NOBANIS – Invasive Alien Species Fact Sheet

Lepomis gibbosus

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Species description

Scientific names: *Lepomis gibbosus* (Linnaeus,1758) - Perciformes, Centrarchidae.
Synonyms: *Perca gibbosa* Linnaeus, 1758; *Pomotis vulgaris* Cuvier, 1829; *Pomotis auritius* Günther, 1859*; Eupomotis aureus* Boulenger, 1895; *Lepomus gibbosus* Cox, 1896; *Eupomotis gibbosus* Jordan et Evermann, 1896.
Common names: pumpkinseed, common sunfish, Sun bass(GB), slunečnice pestrá (CZ), Gemeiner Sonnenbarsch, Sonnenfisch, Kürbiskernbarsch (DE), solaborre (DK), harilik päikeseahven (EE), aurinkoahven (FI), Solabbor (NO), bass słoneczny (PL), Solechnaya ryba (RU), solabborre (SE).

Fig. 1. *Lepomis gibbosus* from England, photo by G. H. Coop.

Fig. 2. *Lepomis gibbosus*, photo by S. Stakėnas.

Species identification
L. gibbosus has a high and laterally compressed body resembling perch. The maximum size is up to 40 cm of total length (Tl) in its native area (Page and Burr 1991), but is smaller in European water bodies (Copp *et al*. 2004). The mouth is small in a top position with patches of sharp hooked teeth on the jaws. There are pads of teeth on the lower pharynx. The long dorsal fin consists of two parts (broadly joined and appear as one). The anterior part is smaller than the posterior and has 9-12 spines; posterior part is higher and has 10-14 soft rays. There are 3 spines in the anal fin followed by 8-11 soft rays. Pelvic fins are located thoracically and pectoral fins have only one anterior spine. It has 28-30 vertebrae and 7-8 long pyloric caecae. The lateral line is complete, bent dorsally in the middle part of the body. It has ctenoid scales, and there are 35-47 ctenoid scales along the lateral line. The colouration is variable with the upper head and back being greenish blue or olive. On the sides, there are some isolated spots formed by some vertical bands. The belly is yellow and the gill covers opalescent blue to green with conspicuous black spot edged with red. The coloration intensifies at spawning time in both sexes (Scott and Grossman 1973, Maitland and Campbell 1992). Its karyotype is 2n=48 (Roberts 1964). As the fish morphology is strongly affected by pray type, feeding mode and habitat type, the moderate variation in body shape, length of fins, pharyngeal jaw bones size and gill rakers shape (Brinsmead and Fox 2002, Gillespie and Fox 2003, Vila-Gispert *et al.* 2007) are common.

Native range
L. gibbosus is native to the temperate Eastern North America from New Brunswick (Canada) to the subtropical Florida peninsula (USA) (Scott and Grossman 1973).

Alien distribution

History of introduction and geographical spread
In Europe the species is introduced to many regions and river systems (Welcomme 1988, Copp and Fox 2007). Today it is found in West and Central Europe (de Groot 1985, Welcomme 1988) as well as in the Iberian Peninsula (Sostoa *et al*. 1987) and the Black Sea region (Economidis *et al*. 1981). In 1877 the first specimens of *L. gibbosus* were introduced from Canada to France (Arnold 1990).
In Germany, *L. gibbosus* was introduced in 1885 (or 1881 according to FAO (1997)) by Max von dem Borne, who was a pioneer of importing fish and crayfish for aquaculture (Kowarik 2003, Copp *et al*. 2005).

In the Czech Republic it was recorded in 1929 in the Třeboňsko region (Baruš and Olivia 1995) In Poland *L. gibbosus* is noted only in the Oder River system (Rembiszewski and Rolik 1975, Witkowski 1979, Witkowski et al. 2004). Today a sustainable population is established in the lower Oder, in a site influenced by warm water from a nearby electric power station (Hesse and Przybyszewski 1985). In Denmark the species was first reported in 2002, and the first confirmed self-reproducing population identified in 2006 (Jensen 2002). In Norway the species was reported in 2005 (Sterud and Jørgensen 2006). In Austria, the year of introduction of *L. gibbosus* is not known. The first documented voucher specimens are from 1952 (Mikschi 2005).

The purposes and histories of such introductions to other European countries are somewhat unclear. It seems that aquarists played a prominent role in the spread of *L. gibbosus* throughout Europe (Tandon 1976). The main purpose for the deliberate introduction of *L. gibbosus* into English waters was as an ornamental fish (Copp *et al*. 2002).

Pathways of introduction

The species was introduced to Europe mainly by aquarists. As an ornamental fish, *L. gibbosus* was introduced and stocked in garden ponds as well as in aquaria and released to different water bodies. Some authors also assume that *L. gibbosus* could be introduced unintentionally with imports of carp fry used in stocking (Tandon 1976. *L. gibbosus* has been intentionally (but illegally) introduced to lakes in Denmark with *Onchorhynchus mykiss* under the presumption that they would free the Rainbow trout from the fish louse (*Argulus* sp.) (Jan K. Jensen, pers. comm.).

