by Agassiz (1835), which originally includes only two species, many more taxa have been placed within it. However, only one revision (*sensu* Mayr 1969) of the genus and its included species has been published (Mathias 1921). This recognized seventeen species but was based on only seventy-seven specimens of six species, from western Europe and the circummediterranean region (Mathias 1921). Two subsequent reviews (sensu Mayr 1969) of the species of *Chondrostoma* have been made, in which Berg (1932) accepted fifteen European species, while Banarescu (1960) recognized a total of ten species in Europe and Asia. Since the original description of the genus is short and inadequate and there is no recent revision of the species, the present alpha-level revision of the genus was undertaken.

The present revision is based on the study of 6887 specimens of all species of *Chondrostoma* and concludes that genus consists of sixteen species and twenty-four subspecies. Moreover, the genus *Chondrostoma* is redefined mainly on osteological characters.

The present report is a brief summary of the taxonomic revision of the genus *Chondrostoma* carried out by the author in fulfillment of a PhD dissertation (Elvira 1985a, unpublished PhD Thesis). Some of the results obtained during this revision, such as the redefinition of the genus, the taxonomic rearrangement of the recognized species and subspecies, and the description of a new species and three new subspecies are presented here. Some results have already been presented at the Fifth European Congress of Ichthyologists, Stockholm, August 1985 (Elvira 1985b).

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## MATERIAL AND METHODS

The material examined belongs to the following institutions and collections (where possible acronyms proposed by Leviton et al. 1985 are used) : BMNH : British Museum (Natural History), London, United Kingdom. DBAEV : Département de Biologie Animale et Ecologie, Université de Lyon, Villeurbanne, France. ETSIM : Departamento de Zoologia y Entomologia, Escuela Tecnica Superior de Ingenieros de Montes, Madrid, Spain. IFIE : Instituto Forestal de Investigaciones y Experiencias, Madrid, Spain. IMNH : Idaho Museum of Natural History, Pocatello, USA. IRAQ : Natural History Museum, University of Baghdad, Baghdad, Iraq. IRSNB : Institut Royal des Sciences Naturelles de Belgique, Bruxelles, Belgium. ISBB : Institute of Biological Sciences, Bucharest, Romania. IZA : Istituto di Zoologia, Università degli Studi, L'Aquila, Italy. LFRHB : Laboratory of Fishery Research and Hydrobiology, Bratislava, Czechoslovakia. LIAT : Laboratoire d'Ichtyologie Appliquée, Ecole Nationale Supérieure Agronomique, Toulouse, France. LZUT : Department of Zoology, Faculty of Sciences, Thessaloniki, Greece. MB : Museu Bocage, Lisbon, Portugal. MHNG : Muséum d'Histoire Naturelle, Genève, Switzerland. MHNNS : Muséum d'Histoire naturelle de Macedonia, Skopje, Yugoslavia. MHNN : Musée d'Histoire Naturelle, Neuchâtel, Switzerland. MNCN : Museo Nacional de Ciencias Naturales, Madrid, Spain. MNHN : Muséum National d'Histoire Naturelle, Paris, France. MSNC : Museo Civico di Storia Naturale, Carmagnola, Italy. MSNG : Museo Civico di Storia Naturale "Giacomo Doria", Genoa, Italy. MZN : Musée de Zoologie, Nancy, France. NMW : Naturhistorisches Museum, Vienna, Austria. NZMS : National Natural History Museum, Sofiya, Bulgaria. UZA : Unidad de Zoología Aplicada, Departamento de Ecología, Comunidad de Madrid, Madrid, Spain. VBCM : Cátedra de Zoología de Vertebrados, Universidad Complutense de Madrid, Madrid, Spain. ZIL : Zoological Institute of Academy of Sciences of the USSR, Leningrad, USSR. ZMH : Zoologisches Institut und Zoologisches Museum, Hamburg, West Germany.

Morphometric and meristic features were taken following Elvira (1980). The following abbreviations are used : StL (standard length), FoL (fork length), ToL (total length), HeL (head length), PrDL (predorsal length), PrPvL (prepelvic length), MxBH (maximum body height), MnBH (minimum body height), HeW (head width), IOW (interorbital width), LLS (lateral line scales), TLS (transversal line scales), DFR (branched rays of the dorsal fin), PtFR (branched rays of the pectoral fin), PvFR (branched rays of the pelvic fin), AFR (branched rays of the anal fin), CFR (caudal fin rays), NFT (number of pharyngeal teeth) and NGR (number of gill rakers of the external row of the first left arch).

Bones were obtained from fresh or preserved (in formalin or alcohol) fishes. They were skeletonized by maceration in water when fishes were fresh, and by means of digestion in warm KOH solution, when fixed. The skeleton was fully examined but only six bones (the supraethmoid, maxilla, premaxilla, dentary, basioccipital and 5th ceratobranchial) were used to define the genus in this preliminary report.

## RESULTS

### Genus *Chondrostoma* Agassiz, 1835.

*Chondrostoma* Agassiz, 1835, *Mém. Soc. Sci. Nat. Neuchâtel*, 1 : 38. Type, by subsequent designation, *Cyprinus nasus* L., 1758 (Berg, 1914, Fauna Rossii, Ryby, III, 2 : 360).

*Chondrostomus* Heckel, 1843, Russegger's Reisen, 1 : 1030. Type, by subsequent designation, *Cyprinus nasus* L., 1758 (Berg, 1914, Fauna Rossii, Ryby, III, 2 : 360).

*Chondrochylus* Heckel, 1843, Russegger's Reisen, 1 : 1031. Type, by subsequent designation, *Chondrochilus regius* Heckel, 1843 (Berg, 1914, Fauna Rossii, Ryby, III, 2 : 360).

*Chondrorhynchus* Heckel, 1843, Russegger's Reisen, 1 : 1031. Type, by monotypy, *Chondrostoma soetta* Bonaparte, 1840.

*Machaerochilus* Fitzinger, 1873, *Sitzungsb. Akad. Wiss. Wien*, 68 : 170. Type, by monotypy, *Chondrostomus phoxinus* Heckel, 1843.

**Diagnosis** : The diagnosis is based on three osteological and one external features in combination :

a) Dentary short with the anterior part medially curved forming an angle of ninety degrees (or close to it) with the lateral portion. The oral surface has a conspicuous prominence where the horny layer of the lip is inserted. The coronoid process is vertical or inclined anteriorly (Fig. 1d).

b) Basioccipital bone with the distal portion of the pharyngeal process thin and broad with a grooved dorsal surface. The masticatory plate is large, smooth and ovate (Fig. 1e).

c) Pharyngeal bone (5th ceratobranchial) with the upper limb distally wider, hammer-shaped, and the lower limb thin and nearly parallel to the former. Five to seven knife-like teeth with smooth grinding surfaces (Fig. 2).

d) Straight or arched subterminal mouth with a constant, more or less developed, horny layer on the lower lip. Other diagnostic features are described below.

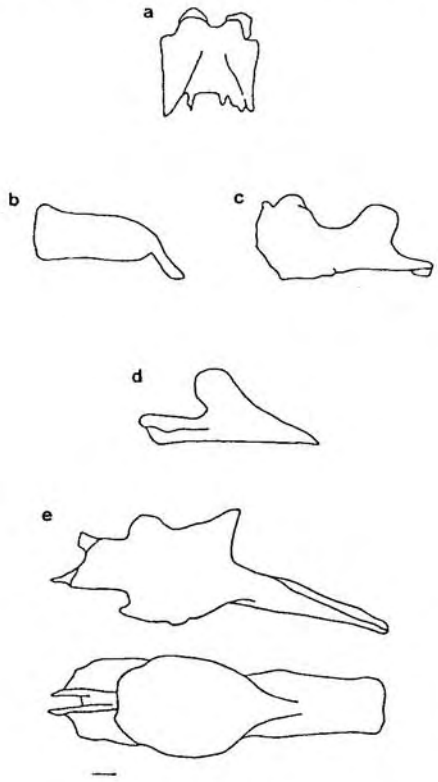


Fig. 1 : *Chondrostoma nasus nasus* . a) Supraethmoid (dorsal view). b) Left premaxillary (lateral view) c) Left maxillary (lateral view) d) Left dentary (lateral view) e) Basioccipital (lateral and ventral views). Scale bar indicates 1 mm.

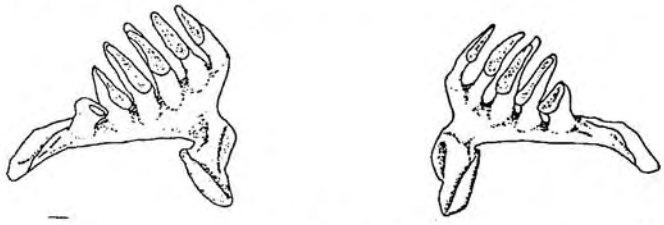

Fig. 2 : *Chondrostoma polylepis polylepis*. Left and right pharyngeal bones (5th ceratobranchials), with the pharyngeal teeth. Scale bar indicates 1 mm.

**Internal features** : Maxillary bone shortened ; the anterior and posterior lateral processes similar in size and shape (Fig. 1c). Premaxillary rather high, the anterior arm short or lacking in some species (Fig. 1b). Supraethmoid is nearly as

long as wide, with the medial anterior margin slightly concave (Fig. 1a). Pharyngeal teeth placed in a single row, five (one species exceptionally may have four in the right arch) to seven teeth on each arch, the same number on both arches or one more on the left (other combinations are unusual). Gill rakers short, fourteen to thirty-six on the external row of the first left arch. Peritoneum black.

**External features** : Body fusiform, more or less pigmented or spotted above the lateral line and whitish below. Mouth inferior, straight to arched like a horse-shoe, upper lip fleshy, the lower with a characteristic horny layer ; without barbel. Origins of dorsal and pelvic fins vertically opposite. Eight to ten branched rays in dorsal fin, from twelve to eighteen in pectoral, eight or nine in pelvic, eight to twelve in anal and seventeen (between two longer unbranched rays) in caudal fin. The outlines of the dorsal and anal fins are usually concave, exceptionally straight or slightly convex. Scales along the lateral line variable from forty-four to one hundred and six.

**Distribution** : The genus is widely distributed in central and southern Europe, from the Iberian Peninsula to the Ural Mountains, and the Middle East, from the Anatolian Peninsula to Iran. Thus, it is characteristic of the Euro-Mediterranean subregion (Banarescu 1960). Different species occur in this area almost without any overlap. Only three pairs of species are sympatric : *C. soetta* and *C. genei* in northern Italy, *C. nasus nasus* (introduced) and *C. toxostoma toxostoma* in south-eastern France, and *C. nasus nasus* and *C. scodrensis* in Lake Scutari within the Drin river basin. *C. polylepis polylepis* and *C. toxostoma arrigonis* are locally sympatric in the upper Júcar river basin but this may be the result of the recent introduction of the former subspecies.

**Etymology** : χονδροσ (chondros) (Greek) : cartilage, στομα (stoma) (Gr.) : mouth ; with the reference to the originally supposed nature of its lower lip. Gender : neuter, "Names ending in ..., or -stoma (στομα) are neuter" (Article 30 (a) of the International Code of Zoological Nomenclature, Anon. 1985).

