

Notes concerning the distribution of Asian fish species, *Pseudorasbora parva*, in Europe

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Abstract. In this paper we discuss about the origin and distribution of a gobionin fish species, the topmouth gudgeon (*Pseudorasbora parva*) in the inland waters of Europe. This species was introduced in our continent for the first time in Romania in 1961 and in Albania, probably in 1960, direct from China. Later, the topmouth gudgeon spread extremely fast in almost the whole Europe, only in a few countries the species being so far absent. In the most cases, this spreading was possible due to human vector; the natural spreading via water courses was much more slower. It seems in certain countries the species has stopped its expansion or even failed to invade the new territories.

Key Words: topmouth gudgeon, *Pseudorasbora parva*, introduction, spreading, aquaculture, population.

Introduction. The topmouth gudgeon (*Pseudorasbora parva*) is a small cyprinid fish species native to East Asia. Its native range encompasses the catchment area of the most rivers in the East Asian subregion: the Amur basin, the western and southern parts of the Korean Peninsula, lake Buir Nor, the Japanese islands of Kyushu and Shikoku as well as the southern and central parts of Honshu, the Liaohe, Paihe, Luanghe and Huanghe river systems in northern China, the whole basin of the Yangtze river, the rivers of Zhejiang Province, the basin of the Mi in Jiang river, Taiwan and the Xijiang and Zhujiang basins (Bănărescu 1999).

The species has been introduced involuntary with fry of the grass carp (*Ctenopharyngodon idella*) and of other valuable cyprinids, starting with 1960, into several European countries, the first ones being Albania and Romania (Gavriiloaie & Falka 2006). The initial European introductions were largely accidental (80%) and almost all of them led to sustainable populations that spread into local catchments and adjoining reservoirs, 2535 populations having been sampled by now in 31 countries (Gozlan et al 2010).

The species proved to be highly invasive, since colonisation is facilitated by its tolerance of degraded aquatic ecosystems and also by its reproductive traits of early sexual maturity, batch spawning, high reproductive effort and parental nest guarding (Simon et al 2011). The species capacity for forming high density populations can result in sharing of common food resources with native fish species, resulting in overlaps in trophic niche (Britton et al 2010), with additional concerns over egg predation, disease transmission and facultative parasitism (Gozlan et al 2010).

In the present paper we discussed about the origin and the distribution of topmouth gudgeon in inland water bodies of Europe.

The distribution of topmouth gudgeon in European countries. According to Knežević (1981), Witkowski (1991) and Wildekamp et al (1997), the species has been intentionally introduced in **Albania** probably in 1960 directly from China, in lake Skadar, as food source for the predatory fishes, where from it gradually spread in Balkan Peninsula (Wildekamp et al (1997).

In **Romania** it was first imported in 1961 and raised on a fish farm in the Lower Danube catchment area; one year later it was imported again and raised on another fish farm in the drainage area of the Middle Danube. From there, the species spread throughout the Danube catchment area both through the streams and rivers and with shipments of live fishes from one fish farm to another (Bănărescu 1999). Today it is widely established in the Romanian waters (Gavriloaie & Chiş 2006).

In **Armenia**, the topmouth gudgeon is present since 1960s, due to unintentional introduction together with other species of Chinese cyprinids (Pipoyan 1996); now it inhabits all reservoirs of Ararat Valley and neighboring territories (Gabryelian 2001).

In **Ukraine** the species has been first observed in 1961, due to an unintentional introduction with some other cyprinid species (Weber 1984). Today, the topmouth gudgeon penetrated into the Black Sea as well (Alexandrov et al 2007).

In **Hungary**, the species was first reported in 1967 from the Hungarian stretch of the Danube river and later from other Hungarian water bodies (Žitňan & Holčík 1976), including lake Balaton (Biró 1972). It competes for food with the indigenous species (Hliwa et al 2002).

In **France** the species was intentionally introduced during the 1970s to the Sarthe region (Allardi & Chancerel 1988). In 1993 it was observed in Camargue region, southern France; the origin of introduction is still unknown, but the most tenable explanation is that individuals escaped from the local carp farm (Rosecchi et al 1997, 2001).