## SPECIES ACCOUNT

The taxa referable to the genus *Chondrostoma* and their present taxonomic status are listed in Table I. *Leuciscus lemmingii* Steindachner, 1866 and *Chondrostoma lusitanicum* Collares-Pereira, 1980, both considered as *Chondrostoma* species by Collares-Pereira (1980a, 1980b, 1983) are provisionally transferred to the genus *Rutilus*, since they lack the combination of diagnostic characteristic features of the genus *Chondrostoma* stated before.

The present account is restricted to specific and subspecific taxa ; several specimens considered to be intra- or intergeneric hybrids will be described in a later paper dealing with hybridization in *Chondrostoma*.

Species and subspecies are listed alphabetically except for the nominal species and the nominal subspecies of the polytypic species which are described first.

***Chondrostoma nasus nasus*** (L., 1758).

*Cyprinus Nasus* L., 1758, Systema Naturae, ed. X, I : 325 (type locality : river Rhine).

*Chondrostoma Nasus* : Agassiz, 1835, *Mém. Soc. hist. nat. Neuchâtel*, 1 : 38.

*Chondrostomus Nasus auratus* Schäfer, 1844, Moselfauna, p. 305 (type locality : river Moselle).

*Chondrostoma nasus* var. *hernadiensis* Jeitteles, 1862, Ver. zool. bot. Ges., 12 : 306 (type locality : river Hernad, Kaschau, Czechoslovakia).

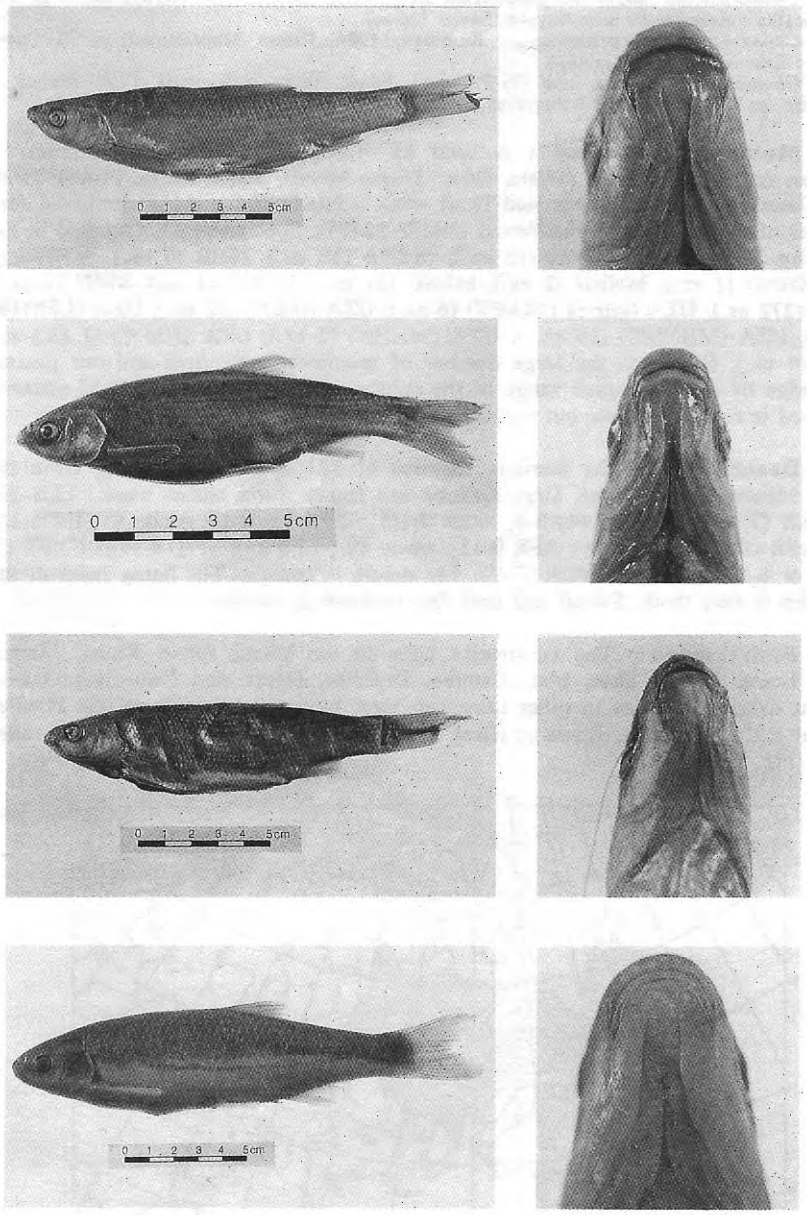


Fig. 3 : Lateral views (left) and ventral views (right) of the head of the new taxa. a) *Chondrostoma nasus angorensis*, NMW 52480 : 1. b) *Chondrostoma holmwoodii meandrensis*, holotype, ZMH 2487 : 1. c) *Chondrostoma scodrensis*, holotype, NMW 52099 : 1. d) *Chondrostoma toxostoma turiensis*, holotype, UZA 1983.12.06.01.

*Chondrostoma caerulescens* Blanchard, 1866, Poissons des eaux douces de la France, p. 416 (type locality : rivers Doubs and Ognon, France).

*Chondrostoma nasus borysthenicum* Berg, 1914, Fauna Rossii, Ryby, III, 2, p. 373 (type locality : river Dnepr near Neyasit, Soviet Union).

*Chondrostoma nasus ohridanum* Karaman, 1924, Pisces Macedoniae, p. 71 (type locality : Lake Ohrid, Yugoslavia).

*Chondrostoma nasus lumi* (?) Poljakov, Filipi, Basho & Hysenaj, 1958, Peshqit e Shqiperise, p. 88 (type locality : Pogradec, Albania).

**Material examined** : A total of 404 preserved specimens from 58 localities in 13 river basins (Wisla, Oder, Rhine, Meuse, Seine, Loire, Rhône, Drin, Mat, Danube, Dniester, Dnepr and Don) were studied. The material included four syntypes of *C. nasus* var. *hernadiensis* (NMW 52475). Specimens were studied in the following institutions : BMNH (13 ex.), IRSNB (12 ex.), ISBB (7 ex.), MHNG (6 ex.), MHNN (1 ex.), MNHN (2 ex.), MSNC (31 ex.), MSNG (1 ex.), MZN (1 ex.), NMW (272 ex.), UZA (gift of DBAEV) (6 ex.), UZA (ISBB) (32 ex.), UZA (LFRHB) (3 ex.), UZA (MHNMS) (10 ex. ), UZA (MNHN) (2 ex.), UZA (NMW) (1 ex.) and ZMH (4 ex.). Owing to the large number of specimens examined and our present knowledge of the geographic range of the subspecies, an exhaustive list of material examined is not given here, but it can be found in Elvira (1985a).

**Description** : The meristic features of 181 specimens coming from the Rhine, Meuse, Loire, Rhône, Drin, Danube and Dnepr rivers basins were : LLS 52-66 ; TLS (7) 8-9 (10)/ 1 / (4) 5-6, mode 9/1/5 ; DFR (8) 9-10, mode 9 ; PtFR 15-18 ; PvFR (8) 9-10, mode 9 ; AFR 9-11 , mode 10 ; CFR I/(16)17(18-19)/I ; NFT (7-6) 6-6 or 6-5, mode 6-6 ; NGR 27-36. The mouth is straight. The horny layer of the lower lip is very thick. Dorsal and anal fins concave in outline.

**Distribution** : The subspecies lives in the Wisla, Oder, Rhine, Meuse, Seine, Loire, Rhône, Drin, Mat, Danube, Dniester, Dnepr and Don rivers basins (present data) as well as in other European river basins, such as those the Niemen (Zhukov 1958), Pregolia, Passarge (Berg 1932) and Somme (Cuvier & Valenciennes 1844) (Fig. 4a).

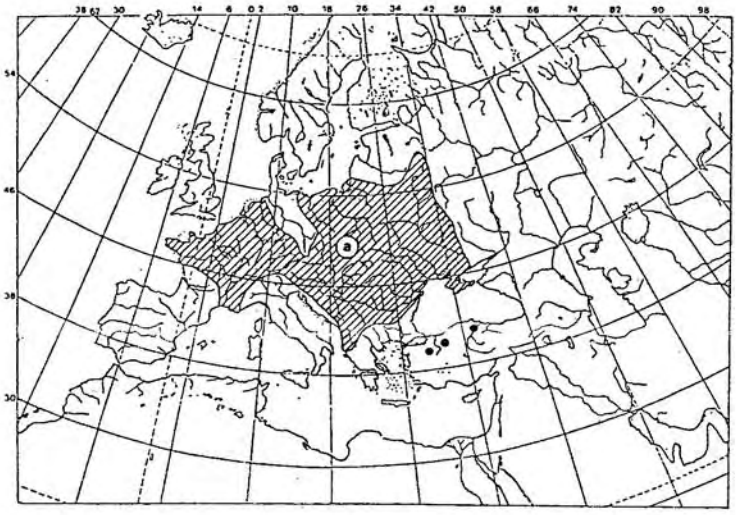


Fig. 4a : Distribution of *C. nasus nasus*. Black circles : distribution of *C. nasus angorensis*.

*Chondrostoma nasus angorensis* ssp. nov.

**Material examined** : NMW 52234 : 1, 1ex., holotype, Eskishir (Eskisehir), 1894, Col. Steindachner. NMW 52234 : 2-11, 10 ex., paratypes, same data. NMW 52235 : 1-3, 3 ex., paratypes, same data. NMW 52477 : 1-3, 3 ex., paratypes, Kirmir-Tschai by Kizildja Hamman (Kizilcahaman), 1895, Col. Escherich. NMW 52233, 4 ex. same data as the holotype. NMW 52236, 6 ex., same data. NMW 52478, 3 ex., same data. NMW 52479, 3 ex., same data. NMW 52480, 7 ex., same data. MSNC uncat., 2 ex., River Kizilirmak near Duragan, Turkey, 8.VIII.1981, Leg. Delmastro.

**Diagnosis** : The subspecies may be recognized by the combination of the following characters : LLS 59-67 ; DFR 9 ; PvFR 9 ; AFR 9-10 ; NFT 6-6 or 6-5, mode 6-6 ; NGR 21-28. Straight mouth with the horny layer of the lower lip very thick. It resembles *C. nasus nasus*, and with that taxon differs from other species by having nine branched rays in the pelvic fins, but differs from the nominal subspecies by the lower number of gill rakers, 21-28 in *C. nasus angorensis* and 27-36 in *C. n. nasus* (CD = 1.67, between the type series of the new subspecies and a sample of twenty-five specimens, from the Danube river basin, of *C. n. nasus*).

**Description** : The meristic characters of the type series (including the holotype) are shown in Table II. The meristic features of the holotype (StL = 118 mm) are : LLS 63 ; TLS 9/1/6 ; DFR 9 ; PtFR 16 ; PvFR 9 ; AFR 10 ; CFR I/17/I ; NFT 6-6 ; NGR 23. The mouth is straight and the horny layer of the lower lip is very thick (Fig. 3a). Dorsal and anal fins concave in outline.

**Distribution** : The three known localities of the subspecies are all in northern Anatolia, in the Sakarya and Kizilirmak river basins (Fig. 4).

**Remarks** : Populations from the Sakarya river basin were first reported by Steindachner (1897) as *C. nasus*. Later, Hanko (1924) regarded them as *C. regium*. Several authors accepted the sympatric occurrence of both species, but Ladiges (1960, 1966) reported specimens from this basin (from Sapanca) as *C. knerii*. His sample (ZMH 1147) consisted of specimens now identified as *Vimba vimba*. On the other hand, Kosswig & Battalgil (1943) reported *C. regium* from the Kizilirmak river basin. Ladiges (1966) did not study specimens from northern Anatolia but he stated that *C. nasus* lives in Sakarya and *C. regium* in Kizilirmak, but were not sympatric. Kuru (1981) considered *C. nasus* to be the only species inhabiting Anatolian waters. He synonymized the formerly accepted species *C. colchicum*, *C. cyri* and *C. regium* under the name *C. nasus*. His study has been recently evaluated by Krupp (1985) as follows : "Besides the fact that Kuru's statistical analysis is faulty, his approach, entirely excluding structural characters, is too simplicistic to evaluate the complex taxonomic situation within this genus". No further comments are needed.

The specimens examined from Sakarya and Kizilirmak river basins show a clear resemblance to *C. nasus* from Europe, hence they are here described as a new subspecies of that taxon.

**Etymology** : *angorensis* : after Angora (Ankara) capital of Turkey. The name was first used by Dr. F. Steindachner in labelling his specimens housed in the Naturhistorisches Museum Wien, Austria, but was never published. Thus, Steindachner (1897) considered these fishes as *C. nasus*.

***Chondrostoma colchicum colchicum*** (Kessler MS) Derjugin, 1899.

*Chondrostoma colchicum* (Kessler MS) Derjugin, 1899, Annuaire Mus. St. Petersb., 1899 : 164 (type locality : river Rion, river Cheba-dere at Batum and river Tschoroch at Batum, Soviet Union).

*Chondrostoma awhasicum* Kamensky, 1901, Die Cypriniden des Kaukasus, 2 : 83 (type locality : Moqua near Suchum-kale, Soviet Union).

*Chondrostoma colchicum* var. *tschorochica* Kamensky, 1901, Die Cypriniden des Kaukasus, 2 : 90 (type locality : Tschoroch-su, Soviet Union).

**Material examined** : A total of eight specimens from two localities in the Coruh river basin (MSNC 6 ex. and ZMH 2 ex.).

**Description** : The meristic characters of the examined specimens (StL = 46-221 mm) from the Coruh river basin were : LLS 60-69 ; TLS (9)10/1/5 ; DFR 8(9) ; PtFR 16-18 ; PvFR 8 ; AFR 9(10) ; CFR I/17/I ; NFT 6-5 ; NGR 24-29. The mouth is straight with a thick horny layer. The outlines of the dorsal and anal fins are concave.

**Distribution** : The type specimens were collected from the Rion and Coruh river basins (Derjugin 1899). Berg (1949) stated that *C. c. colchicum* lives in the rivers of the Black Sea drainage from the river Tuapse to the river Coruh (Fig. 5a). Kuru (1980, 1981) reported several specimens from the Yesilirmak river basin.


Fig. 5a : Distribution of *C. colchicum colchicum*. b : distribution of *C. colchicum kubanicum*.

***Chondrostoma colchicum kubanicum*** Berg, 1914.

*Chondrostoma colchicum kubanicum* Berg, 1914, Fauna Rossii, Ryby, III, 2 : 384 (type locality : river Kuban near Armawir and river Laba near Labinskaja, Soviet Union).

**Material examined** : Three syntypes : ZIL 15299, 3 ex., the river Cubanj (Kuban) near Armavir, 25. IV. 1911, and one specimen more from the same river basin (ISBB 1 ex.).

**Description** : LLS 54-61 ; TLS 7-9/1/5 ; DFR 8(9) ; PtFR 15-16 ; PvFR 8 : AFR 9-10, mode 9 ; CFR I/17(18)/I ; NFT (6-6) 6-5 (5-5) ; NGR 29-30. Mouth

straight with the horny layer well developed and thick. Dorsal and anal fins concave in outline.

**Distribution** : Kuban river basin in N. W. Caucasus (Fig. 5b).

***Chondrostoma genei*** (Bonaparte, 1839).

*Leuciscus Genei* Bonaparte, 1839, Iconografia Fauna Italica, p. 243 (type locality : lakes of Piemont, Italy).

*Chondrostoma Genei* : Heckel, 1847, Russegger's Reisen, 3 : 289.

*Chondrostoma jaculum* De Filippi, 1845, *Not. Nat. Civ. Lombardia, Milano*, 1 : 11 (type locality : the rivers Ticino and Po, Italy).

*Chondrostoma Genei* var. *albicans* Gatti, 1896, *Bol. Soc. Rom. Zool.*, 5 : 215 (type locality : river Vomano by Fontanelle, Italy).

**Material examined** : A total of 192 specimens from 15 localities in 4 river basins (Po, Adige, Arno and Tiber). The material included 4 syntypes of *Chondrostoma jaculum* (NMW 52244). Specimens were studied in the following institutions : BMNH (5 ex.), MB (8 ex.), MNHN (1 ex.), MSNG (4 ex.), NMW (144 ex.), UZA (gift of MSNC) (24 ex.), UZA (gift of IZA) (5 ex.) and ZMH (1 ex.).

**Description** : The meristic description is based on a sample of 68 specimens (StL = 57-156 mm) from the Po river basin : LLS 50-62 ; TLS 8-9 (10-11)/1/4-6 ; DFR 8(9), PtFR (12)13-15(16) ; PvFR (7)8(9) ; AFR 8-10(11) : mode 9 ; CFR I/(16)17(18-19)/I ; NFT (6-5) 5-5 (5-4) ; NGR 14-19. Mouth slightly arched. Horny layer of the lower lip well developed but rather thin. The outline of the dorsal fin is concave, that of the anal fin concave or sinuous.

**Distribution** : Northern and central Italy. Our specimens were captured in the Po, Adige, Tiber and Arno river basins. Tortonese (1970) reported that the species also occurs in the Cesano, Metauro, Foglia, Brenta, Piave, Livenza and Isonzo river basins. Gatti (1896), Bianco (1979) and Bianco & Colatriano ( 1980) recorded it from the Vomano and Tronto river basins in central Italy (Fig. 6).

Fig. 6 : Distribution of *C. genei*.

***Chondrostoma holmwoodii holmwoodii*** (Boulenger, 1896).

*Capoeta Holmwoodii* Boulenger, 1896, *Ann. Mag. Nat. Hist.*, ser. 6, 18 : 153 (type locality : Smyrna (Izmir), Turkey).

*Varicorhinus holmwoodi* : Pellegrin, 1928, Les poissons des eaux douces d'Asie-Mineure, p. 47.

*Chondrostoma nasus holmwoodi* : Karaman, 1969, *Mitt. Hamburg. Zool. Mus. Inst.*, 66 : 19.

**Material examined** : A total of 29 preserved specimens from two localities in two river basins. The sample included the two known syntypes : BMNH 1893.1.14 : 7-8, 2 ex., Smyrna, Leg. Holmwood ; and the specimens from ZMH (27 ex.).

**Description** : Meristic features of the twenty-nine examined specimens (StL = 75-171 mm) : LLS 60-69 ; TLS (9)10(11)/1/5(6) ; DFR 8 ; PtFR 15-16(17) ; PvFR 8 : AFR (8)9(10), mode 9 ; CFR I/(16)17/I : NFT (7-6) 6-6 ; NGR 25-30. Mouth straight. Horny layer well developed. Dorsal and anal fins concave in outline.

**Distribution** : The Bakir and Gediz river basins in western Anatolia (Fig. 7).

Fig. 7 : Black circles : distribution of *C. holmwoodii holmwoodii*. Black squares : distribution of *C. holmwoodii meandrensis*.

***Chondrostoma holmwoodii meandrensis*** ssp. nov.

**Material examined** : ZMH 2487 : 1, 1 ex., holotype, Isikli, Leg. Kosswig, VIII-IX.1964. ZMH 2487 : 2-25, 24 ex., paratypes, same data. ZMH 2487 : 26-59, 34 ex., same data. ZMH 2488, 21 ex., same data. ZMH 1140, 8 ex., same data, 1945-46. ZMH 1142, 8 ex., same data. ZMH 1146, 1 ex., Saraykoy, Leg. Kosswig, 6.XI.1945.

**Diagnosis** : The diagnostic characters of the subspecies are : LLS 52-60 ; DFR 8 ; PFR 8 ; AFR 9-10, mode 9 ; NFT 6-6 (6-5) ; NGR 25-30. The mouth is

straight and the horny layer of the lower lip thick. Dorsal and anal fins concave in outline. It differs from the nominal subspecies by its lower number of scales, 52-60 scales along the lateral line instead of 60-69 in *C. holmwoodii holmwoodii* (CD= 1.87).

**Description** : The holotype, a female, StL = 104 mm, FoL = 116 mm and ToL = 126 mm, with LLS 56, TLS 9/1/5, DFR 8, PtFR 14, PvFR 8, AFR 9, CFR I/17/I, NFT 6-6 and NGR 28. Fig. 3b shows its lateral view and a ventral view of the oral region. The meristic and morphometric characters of the type series (the holotype and the twenty-four paratypes, StL = 67-108 mm) are given in Table III.

**Distribution** : Büyük Menderes river basin in western Anatolia. Only two known localities : Isikli (the type locality) and Saraykoy (Fig. 7).

**Remarks** : The material described was originally studied by Ladiges, who identified it as three different species : *C. knerii*, *C. nasus* and *C. regium* (Ladiges 1960), and later as *C. nasus* (Ladiges 1966). Kuru (1981) did not examine specimens from the Büyük Menderes river basin.

**Etymology** : *meandrensis* : after the river Meandros (latin name of the river Büyük Menderes, where the subspecies lives).

***Chondrostoma knerii*** (Heckel, 1843).

*Chondrostoma Knerii* Heckel, 1843, Russegger's Reisen, 1 : 1030 (type locality : river Narenta, Dalmatia, Yugoslavia).

*Chondrostoma Knerii* : Heckel, 1847, Russegger's Reisen, 3 : 289.

*Chondrostoma genei* var. *knerii* : Mathias, 1921, *Mém. Soc. Zool. France*, 28 (1-2) : 37.

*Chondrostoma nasus knerii* : Karaman, 1928, *Bull. Soc. Sci. Skopje*, 6 : 161.

**Material examined** : A total of 73 specimens from 8 localites in 3 river basins. The material included 12 syntypes : NMW 52265, NMW 52269, NMW 52270, NMW 52271, NMW 52280 and NMW 52281, 12 ex., Narenta, 1843.II.17. Specimens were studied in the following institutions : BMNH (6 ex.), NMW (65 ex.) and ZMH (2 ex.).

**Description** : Meristic data derived from thirty-eight specimens (StL = 98-186 mm) from the Neretva river basin : LLS 50-59 ; TLS 8-9/1/5(6) ; DFR 8-9, mode 8 : PtFR (14)15-16(17) ; PvFR (7)8(9) ; AFR 8-9(10), mode 9 ; CFR I/17(18)/I ; NFT 6-6 and NGR 19-24. Mouth rather arched and the horny layer of the lower lip thin. The outlines of the dorsal and anal fins are concave.

**Distribution** : The species lives in the Neretva river basin and in some neighbouring lakes in Dalmatia and Bosnia-Herzegowina, Yugoslavia, as well as in Zadar, Dalmatia (Fig. 8).

***Chondrostoma orientalis*** Bianco & Banarescu, 1982.

*Chondrostoma cyri orientalis* Bianco & Banarescu, 1982, *Cybium*, 6(2) : 80 (type locality : river Pulwar near Persepolis, Iran).