The first find of topmouth gudgeon in **Slovakia** was reported in 1974 by Žitňan & Holčík (1976) in a back-water of the Tisza river, in south-western part of the country. The second site of occurrence of the species was registered in a flooded sand pit at the village of Chl'aba, near the confluence of the Danube with the Ipel river, in south (Enekl 1977). Its occurrence in the Slovak segment of the Danube river is insular and rather rare (Holčík 2003). According to Lusk et al (2004), the species has a depressive impact on the indigenous species, being considered one of the invasive species in the country (Koščo et al 2010).

In **Bulgaria** the topmouth gudgeon was first discovered in 1975 in the channels of a carp fish-pond near Rusa town on the Danube where it was introduced together with some fitophagous species from Ukraine (Jancović & Karapetkova 1992). The species naturally entered the southern part of the country from Albania (Wildekamp et al 1997). The species spread rapidly and now it inhabits river branches, old river beds, channels and ponds of the Danube and its tributaries; it is also very abundant in carp fish ponds (Jancović & Karapetkova 1992; Uzunova & Zlatanova 2007).

Topmouth gudgeon was first recorded in **Montenegro** in 1977 in Sasko lake (Knezevic et al 1978) and then in Skadar lake (Knezevic 1981). In **Serbia** it was first observed in 1978 in river Lugomir (Karaman 1983). The species was brought unintentionally to Serbia and Montenegro from Romanian part of the Danube river and from the Albanian part of the river Bojana and Skadar lake (Wildekamp et al 1997). From its appearance in the country, topmouth gudgeon has colonized most water-courses, even some brackish waters (Cakic et al 2004).

In **Slovenia** the species was first discovered in 1986 in a vicinity of a small fish-pond in Jasenak brook, where it was introduced together with fingerlings of other fish species (Jancović & Karapetkova 1992). Today it is present in many standing and slow running waters through the country (Povž & Šumer 2005).

In **Croatia**, topmouth gudgeon was observed in the carp fish-pond Crna Mlaka by Zagreb (Jancović & Karapetkova 1992). We did not find any other data concerning the present status of the species in this country.

Jankovský (1983) reported the first appearance of the topmouth gudgeon in **Czech Republic** in the carp pond Vidlak in the district Jindřichův Hradec from Bohemia. The species had a rapid expansion, occurring almost in all types of still and running waters, except of the trout and grayling zones (Adámek & Siddiqui 1997), but its initial expansion rate is already rather stabilized or declining (Musil et al 2008). However, in case of mass reproduction, this species will become a serious food competitor for other plankton feeding fish (above all, young of the year) and also exert a negative influence on the environment (Lusk et al 2010).

In **Turkey**, in October 1982 first specimens of topmouth gudgeon were collected from the channels tributary to Meric river, in Edirne, Ipsala (Erk'akan 1983). The origin of the species is unknown. Later, the species extended its range (Ekmekçi & Kirankaya 2006) and it has also spread in the Asiatic part of Turkey (Wildekamp et al 1997; Şaşı & Balık 2003).

The species was first discovered in **Austria** in 1982 in rivers March and Groβetulln (Weber 1984) and later in some other areas of the country (Ahnelt 1989; Spindler 1997).

In **Germany** the species has been observed for the first time in 1984, in the eastern part (Kappus & Salewski 1997); a year after, the species appeared in the western part as well (Stein & Herl 1986). The origin of the species was an unintentional stocking together with carp and other species (Holčik 1991; Freyhof 2003). It seems the topmouth gudgeon competes with some of the autochthonous species (Gollasch & Nehring 2006).

The species was first discovered in **England** in mid 1980s in an ornamental pond in southern part of the country due to a contaminated stock of *Leuciscus idus* imported from Germany (Domaniewski & Wheeler 1996). Since then, established populations have been found in the wild at several locations across the central part of the country (Gozlan et al 2002). The species spread rapidly, having been discovered in the north-west of England as well (Hickley & Chare 2004). In 2005, twenty-five sites have been reported as hosting topmouth gudgeon in England and Wales (Pinder et al 2005). Despite the success of the species in establishing populations in almost all European countries, it should not be assumed that all introductions have been or will be successful; for example England is the first country where a population of topmouth gudgeon from Goldings Hill Pond failed to establish (Copp et al 2007).