**Material examined** : IZA 8170, 1 ex., holotype, Pulwar river near Persepolis, 30.V.1976, Col. Bianco & Zerunian. IZA 7833, 19 ex., paratypes, Pulwar river near Persepolis, 30.V.1976, Col. Bianco & Zerunian.

**Description** : The holotype and the nineteen paratypes studied (StL = 48-95 mm) show the following features : LLS aprox. 49-54 (the specimens are almost scaleless, the number of scales along the lateral line, 47-55 being taken by Bianco & Banarescu 1982) ; TLS 8-9/1/4-5 ; DFR (7)8 ; PtFR (13)14(15) ; PvFR (7)8 ; AFR 9-10, mode 9 ; CFR I/17/I ; NFT 6-6 (6-5, 5-6), and NGR 28-32. The mouth is rather straight, the horny layer thick. The outlines of the dorsal and anal fins are concave.

**Distribution** : The only known locality is the river Pulwar near Persepolis, Iran, flowing into the Kor river basin (Fig. 8).

Fig. 8 : Black circles : distribution of *C. knerii*. Black square : distribution of *C. orientalis*.

***Chondrostoma oxyrhynchum oxyrhynchum*** Kessler, 1877.

*Chondrostoma oxyrhynchum* Kessler, 1877, Travail Aralo Kaspian exped., 4 : 134 (type locality : river Kuma by Georgijewsk, Soviet Union).

**Material examined** : Five preserved specimens from two localities in two river basins (Kuma and Rubas-Tschai). The material included one syntype : BMNH 1897.7.5 : 28, 1 ex., Caucasus, Leg. St. Petersburg Mus. ; and four specimens more from the institutions : ISBB (1 ex.) and ZIL (3 ex.).

**Description** : This subspecies has the following morphological characters : LLS 56-67 ; TLS 9-10/1/5-6 ; DFR (7)8 : PtFR 15-16 ; PvFR 8 ; AFR (8)9-10, mode 9 ; CFR I/17/I ; NFT 6-5 or 5-5, mode 6-5, and NGR 23-26. Arched mouth with the horny layer of the lower lip thin. Dorsal and anal fins concave in outline.

**Distribution** : Rivers of the Caspian Sea drainage from the Kuma river to the Samur river basin. Berg (1949) recorded fishes from the Kuma, Terek, Sulak, Rubas-Tschai and Samur river basins (Fig. 9a).

***Chondrostoma oxyrhynchum cyri*** Kessler, 1877.

*Chondrostoma cyri* Kessler, 1877, Travail Aralo Kaspian exped., 4 : 137 (type locality : river Kura, Tbilisi, Soviet Union).

*Chondrostoma schmidti* Berg, 1910, *Ezhegodnik Zoologicheskogo muzeya Akademii Nauk*, 15 : 0168 (type locality : river Alasan at Naporiri, Soviet Union).

*Chondrostoma leptosoma* Berg, 1914, Fauna Rossii, Ryby, III, 2 : 389 (type locality : river Kars-tschai tributary of the river Arax and upper river Arax by Kopri-kei (Erzerum), Turkey, lower river Arax by Karadonly and river Arax by Dshulfa, Soviet Union).

*Chondrostoma cyri leptosoma* : Derzhavin, 1926, *Izvestiya Bakinskoi ikhtiologicheskoi laboratorii*, II, 1 : 174.


Fig. 9a : Distribution of *C. oxyrhynchum oxyrhynchum*. b : distribution of *C. oxyrhynchum cyri*.

**Material examined** : A total of 20 specimens from 8 localities in the Kura river basin. The sample included one syntype of *Chondrostoma cyri* : BMNH 1897.7.5.25, 1 ex., Tiflis, Transcaucasia, Leg. St. Petersburg Mus., and five syntypes of *Chondrostoma leptosoma* : ZIL 9098, 5 ex., Karadany, 1888, Col. Warpachovsky. Specimens were studied in the following institutions : BMNH (3 ex.), ZIL (8 ex.) and ZMH (9 ex.).

**Description** : The twenty measured specimens (StL = 83-195 mm) from the Kura river basin show the following meristic features : LLS 54-62 ; TLS 8-9/1/(3)4-5 ; DFR (7)8(9) ; PtFR (13)14-15(16), mode 14 ; PvFR (7)8 ; AFR (8)9-10, mode 9 ; CFR I/(16)17(18)/I ; NFT 6-5 or 5-5, mode 6-5, and NGR 22-26. A strongly arched mouth with the horny layer of the lower lip very thin. Dorsal and anal fins concave in outline.

**Distribution** : Kura river basin in southeastern Caucasus (Fig. 9b).

***Chondrostoma phoxinus*** (Heckel, 1843).

*Chondrostoma Phoxinus* Heckel, 1843, Russegger's Reisen, 1 : 1031 (type locality : small streams by Livno, Bosnia, Yugoslavia).

*Chondrostoma Phoxinus* : Heckel, 1847, Russegger's Reisen, 3 : 289.

*Machaerochilus phoxinus* : Fitzinger, 1873, *Sitzungsb.* Akad. Wiss. Wien, 68 : 170.

**Material examined** : A total of 114 specimens from 6 localities in 4 basins (Duvno, Glamoc, Livno and Sinj). The material included 11 syntypes : MHNN 1045, 1 ex., Livno, Dalmatia, Leg. Vienna Mus. ; and NMW 52481, 10 ex., Livno, 1842.III.16. Specimens were studied in the following institutions : BMNH (3 ex.), MHNN (1 ex.), NMW (104 ex.) and ZMH (6 ex.).

**Description** : The species is characterized by : LLS 78-106 ; TLS 14-22/1/8-13 ; DFR (7)8(9) ; PtFR 14-17 ; PvFR (7)8(9) ; AFR (7)8-9, mode 8 ; CFR I/(16)17/I ; NFT 6-6 or 6-5, mode 6-6, and NGR 23-28. Mouth arched, the horny layer of the lower lip is very thin. The outline of the dorsal fin may be straight, slightly concave, or convex (this is exceptional in *Chondrostoma*). Outline of the anal fin straight or concave.

**Distribution** : The species lives in the waters of the karst regions of Bosnia-Herzegowina and Dalmatia, both in endorheic (Duvno, Glamoc and Livno basins) and in fluvial drainages (Sinj basin, including in the Cetina river basin) (Fig. 10).

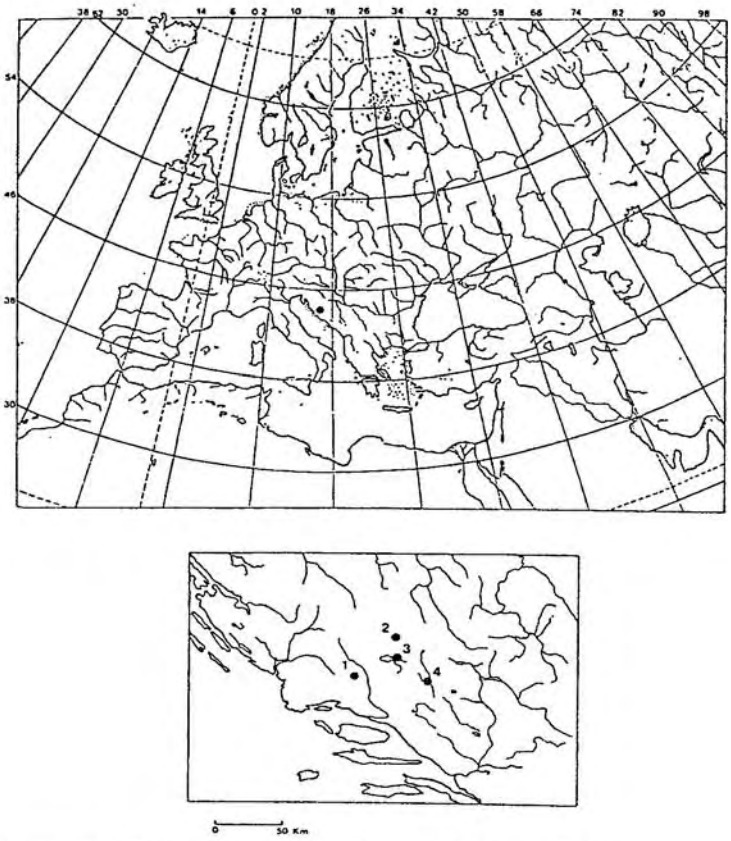


Fig. 10 : Distribution of *C. phoxinus*. 1. Sinj. 2. Glamoc. 3. Livno. 4. Duvno.

***Chondrostoma polylepis polylepis*** Steindachner, 1865.

*Chondrostoma polylepis* Steindachner, 1865, *Mem. Acad. Sci. Lisboa*, 3 : 3 (type locality : Crato, Portuga).

**Material examined** : The material available comprised a total of 2600 specimens, including two syntypes (NMW 53589 : 1-2). They were captured in the following Iberian river basins : Eo, Eume, Allones, Tambre, Ulla, Umia, Minho,

Limia, Douro, Mondego, Alcoa, Tagus and Júcar, and housed in the institutions : BMNH (41 ex.), ETSIM (243 ex.), ISBB (1 ex.), MB (212 ex.), MHNG (9 ex.), MNCN (115 ex.), NMW (176 ex.), UZA (1553 ex.), UZA (originally in the collections of IFIE) (247 ex.) and VBCM (3 ex.).

**Description** : The overall variation in meristic characters is : LLS 61-78 ; TLS (10)11-12(13)/1/(4)5-6 ; DFR (7)8-9(10), mode 8 ; PtFR (14)15-17(18) ; PvFR (7)8 ; AFR 8-9(10) ; CFR I/(16)17(18)/I ; NFT (6-6) 6-5 or 5-5, and NGR 19-31. Straight mouth with the horny layer of the lower lip thick. The outlines of the dorsal and anal fins are concave.

**Distribution** : This subspecies lives in the central and northwestern river basins of the Iberian Peninsula. In addition to the river basins listed above under "Material examined", it has been recorded from the Ave, Vouga and Sado by Almaça (1964). Thus, it occurs from the Eo to the Sado river basins in the Atlantic Sea drainage, and in the Júcar river basin in the Mediterranean Sea drainage. This represents the first report of its occurrence in the Júcar river basin and seems to be local ; it might be a recent introduction (Fig. 11a).

**Remarks** : Latitudinal clinal variation among populations of *C. polylepis* was detected involving the numbers of scales, branched rays of anal fin, pharyngeal teeth and gill rakers. Within the range of *C. p. polylepis* two kinds of morphological pattern, here named as "northern" and "southern", were found. "Northern" populations (those from the Eo, Eume, Allones, Tambre, Ulla, Umia, Minho, Limia and a great part of Douro river basin) are mainly characterized by : AFR 8-9, mode 8 ; NFT 5-5, and NGR 19-26. "Southern" ones (part of the Douro river basin, Mondego, Alcoa, Tagus and Jucar, and according to Coelho (1983, 1985) also Vouga and Sado), have : AFR (8)9(10), NFT (6-6) 6-5 or 5-5, mode 6-5, and NGR 22-31.

The existence of the subspecies recently described by Coelho (1985), *Chondrostoma polylepis duriensis*, is doubtful, since from my data populations of both allopatric subspecies (*C. p. polylepis* and *C. p. duriensis*) can be found in the Douro river basin. A more extensive account of these data will be given in a further paper.

***Chondrostoma polylepis willkommii*** Steindachner, 1866.

*Chondrostoma Willkommii* Steindachner, 1866, *Sitzungsb.Akad. Wiss. Wien*, 54 : 266 (type locality : river Guadiana and its tributaries near Mérida, Spain and Mertola, Portugal ; river Guadalquivir near Sevilla and Córdoba, and the rivers Guadaira, Genil and Guadalete, Spain).

*Chondrostoma polylepis willkommii* : Lozano-Rey, 1935, *Mem. Acad. Cienc. E. F. N. Madrid*, ser. Cienc. Nat., 5 : 166.

**Material examined** : 1048 specimens (of which 106 are syntypes, NMW 52664-52666 and NWM 52668-52705) from the Guadiana, Odiel, Guadalquivir, Guadalete, Guadiaro and Guadalhorce river basins, housed in the following institutions : BMNH (12 ex.), ETSIM (144 ex.), IRSNB (17 ex.), ISBB (7 ex.), MB (115 ex.), MNCN (62 ex.), NMW (109 ex.), UZA (563 ex.), UZA (from IFIE) (18 ex.) and VBCM (1 ex.).

**Description** : The main meristic features are : LLS 59-74 ; TLS (9)10-11(12)/1/4-5(6) ; DFR (7)8-9, mode 8 ; PtFR (14)15-17(18) ; PvFR (7)8 ; AFR (8)9-10, mode 9 ; CFR I/(16)17(18)/I ; NFT (7-7) 7-6 or 6-6 (6-5), and NGR 26-35. Straight mouth and horny layer of the lower lip very thick. Dorsal and anal fins concave in outline.

**Distribution** : The subspecies inhabits the southernmost river basins of the Iberian Peninsula, the Guadiana, Odiel, Guadalquivir, Guadalete, Guadiaro and Guadalhorce (Fig. 11b). It has been reported from Mira and Arade, S. W. Portugal (Daget 1968), records that have been never confirmed.

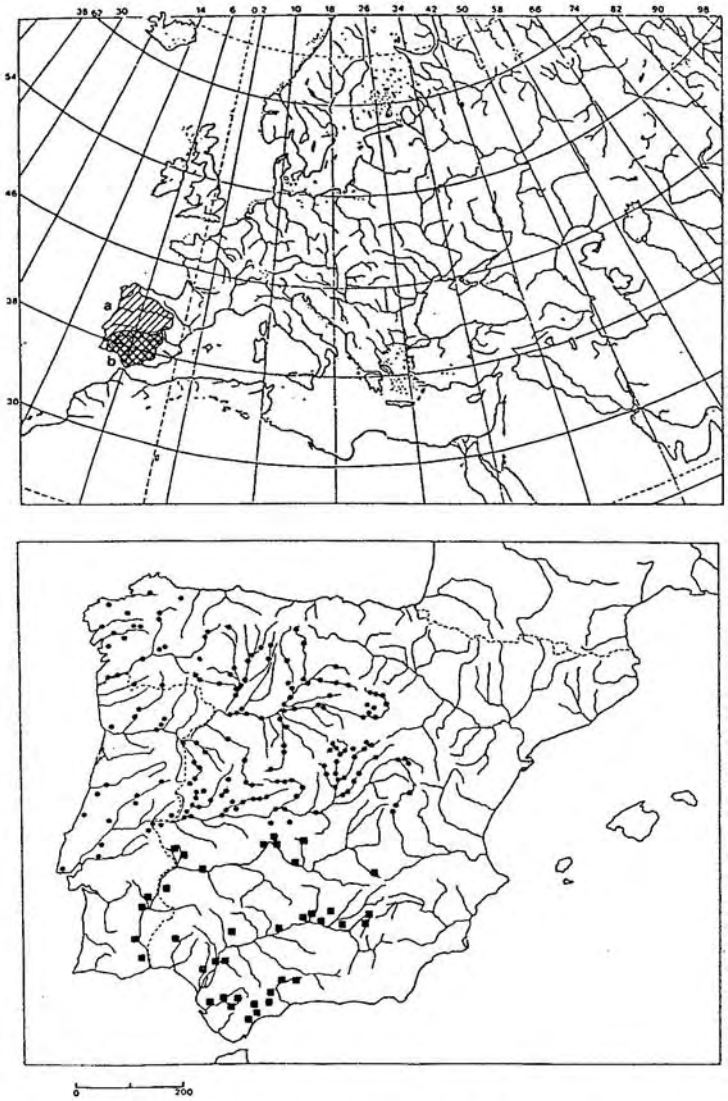


Fig. 11a : Distribution of *C. polylepis polylepis* (black circles : localities of the material examined). b : Distribution of *C. polylepis willkommii* (black squares : localities of the material examined).

**Remarks** : The main clinal variation with regard to *C. p. polylepis* is related to the number of scales, 59-74 in the lateral line, in contrast to 61-78 in *C. p. polylepis*. Besides the branches rays of the anal fin, (8)9-10 in contrast to 8-

9(10) ; gill rakers, 26-35 in contrast to 19-31, and mainly the pharyngeal teeth, (7-7) 7-6 or 6-6 (6-5) in contrast to (6-6) 6-5 or 5-5.

Within the *C. p. willkommii* range the main morphological cline affects the number of pharyngeal teeth : 7-6 or 6-6 with the modal number of 7-6 in the Guadiana river Basin, and (7-6) 6-6 in the other basins.

Almaça (1978) and Coelho (1983, 1985) considered *C. willkommii* as a distinct species of *C. polylepis*. Coelho (1985) justified this "... on the registered variability, on the inexistence of intermediate populations and on the isolation...". The supposed absence of intermediate populations is not real, since for instance that of the Tagus is intermediate for some characters between those of the Douro and Guadiana, the Guadiana between the Tagus and the Guadalquivir, and so on. I agree with the statement on isolation and variability, but explain them in an alternative way. Mayr (1969) stated "Allopatric populations that intergrade clinally with each other belong to the same species". This represents the situation of the Iberian populations here recognised as *C. polylepis* (the same principle is used for the populations of *C. toxostoma*).

***Chondrostoma prespensis*** Karaman, 1924.

*Chondrostoma nasus prespensis* Karaman, 1924, Pisces Macedoniae, p. 73 (type locality : lake Prespa, Yugoslavia).

**Material examined** : A total of 22 preserved specimens from the lake Prespa, housed in the following institutions : MHNMS (10 ex.), UZA (gift of MHNMS) (10 ex.) and ZMH (2 ex.).

**Description** : The meristic features are : LLS 56-66 ; TLS 9-10/1/5-6 ; DFR 8 ; PtFR 16-18 ; PvFR 8; AFR 8-9(11), mode 9 ; CFR I/17/I ; NFT 7-6 or 6-6, and NGR 23-27. A greater variation, based on the study of one hundred specimens, was given by Grupce & Dimovski (1977). The mouth is slightly arched and the horny layer of the lower lip thin. Dorsal and anal fins concave in outline.

**Distribution** : The species has a very restricted distribution, limited to the lake Prespa, as well as (Poljakov et al. 1958) the lake Maliquit within the Semani river basin in Albania (Fig. 12).

***Chondrostoma regium*** (Heckel, 1843).

*Chondrochilus regius* Heckel, 1843, Russegger's Reisen, 1 : 1077 (type locality : river Orontes (?) by Aleppo, Siria and river Tigris by Mosul, Iraq).

*Chondrostoma regius* : Heckel, 1847, Russegger's Reisen, 3 : 289.

**Material examined** : A total of 82 specimens from 20 localities in 6 river basins. The material included 12 syntypes : NMW 52532-52535, 7 ex., river Kueik near Aleppo, 1842.V.19, Col. Kotschy ; NMW 52536-52538, 5 ex., river Tigris near Mossul, 1843.14, Col. Kotschy. Specimens were studied in the following institutions : BMNH (24 ex.), IRAQ (12 ex.), ISBB (2 ex.), MSNC (5 ex.), NMW (12 ex.), UZA (gift of IRAQ) (2 ex.) and ZMH (25 ex.).

**Description** : The meristic description is based on the study of forty-seven specimens from the Tigris-Euphrates river basin (StL = 37-244 mm) : LLS 58-72 ; TLS 10-11/1/5-6 ; DFR (8)9(10) ; PtFR (14)15-17(18) ; PvFR 8(9) ; AFR (9)10-11(12), mode 11; CFR I/17/I ; NFT 7-6 or 6-6, mode 6-6, and NGR 25-34. Mouth straight, the horny layer of the lower lip thick. The outlines of the dorsal and anal fins are concave.

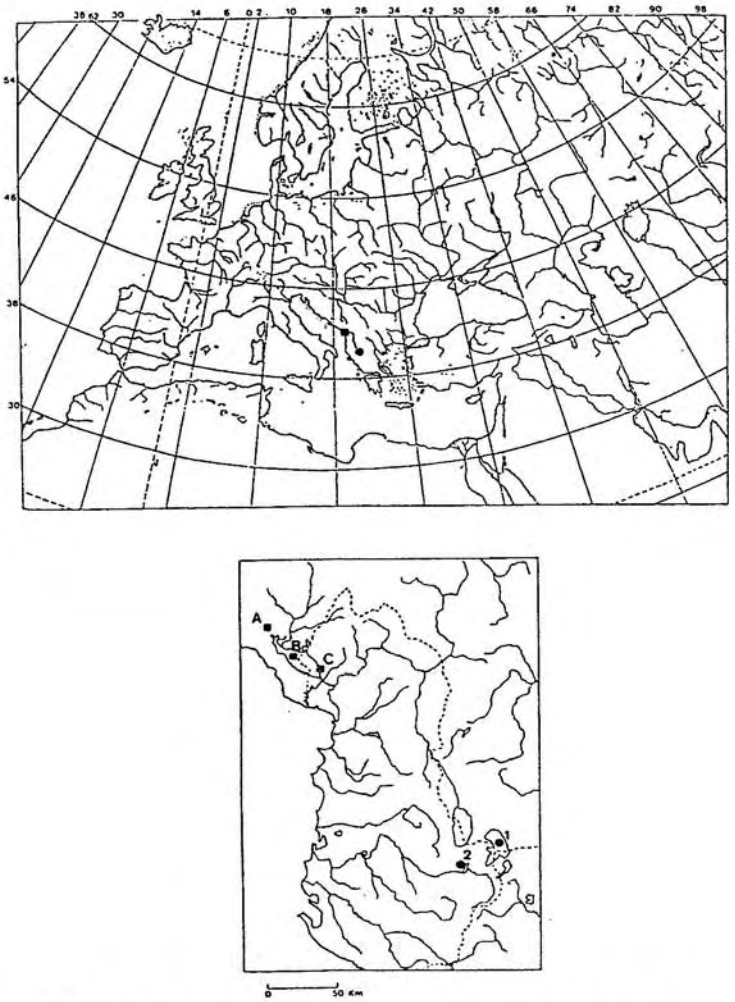


Fig. 12 : Black circles : distribution of *C. prespensis* (1. Lake Prespa. 2. Lake Maliquit). Black squares : distribution of *C. scodrensis* (A. River Rieka, Montenegro. B. Lake Scutari. C. Scutari).

**Distribution** : The species inhabits freshwaters of the eastern Mediterranean drainage : lake Beysehir, and the Göksu, Ceyhan, Kueik and Orontes river basins, as well as the Tigris-Euphrates river basin flowing to the Persian Gulf (Fig. 13a). Kosswig & Battalgil (1943) recorded it from a site within the Seyhan river basin, which is placed between the Göksu an the Ceyhan. Likewise, Kosswig & Battalgil (1943) reported it from Kayseri (Kizilirmak river basin, southern Black Sea drainage, where *C. nasus angorensis* occurs) but gave no morphological details. The existence of *C. regium* in this basin must be considered doubtful until additional records can be obtained.