The first record for the **Italy** was in 1987, in the northern part of the country (Sala & Spampinato 1991), where from it extended its range (Balma & Delmastro 1995), reaching in few years an almost pan-Italian distribution, and being very abundant in certain locations (Bianco & Ketmaier 2001). It was stocked unintentionally.

In **Greece**, the species was first recorded by Bianco (1988) in lakes Megali Prespa and Mikri Prespa and in the river Aliakmon. It was probably introduced together with other species at the end of the 1970s into the Albanian part of lake Prespa. Rosecchi et al (1993) recorded the species in lakes Kerkini and Koronia, and rivers Axios and Loudias. Today it has a large expansion in Greece waters (Koutrakis et al 2008). The species is in competition with fry of the riverine cyprinid fish for food (Economidis et al 2000).

In **Switzerland** the species has been recorded for the first time in 1990 and its origin seems to be an intentional introduction together with other cyprinids imports from China. It colonized the lowland parts of the country (Wittenberg 2005).

The species was first discovered in **Poland** in November 1990 in a carp farm from south-west Poland; its presence was associated with an earlier import of fry of carp and herbivorous fishes probably from Hungary (Witkowski 1991). The species occurs in the whole territory of the country, both in ponds, rivers and lakes (Kotusz & Witkowski 1998; Nowak & Szczerbik 2009), and even in heated lakes (Kapusta et al 2008; Nowak et al 2008). At present 51 localities are known, mainly in the lowlands of Poland; the species still shows an expansion tendency which is favoured by stocking open waters with material containing an admixture of the topmouth gudgeon, using it as a bait-fish and by some aspects of its biology and ecology (Witkowski 2009; Grabowska et al 2010).

In **Belgium**, the species was first observed in 1992 and later investigations showed that the species continues to expand its range (Verreycken et al 2010). The first way of spreading seems to be by natural dispersion; secondly, the use of this species as live baitfish helped this species by its expansion; a third and probably most important factor is the unintentional introduction, together with other cyprinids (Thys 1997).

During a study of the local fish fauna started in March 2001, twenty specimens of topmouth gudgeon were collected from irrigation channels network in the river Ebro delta, in **Spain**. Since the Pyrenees are a natural barrier impossible for freshwater fishes to cross, the colonisation of the river Ebro delta can only be attributed to a deliberate or accidental introduction. The origin of the introduction is unknown, but a reasonable hypothesis is that this population is a result of an accidental introduction from an

aquaculture installation located in village l'Aldea on the Ebro river delta, where several cyprinid species are bred for aquarium purposes (Caiola & de Sostoa 2002).

A population of topmouth gudgeon was discovered in September 2002 in Lake Klokkeholm Møllesø in **Denmark**. Probably it has been illegally released in the lake by the fishermen. This is the first record from Scandinavia (Olesen et al 2003).

In the **Netherlands** the species was mentioned by Wildekamp et al (1997) and Gozlan et al (2002). It is assumed that the species spread in this country using the Danube-Rhine Canal and the river Rhine (Gozlan et al 2002).

In **Russia**, the species was probably introduced along with some valuable species for aquaculture; it had a rapid expansion and now is widely established (Bogutskaya & Naseka 2002). There are no references concerning the first mention of the species in this country.

The species is also present in other countries outside the Europe: in Iran (Coad & Abdoli 1993), Israel (Welcomme 1981), Algeria (Perdices & Doadrio 1992) and Fiji (Welcomme 1988).

It seems the species is still absent from several European countries, as Portugal, Ireland, Iceland, Norway, Sweden, Finland, Bosnia & Herzegovina, Malta, Andorra, Monaco, San Marino.

Conclusions. In Europe there were two places where from the species spread in 50 years throughout the almost entire continent: Albania and Romania. The main way of spreading was unintentional stocking together with some other fish species. There was a natural spreading as well, but in this case the rate of spreading was much lower than the first way. Today, the species is very abundant especially in fish-ponds and aquaculture facilities, then in still and slow running waters and even in brackish water. The species has a negative impact upon the native fish species, mostly resulting in overlaps in trophic niche, with additional concerns over egg predation, disease transmission or facultative parasitism. It seems there are few countries where the species failed to establish or has declined its populations in certain areas.

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