**Remarks** : After this revision was completed a new species was described from the Orontes river basin, *Chondrostoma kinzelbachi* by Krupp (1985). It appears to be closely related to *C. regium*, its best diagnostic feature being the high number of pharyngeal teeth (mode 7-7). Its sympatric occurrence in that basin with an supposedly aberrant population of *C. regium* (Krupp 1985) is unique for two closely related species of *Chondrostoma*, although Krupp (1985) justifies it by the geological history of the river. I consider that it may represent the extreme of the clinal variation affecting *C. regium*. Further studies of this population will be undertaken.


Fig. 13a : Distribution of *C. regium*. b : distribution of *C. soetta*.

***Chondrostoma scodrensis*** sp. nov.

**Material examined** : NMW 52099 : 1, 1 ex., holotype, Scutari, IX.1881, Col. Steindachner. NMW 52098 : 1, 1 ex., paratype, same data. NMW 52285 : 1-2, 2 ex., paratypes, river Rieka, VIII.1881, Col. Steindachner. NMW 52293 : 1-2, 2 ex., paratypes, same data. NMW 52289 : 1, 1 ex., paratype, same locality, 1881, Col. Steindachner. NMW 52287 : 1-2, 2 ex., paratypes, river Rieka and lake Scutari, 1881, Col. Steindachner.

**Diagnosis** : Meristic diagnostic characters of the new species are (in combination) : LLS 51-59 ; DFR 8-9 ; PvFR 8 ; AFR 9-10, mode 10 ; NFT 6-5 or 5-5, and NGR 14-17. The mouth is slightly arched. The horny layer of the lower lip is well developed but rather thin. Dorsal and anal fins are concave in outline.

The species differs from *C. nasus nasus*, with which it sympatrically occurs, principally by the shape of the mouth and lips. The mouth is clearly straight in *C. n. nasus* while it is slightly arched in *C. scodrensis* ; the horny layer of the lower lip is very thick in *C. n. nasus* and rather thiner in *C. scodrensis*. Moreover, they possess several different meristic features, for instance : PvFR 9 (*C. n. nasus*) and 8 (*C. scodrensis*), NFT (7-6) 6-6 (6-5) (*C. n. nasus*) and 6-5 or 5-5 (*C. scodrensis*), and NGR 27-34 (*C. n. nasus*) and 14-17 (*C. scodrensis*). The stated values of *C. n. nasus* are taken from fishes in the same river basin.

Other species of *Chondrostoma* from neighbouring areas also show considerable differences from both *C. n. nasus* and *C. scodrensis* : *C. vardarensis*, from southern Balkanian Mountains, has a higher number of lateral line scales, 57-66, and a much higher number of gill rakers, 28-38. *C. phoxinus*, from Dalmatia and Bosnia-Herzegowina, has smaller scales and therefore a higher number, 78-106 along the lateral line ; 8-9 branched rays in the anal fin and a higher number of gill rakers, 23-28. *C. knerii*, from the Neretva river basin, seems to be closer but it has more pharyngeal teeth, 6-6, and a higher number of gill rakers, 19-24. *C. prespensis*, from lake Prespa, the geographically nearest allopatric taxon, bears more scales along the lateral line, 56-66 ; 8-9 (modal number 9) branched rays in the anal fin, and higher number of pharyngeal teeth, 7-6 or 6-6, and gill rakers, 22-27.

**Description** : Based on the nine studied specimens, the holotype and the eight paratypes.

*Holotype* : StL 132 mm, FoL 147 mm and ToL 164 mm. Its meristic characters are : LLS 56, TLS 9/1/4; DFR, 8, PtFR 16, PvFR 8, AFR 10, CFR I/17/I, NFT 6-5 and NGR 16. Morphological features as described below for the type series. Fig. 3c shows its lateral view and a ventral view of the oral region.

Type series (holotype and eight paratypes), StL = 95-135 mm. Meristic features are given in Table IV. The mouth is slightly arched and the horny layer of the lower lip rather thin. Concave distal profiles of the dorsal and anal fins.

The type series has been preserved in alcohol for more than a century and as a result the fishes are rather discoloured and soft. For this reason, coloration is not described, no morphometric indexes are stated, and the fishes were not dissected to sex.

**Distribution** : The new species is only known from lake Scutari, on the borders of Yugoslavia (Republic of Montenegro) and Albania, and from the river Rieka, a north-western tributary of that lake in Yugoslavia (Fig. 12).

**Remarks** : Steindachner (1883) reported his specimens from the river Rieka and lake Scutari as *C. knerii*. Later records of *C. knerii* in lake Scutari have been recently made by Vukovic & Ivanovic (1971) and others.

Most of the examined specimens from lake Scutari are now determined as *C. nasus nasus*, a small number are described as the new species. No specimens bearing characters of *C. knerii* wer found.

The fish fauna of the area is still poorly known, since Knezevic (1985) reported for the first time thirteen species in the basin of lake Scutari.

**Etymology** : *scodrensis* : after Scodra, latin name of Scutari, the type locality.

***Chondrostoma soetta*** Bonaparte, 1840.

*Chondrostoma Soetta* Bonaparte, 1840, Iconografia Fauna Italica, p. 251 (type locality : rivers of Lombardy, Italy).

*Chondrochylus nasicus* Heckel, 1843, Russegger's Reisen, 1 : 1031 (type locality : lake Garda, Italy).

*Chondrostoma seva* Valenciennes in Cuvier & Valenciennes, 1844, Histoire naturelle, XVII, p. 396 (type locality : river Po by Turin, Italy).

**Material examined** : A total of 68 preserved specimens from 13 localities in 3 river basins (Po, Brenta and Sile). The material included the holotype of *Chondrostoma seva* : MNHN 3147, 1 ex., Po, Turin ; and seven syntypes of *Chondrochylus nasicus* : NMW 52638, NMW 52639, 7 ex., lake Garda, 1838.III.8. Specimens were studied in the following institutions : BMNH (5 ex.), IRSNB (3 ex.),

MHNG (10 ex.), MHNN (1 ex.), MNHN (1 ex.), MSNG (2 ex.), NMW (45 ex.) and UZA (gift of MSNC) (1 ex.).

**Description** : The species is characterized by : LLS 54-62 ; TLS (8)9-10/1/5-6 ; DFR (8)9 (10) ; PtFR 15-17(18) ; PvFR 8(9) ; AFR 11-13, mode 12 ; CFR I/(16)17(18)/I ; NFT 7-7 or 7-6, mode 7-6, and NGR 24-29. The mouth is straight and the horny layer of the lower lip thick. Dorsal and anal fins are concave in outline.

**Distribution** : River basins of northern Italy flowing to the Adriatic Sea. The material examined was captured in the Po, Brenta and Sile river basins. The species has also been recorded from the following river basins : Adige (Canestrini, 1866), Piave, Livenza (Berg, 1932), Tagliamento and Isonzo (Tortonese, 1970) (Fig. 13b).

***Chondrostoma toxostoma toxostoma*** (Vallot, 1837).

*Cyprinus toxostoma* Vallot, 1837, Ichthyologie française, p. 188 (type locality : river Saona, Pontailler, France).

*Chondrostoma toxostoma* : Fatio, 1882, Histoire naturelle des poissons, p. 740.

*Chondrostoma dremaei* Blanchard, 1866, Poissons des eaux douces de la France, p. 418 (restricted type locality : river Lot near Cahors, France ; Almaça 1968).

*Chondrostoma rhodanensis* Blanchard, 1866, Poissons des eaux douces de la France, p. 420 (restricted type locality : river Rhône near Avignon, France ; Almaça, 1968).

*Chondrostoma Peresi* La Blanchère, 1872, *C. R. Acad. Sci. Paris*, 75 : 1632 (type locality : river Lot, France).

**Material examined** : A total of 132 specimens from 11 localities in 6 river basins. The sample included four paralectotypes of *Chondrostoma rhodanensis* (MNHN 3144, MNHN 3870 and MNHN B. 2580). Specimens were studied in the following institutions : IRSNB (6 ex.), ISBB (5 ex.), MHNG (4 ex.), MNHN (8 ex.), NMW (92 ex.), UZA (gift of DBAEV) (2 ex.) and UZA (gift of LIAT) (15 ex.).

**Description** : The meristic characters of the subspecies *C. toxostoma toxostoma* are : LLS 53-62 ; TLS (8)9(10) ; DFR (7)8 ; PtFR (13)14-16 ; PvFR (7)8(9) ; AFR (9)10-11, mode 10 ; CFR I/17(18)/I ; NFT (7-6) 6-6 (6-5), and NGR 24-35. The mouth is very arched. The horny layer of the lower lip is very thin. The outlines of the dorsal and anal fins are concave.

**Distribution** : This subspecies is known currently live in the Loire, Gironde, Adour (atlantic drainage), Hérault, Rhône and Var (mediterranean drainage) river basins, where the material examined was collected. Spillmann (1961) also recorded it from the Aude river (Fig. 14a).

***Chondrostoma toxostoma arrigonis*** (Steindachner, 1866).

*Leuciscus Arrigonis* Steindachner, 1866, *Sitzungsb. Akad. Wiss. Wien*, 54 : 11 (type locality : lake Uña and river Júcar near Cuenca, Spain).

*Chondrostoma Arrigonis* : Steindachner, 1866, Allgemeine Bemerkungen..., p. 8.

*Chondrostoma toxostoma arrigonis* : Lozano-Rey, 1935, *Mem. Acad. Cienc. E. F. N. Madrid*, ser. Cienc. Nat., 5 : 170.

**Material examined** : A total of 256 specimens from 10 localities in the Júcar river basin. The material included 161 syntypes of *Leuciscus Arrigonis* (NMX 52183-52207, NMW 52209-52216, NMW 52226-52231 and NMW 53409). Specimens were studied in the following institutions : MNCN (13 ex.), NMW (161 ex.), UZA (79 ex.) and UZA (from the IFIE collections) (3 ex.).

**Description** : The meristic variation of the sixty-eight measured specimens (StL = 49-175 mm) from the Júcar river basin was : LLS 44-53 ; TLS 7-8(9)/1/4-5 ; DFR (7)8 ; PtFR (13)14-15(16) ; PvFR (7)8(9) ; AFR 8-10, mode 9 ; CFR I/(16)17: I ; NFT 6-5 or 5-5, mode 6-5, and NGR 16-23. Arched mouth with the horny layer of the lower lip thin. The outline of the dorsal fin straight or slightly concave, that of the anal fin concave.

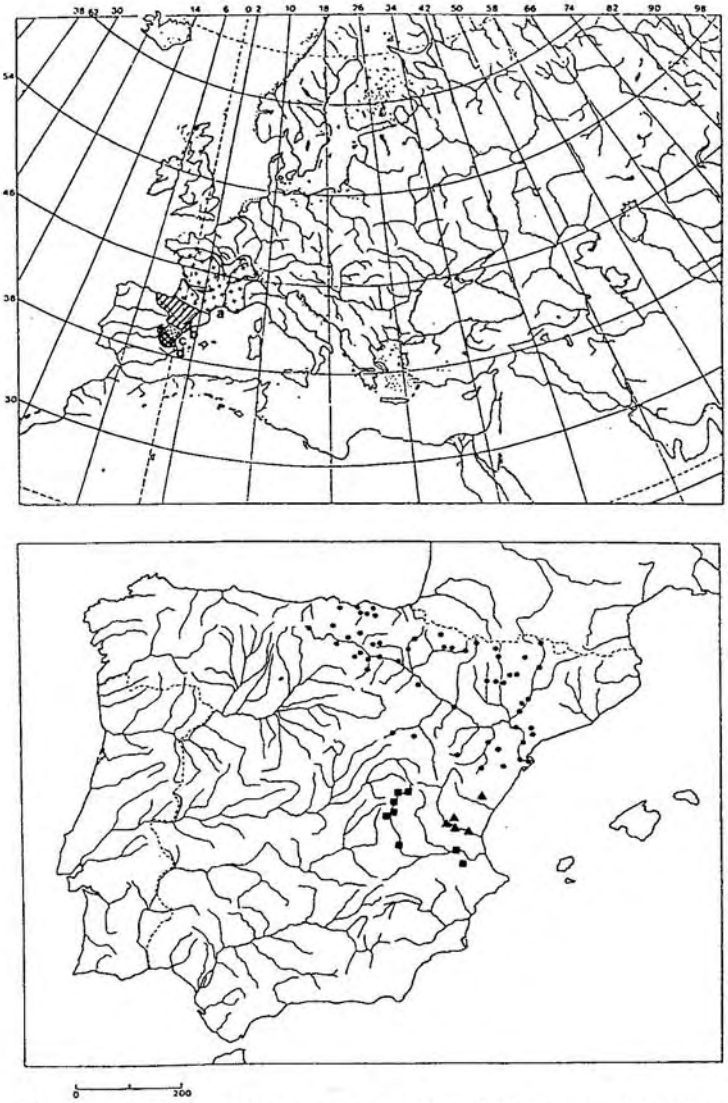

Fig. 14a : Distribution of *C. toxostoma toxostoma*. b : distribution of *C. toxostoma miegii* (black circles : localities of the material examined). c : distribution of *C. toxostoma turiensis* (black triangles : localities of the material examined). d : distribution of *C. toxostoma arrigonis* (black squares : localities of the material examined).

**Distribution** : The subspecies exclusively lives in the Júcar river basin, eastern Spain (Fig. 14d).

**Remarks** : Collares-Pereira (1980a, 1980b, 1983) condidered *C. arrigonis* as a distinct species. Since there are no relevant morphological (mainly osteological) differences and since the populations from the Júcar river basin are included within the clinal variations affecting the populations of *C. toxostoma*, the taxon is here given subspecific status as *C. toxostoma arrigonis*.

***Chondrostoma toxostoma miegii*** Steindachner, 1866.

*Chondrostoma Miegii* Steindachner, 1866, *Sitzungsb. Akad. Wiss. Wien*, 53 : 202 (type locality : river Ebro near Logroño and Zaragoza, river Nervión near Bilbao, small streams near Las Arenas, and Lagoon Purguel near Tudela, Spain)

*Chondrostoma toxostoma miegii* : Berg, 1932, *Zoogeographica*, 1 (2) : 143.

**Material examined** : An extensive sample of the subspecies was studied, including the 102 syntypes of *Chondrostoma Miegii* (NMW 52258 and NMW 52393-52414). A total of 1139 specimens from 64 localities in the Asón, Nervión, Oca, Ebro and La Cenia river basins, housed in the institutions : BMNH (8 ex.), ETSIM (3 ex.), MHNG (1 ex.), NMW (102 ex.), UZA (873 ex.), UZA (from IFIE collections) (140 ex.) and VBCM (12 ex.), were examined.

**Description** : The meristic variability of the subspecies is : LLS 48-59 ; TLS (7)8-9/1/4-5(6) ; DFR (7)8-9, mode 8 ; PtFR (13-14)15-16(17) ; PvFR (7)8 ; AFR (8)9-10(11), mode 9 ; CFR I/(16)17(18)/I ; NFT (7-7)7-6 or 6-6, mode 7-6, and NGR 24-33. Arched mouth with the horny layer of the lower lip thin. The outlines of the dorsal and anal fins are concave.

**Distribution** : The subspecies lives in north-eastern Spain, both in the E. Cantabrian Sea drainage : from river Asón to the Pyrénées, and in the Mediterranean Sea drainage : Ebro and La Cenia river basins (Fig. 14b). According to Sostoa *et al.* (1985) it does also occur in the Llobregat river basin.

***Chondrostoma toxostoma turiensis*** ssp. nov.

**Material examined** : UZA 1983.12.06.01, 1 ex., holotype, river Turia, Chulilla, Valencia, 6.XII.1983. UZA 1983.12.06.02-13, 12 ex., paratypes, same data. UZA 1984.02.05.01-12, 12 ex., paratypes, same locality, 5.II.1984. UZA 1983.12.06.14, 1 ex., paratype, river Turia, Pedralba, Valencia, 6.XII.1983. UZA 1983.12.04.01, 1 ex., river Villahermosa, Zucaina, Castellón, 4.XII.1983. MNCN uncat., 2 ex., river Tuéjar, Calles, Valencia, 9.X.1979. MNCN uncat., 1 ex., river Turia, Domeño, Valencia, 9.X.1979.

**Diagnosis** : The meristic characters are (in combination) : LLS 44-51 ; DFR 8 ; PvFR 8 ; AFR ç ; NFT 6-6 or 6-5, mode 6-5, and NGR 21-27. Mouth arched. A horny layer on the lower lip is present but is rather thin. Dorsal and anal fins concave in outline.

It differs from *C. toxostoma miegii*, which lives to the north, by a lower number of scales, 44-51 compared with 48-59 in *C. t. miegii*, and fewer gill rakers, 21-27 compared with 24-33, but mainly by the number of pharyngeal teeth, 6-5 or less frequently 6-6 in *C. t. turiensis* compared with 7-6 or less frequently 6-6 in *C. t. miegii*. The most meridional subspecies, *C. t. arrigonis*, bears 6-5 or 5-5 pharyngeal teeth and fewer gill rakers, 16-23. *C. t. toxostoma*, which lives in the northern Pyrenean drainages, has smaller and more numerous scales along the lateral line, 53-

62 ; usually 10-11 branched rays in the anal fin ; usually 6-6 pharyngeal teeth, and a higher number of gill rakers, 24-35.

**Description** : Holotype (StL = 160 mm, FoL = 178 mm, ToL = 191 mm, adult female). Meristic characters : LLS 47, TLS 8/1/4, DFR 8, PtFR 14, PvFR 8, AFR 9, CFR I/17/I, NFT 6-6 and NGR 23. Morphometric indexes : HeL/StL = 0.196, PrDL/PrPVL = 1.072, MxBH/StL = 0.254, MnBH/StL = 0.106, Hew/HeL = 0.710, HeW/StL = 0.139, IOW/HeL = 0.465 and IOW/StL = 0.091. Other morphological features as described below for the type series. Fig. 3d shows the lateral view and a ventral view of the oral region.

Type series (holotype and twenty-five paratypes), StL = 77-179 mm. Meristic and morphometric data are given on Table V. The mouth is clearly arched, the horny layer of the lower lip developed but thin. The outlines of the dorsal and anal fins are concave (but that of the dorsal fin may be nearly straight).

**Distribution** : The new subspecies lives in the Turia and Mijares river basins, limited by the larger basins of the river Júcar to the south, where *C. t. arrigonis* lives, and of the rivers La Cenia and Ebro to the north, where *C. t. miegii* occurs (Fig. 14c). The fishes reported by Doadrio et al. (1980) as *C. t. arrigonis* from the Turia river basin are now identified as *C. t. turiensis.*

**Etymology** : *turiensis* : after the river Turia (Spain) where the type series was collected.

***Chondrostoma vardarensis*** Karaman, 1928.

*Chondrostoma nasus vardarensis* Karaman, 1928, *Bull. Soc. Sci. Skopje*, 6 : 160 (type locality : river Vardar, Yugoslavia).

**Material examined** : A total of 247 specimens from 18 localities in 7 river basins (Aoos, Pinios, Aliakmon, Vardar, Struma, Mesta and Meritza). Specimens were studied in the following institutions : MSNC ( 5 ex.), NMW ( 180 ex.), UZA (gift of LZUT) (25 ex.), UZA (MHNMS) (19 ex.), UZA (NZMS) (15 ex.) and ZMH ( 3 ex.).

**Description** : The meristic variation of the examined specimens from the Vardar river basin was : LLS 57-66, TLS 9-10/1/5-6, DFR 8(9), PtFR 15-17(18), PvFR 8(9), AFR 9(10), CFR I/17/I, NFT 6-5 and NGR 28-38. The mouth is straight and the horny layer of the lower lip thick. The outlines of the dorsal and anal fins are concave.

**Distribution** : This species inhabits the Balkan Peninsula, both in the Adriatic Sea drainage : Aoos (=Vjosa) river basin, and the Aegean Sea drainage : Pinios, Aliakmon, Vardar (= Axios), Struma (= Strymon), Mesta (= Nestos) and Maritza (= Evros = Meri) river basins (Fig. 15a).

**Remarks** : Notwithstanding the small sample measured (seventy-three specimens from seven basins) a clinal variation affecting the number of pharyngeal teeth was noted. Thus, western populations (from Aoos to Vardar) have 6-5 teeth (sometimes 5-5), while eastern populations (from Struma to Maritza) have usually 6-5 but also 6-6 (the four examined specimens from Maritza have 6-6).

***Chondrostoma variabilis*** Jakowlew, 1870.

*Chondrostoma variabilis* Jakowlew, 1870, (Protokoly zasedanii Kazanskojo obshchestva estestvoispytatelei), 1 : 107 (type locality : Volga delta, Soviet Union).

*Chondrostoma variabile* : Kessler, 1877, Travail Aralo Kaspian exped., 4 : 131.
*Chondrostoma nasus variabile* : Berg, 1914, Fauna Rossii, Ryby, III, 2 : 375.

**Material examined** : Five specimens from two localities in the Ural and Volga river basins, housed in : MNHN (2 ex.) and ZIL ( 3 ex.).


Fig. 15a : Distribution of *C. vardarensis*. b : distribution of *C. variabilis*.

**Description** : The known meristic variability of the species is : LLS 53-60 ; TLS 8/1/4-5 ; DFR (8)9 ; PtFR 14-15 ; PvFR 8(9) ; AFR 9-10(11), mode 10 ; CFR I/17/I ; NFT (6-6) 6-5 (5-5) and NGR 28-33. Mouth straight ; the horny layer of the lower lip thick. Dorsal and anal fins concave in outline.

**Distribution** : The species inhabits the Don, Volga, Ural and Emba river basins (Berg, 1949). Its occurrence in the Volga and Ural is confirmed by the present study, but records from the Don and Emba need to be confirmed (Fig. 15b).

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Table I. List of the described species, subspecies and varieties (recognized as *Chondrostoma*) and their present taxonomic status.

| Taxon | Author | date | Present taxonomic status |
|---|---|---|---|
| Cyprinus Nasus | Linnaeus | 1758 | C. nasus nasus |
| Chondrostoma Rysela | Agassiz | 1835 | C. nasus nasus x Leuciscinae spp. |
| Cyprinus toxostoma | Vallot | 1837 | C. toxostoma toxostoma |
| Leuciscus Genei | Bonaparte | 1839 | C. genei |
| Chondrostoma Soetta | Bonaparte | 1840 | C. soetta |
| Chondrostoma Knerii | Heckel | 1843 | C. knerii |
| Chondrostoma Phoxinus | Heckel | 1843 | C. phoxinus |
| Chondrochylus nasicus | Heckel | 1843 | C. soetta |
| Chondrochilus regius | Heckel | 1843 | C. regium |
| Chondrostomus Nasus auratus | Schäfer | 1844 | C. nasus nasus |
| Chondrostoma seva | Cuv. in C. & V. | 1844 | C. soetta |
| Chondrostoma jaculum | De Filippi | 1845 | C. genei |
| Chondrostoma nasus var. hemadiensis | Jeitteles | 1862 | C. nasus nasus |
| Chondrostoma polylepis | Steindachner | 1865 | C. polylepis polylepis |
| Chondrostoma miegii | Steindachner | 1866 | C. toxostoma miegii |
| Leuciscus Arrigonis | Steindachner | 1866 | C. toxostoma arrigonis |
| Leuciscus Lemmingii | Steindachner | 1866 | Rutilus lemmingii |
| Chondrostoma Willkommii | Steindachner | 1866 | C. polylepis willkommii |
| Chondrostoma caerulescens | Blanchard | 1866 | C. nasus nasus |
| Chondrostoma dremaei | Blanchard | 1866 | C. toxostoma toxostoma |
| Chondrostoma rhodanensis | Blanchard | 1866 | C. toxostoma toxostoma |
| Chondrostoma variabilis | Jakowlew | 1870 | C. variabilis |
| Chondrostoma Peresi | La Blanchère | 1872 | C. toxostoma toxostoma |
| Chondrostoma oxyrhynchum | Kessler | 1877 | C. oxyrhynchum oxyrhynchum |
| Chondrostoma cyri | Kessler | 1877 | C. oxyrhynchum cyri |
| Chondrostoma Reiseri | Steindachner | 1893 | C. phoxinus x Paraphoxinus alepidotus |
| Chondrostoma Genei var. albicans | Gatti | 1896 | C. genei |
| Capoeta Holmwoodii | Boulenger | 1896 | C. holmwoodii holmwoodii |
| Chondrostoma colchicum | Derjugin | 1899 | C. colchicum colchicum |
| Chondrostoma awhasicum | Kamensky | 1901 | C. colchicum colchicum |
| Chondrostoma colchicum var. tschorochica | Kamensky | 1901 | C. colchicum colchicum |
| Chondrostoma schmidti | Berg | 1910 | C. oxyrhynchum cyri |
| Chondrostoma nasus borysthenicum | Berg | 1914 | C. nasus nasus |
| Chondrostoma colchicum kubanicum | Berg | 1914 | C. colchicum kubanicum |
| Chondrostoma leptosoma | Berg | 1914 | C. oxyrhynchum cyri |
| Chondrostoma nasus ohridanum | Karaman | 1924 | C. nasus nasus |
| Chondrostoma nasus prespensis | Karaman | 1924 | C. prespensis |
| Chondrostoma nasus vardarensis | Karaman | 1928 | C. vardarensis |
| Chondrostoma lemmingi steindachneri | Berg | 1932 | C. p. polylepis x Rutilus arcasii |
| Chondrostoma nasus lumi (?) (sic) | Poljakov et al. | 1958 | C. nasus nasus |
| Chondrostoma lusitanicum | Collares-Pereira | 1980 | Rutilus lusitanicus |
| Chondrostoma cyri orientalis | Blanco & Banarescu | 1982 | C. orientalis |
| Chondrostoma nasus angorensis | present report | | C. nasus angorensis |
| Chondrostoma holmwoodii meandrensis | present report | | C. holmwoodii meandrensis |
| Chondrostoma scodrensis | present report | | C. scodrensis |
| Chondrostoma toxostoma turiensis | present report | | C. toxostoma turiensis |

Table II. Meristic features in the type series of *Chondrostoma nasus angorensis* (StL = 117-162 mm, n = 17). R = range, M = mode, X = mean, s = standard deviation, lim. 95 % = 95 % confidence limits, V = coefficient of variation, n = sample size.

| | R | M | $\bar{X}$ | s | lim. 95% | V | n |
|---|---|---|---|---|---|---|---|
| LLS | 59-67 | | 62.688 | 2.869 | 61.160-64.216 | 4.6 | 16 |
| TLS | 9 (10-11)/1/5-6 | 15 | 15.625 | 0.719 | 15.242-16.008 | 4.6 | 16 |
| DFR | 9 (10) | 9 | 9.059 | 0.243 | 8.934-9.184 | 2.7 | 17 |
| PtFR | (12-13) 15-16 (17) | 16 | 15.471 | 1.231 | 14.838-16.104 | 8.0 | 17 |
| PvFR | (8) 9 | 9 | 8.882 | 0.332 | 8.711-9.053 | 3.7 | 17 |
| AFR | 9-10 (11) | 10 | 9.824 | 0.636 | 9.497-10.151 | 6.5 | 17 |
| CFR | I/(15) 17/I | | | | | | 17 |
| NFT | 6-6 6-5 | 6-6 | 11.588 | 0.507 | 11.327-11.849 | 4.4 | 17 |
| NGR | 21-28 | | 24.813 | 1.905 | 23.798-25.828 | 7.7 | 16 |

Table III. Meristic and morphometric features in the type series of *Chondrostoma holmwoodii meandrensis* (StL = 67-108 mm, n = 25).

**Meristic features.**

| | R | M | $\bar{X}$ | s | lim. 95% | V | n |
|---|---|---|---|---|---|---|---|
| LLS | 52-60 | | 56.320 | 1.626 | 55.649-56.991 | 2.9 | 25 |
| TLS | (8) 9 (10)/1/(4) 5 (6) | | 14.920 | 0.400 | 14.755-15.085 | 2.7 | 25 |
| DFR | 8 (9) | 8 | 8.040 | 0.200 | 7.957-8.123 | 2.5 | 25 |
| PtFR | (13) 14-15 | 14 | 14.160 | 0.554 | 13.931-14.389 | 3.9 | 25 |
| PvFR | (7) 8 | 8 | 7.960 | 0.200 | 7.908-8.012 | 2.5 | 25 |
| AFR | (7) 9-10 | 9 | 9.080 | 0.572 | 8.844-9.316 | 6.3 | 25 |
| CFR | I/17 (18)/I | | | | | | 25 |
| NFT | 6-6 (6-5) | 6-6 | 11.960 | 0.200 | 11.877-11.960 | 1.7 | 25 |
| NGR | 26-30 | | 27.375 | 1.135 | 26.896-27.854 | 4.1 | 24 |

**Morphometric indexes.**

| | R | $\bar{X}$ | s | lim. 95% | V | n |
|---|---|---|---|---|---|---|
| HeL/StL | 0.209-0.233 | 0.221 | 0.007 | 0.217-0.225 | 3.1 | 15 |
| PrDL/PrPvL | 0.935-1.033 | 0.992 | 0.028 | 0.976-1.008 | 2.8 | 15 |
| MxBH/StL | 0.237-0.291 | 0.270 | 0.015 | 0.262-0.278 | 5.6 | 15 |
| MnBH/StL | 0.103-0.115 | 0.108 | 0.004 | 0.106-0.110 | 3.2 | 15 |
| HeW/HeL | 0.540-0.613 | 0.579 | 0.022 | 0.567-0.591 | 3.8 | 15 |
| HeW/StL | 0.123-0.135 | 0.128 | 0.003 | 0.126-0.130 | 2.3 | 15 |
| IOW/HeL | 0.369-0.432 | 0.406 | 0.017 | 0.397-0.415 | 4.3 | 15 |
| IOW/StL | 0.084-0.097 | 0.090 | 0.004 | 0.088-0.092 | 4.1 | 15 |

Table IV. Meristic features in the type series of *Chondrostoma scodrensis* (StL = 95-135 mm, n = 9).

| | R | M | $\bar{X}$ | s | lim. 95% | V | n |
|---|---|---|---|---|---|---|---|
| LLS | 51-59 | | 55.667 | 2.739 | 53.562-57.772 | 4.9 | 9 |
| TLS | (8) 9 (10)/1/4 (5) | 14 | 14.222 | 0.833 | 13.582-14.862 | 5.9 | 9 |
| DFR | 8-9 | | 8.444 | 0.527 | 8.039-8.849 | 6.2 | 9 |
| PtFR | 15-18 | 16 | 16.222 | 0.833 | 15.582-16.862 | 5.1 | 9 |
| PvFR | 8 | | | | | | 9 |
| AFR | 9-10 | 10 | 9.667 | 0.500 | 9.283-10.051 | 5.2 | 9 |
| CFR | I/17/I | | | | | | 7 |
| NFT | 6-5 5-5 | | 10.556 | 0.527 | 10.151-10.961 | 5.0 | 9 |
| NGR | 14-17 | | 15.444 | 1.014 | 14.665-16.223 | 6.6 | 9 |

Table V. Meristic and morphometric features in the type series of *Chondrostoma toxostoma turiensis* (StL = 77-179 mm, n = 26).

**Meristic features.**

| | R | M | $\bar{X}$ | s | lim. 95% | V | n |
|---|---|---|---|---|---|---|---|
| LLS | 44-51 | | 46.885 | 2.215 | 45.990-47.780 | 4.7 | 26 |
| TLS | (7) 8-9/1/4-5 | | 13.423 | 0.809 | 13.096-13.750 | 6.0 | 26 |
| DFR | (7) 8 | 8 | 7.880 | 0.332 | 7.743-8.017 | 4.2 | 26 |
| PtFR | (12) 13-14 (15) | 14 | 13.769 | 0.710 | 13.482-14.056 | 5.2 | 26 |
| PvFR | (6-7) 8 | 8 | 7.654 | 0.562 | 7.427-7.881 | 7.3 | 26 |
| AFR | (7-8) 9 (10) | 9 | 8.885 | 0.711 | 8.598-9.172 | 8.0 | 26 |
| CFR | I/ (15-16) 17 (18)/I | | | | | | 26 |
| NFT | 6-6 6-5 (5-5) | 6-5 | 11.240 | 0.663 | 10.966-11.514 | 5.9 | 25 |
| NGR | 21-27 | | 23.217 | 1.565 | 22.540-23.894 | 6.7 | 23 |

**Morphometric indexes.**

| | R | $\bar{X}$ | s | lim. 95% | V | n |
|---|---|---|---|---|---|---|
| HeL/StL | 0.178-0.213 | 0.197 | 0.010 | 0.191-0.203 | 5.2 | 14 |
| PrDL/PrPvL | 0.997-1.072 | 1.029 | 0.021 | 1.017-1.041 | 2.1 | 14 |
| MxBH/StL | 0.233-0.281 | 0.250 | 0.015 | 0.241-0.259 | 5.9 | 14 |
| MnBH/StL | 0.099-0.118 | 0.107 | 0.005 | 0.104-0.110 | 4.6 | 14 |
| HeW/HeL | 0.629-0.767 | 0.684 | 0.043 | 0.659-0.709 | 6.3 | 14 |
| HeW/StL | 0.125-0.140 | 0.134 | 0.005 | 0.131-0.137 | 3.8 | 14 |
| IOW/HeL | 0.362-0.517 | 0.456 | 0.038 | 0.434-0.478 | 8.4 | 14 |
| IOW/StL | 0.084-0.100 | 0.092 | 0.005 | 0.089-0.095 | 5.1 | 14 |