Alien status in region

L. gibbosus is a one of 40 alien fish species recorded in Polish waters (www.iop.krakow.pl). This fish was not introduced intentionally and today occurs only in a few locations in the lower Oder River area. The abundant self-sustained population occurs only in the Oder R. nearby Szczecin, where water is heated by an electric plant (Terlecki 2000).
In Denmark two populations are known to have been naturalised, which both are self-reproducing (Jensen 2002, Jensen *et al.* 2007). It is likely that there are more populations, but it is not documented. It is still unknown if the species will spread in Danish waters and develop the invasive behaviour reported from other countries (Møller et al. 2008).
L. gibbosus has the reputation that it can control *Argulus foliaceus* which is why it has been released.
L. gibbosus is widely distributed throughout German inland waters. It has established permanent populations in many ponds, lakes and rivers. This species is especially found in higher abundances in the backwaters of the upper Rhine River as well as often in park ponds of large towns (Arnold 1990, Freyhoff 2003).
The northernmost reproducing population is reported from Norway (Sterud and Jørgensen 2006).
The species is not known from Finland, Sweden, Greenland, Faroe Islands (see also table 1).

Country	Not found	Not established	Rare	Local	Common	Very common	Not known
Austria				X			
Belgium				X			
Czech republic			X				
Denmark			X				
Estonia	X						
European part of Russia				X			
Finland	X						
Faroe Islands	X						
Germany					X		
Greenland	X						
Iceland	X						
Ireland	X						
Latvia	X						
Lithuania			X				
Netherlands							
Norway			X				
Poland				X			
Slovakia							
Sweden	X						

Table 1. The frequency and establishment of *Lepomis gibbosus*, please refer also to the information provided for this species at www.nobanis.org/search.asp. Legend for this table: **Not found** –The species is not found in the country; **Not established** - The species has not formed self-reproducing populations (but is found as a casual or incidental species); **Rare** - Few sites where it is found in the country; **Local** - Locally abundant, many individuals in some areas of the country; **Common** - Many sites in the country; **Very common** - Many sites and many individuals; **Not known** – No information was available.

Ecology

Habitat description

In both its native and introduced area, *L. gibbosus* inhabits the shallow water in lakes and slow running rivers with soft bottoms and submerged vegetation. It can be found in ponds, where it is kept as an ornamental fish, and in side arms of large rivers or backwaters (Scott and Grossman 1973, Maitland and Campbell 1992).

Reproduction and life cycle

L. gibbosus is a multispawning fish with male parental care (Balon 1957). According to the style of reproduction the nest guarding sunfish is classified as a polyphil - group B.2.6 in Balon (1975) classification. Spawning begins when water temperature is high (*i.e.* close to 20^{o}C), in Poland usually in June. However in different areas spawning can start in May and extend until the end of July (*e.g.* in Slovakia) (Baruš and Oliva 1995, Zięba *et. al* 2010). Territorial males defend a small territory and build a nest, a small depression (3-5 cm deep and up to 40 cm across) in the vicinity of weeds. The size of the nest is approximately twice that of a male. The courtship displayed by the couple is restricted to a sequence of twisting and repeated spawning actions in the nest occasionally interrupted by others males. One male

can spawn consecutively with several females. After spawning, the male guards the nest while fanning eggs and guarding fry until the yolk sac absorption (Balon 1957).
In the entire area of its distribution, *L. gibbosus* exhibits a remarkable variation in its life history traits. Usually *L. gibbosus* matures at age 1-2. The female's absolute fecundity varies between 600-5000 eggs, but it changes with fish size and type of environment (Crivelli and Mestre 1988, Fox and Crivelli 2001, Copp *et al*. 2002). Eggs are yellow with a large amount of yolk and 1 mm in diameter (range 0.8-1.3 mm). This species can live up to 10 years (native range), but in Europe the maximum life span is 8 years (Copp *et al*. 2004). There are no published studies of *L. gibbosus* reproduction in Polish waters (Terlecki 2000).
The variation in growth, summarised by Copp *et al*. (2004), Copp and Fox (2007) and updated for northwestern Europe populations by Cucherousset *et al.* 2009, shows distinct differences between North American and European populations. In Europe, the mean body size and adult growth rates are smaller than in North America. Also the average asymptotic length is higher for American populations than European ones.
In general *L. gibbosus* is an omnivorous fish, feeding mainly on worms, crustacean and insects but consuming also small fishes and fish eggs as well as other vertebrates (FishBase). Godinho *et al*. (1997) and Zapata and Granado-Lorencio (1993) found that *L. gibbosus* feed mainly the most abundant prey types but juveniles and adults commonly use different food resources (ontogenetic diet shift).

Dispersal and spread
The rate of expansion of *L. gibbosus* in Polish waters is very low probably due to the high temperature required by the species. Today this species occurs only in a few sites in the lower River Oder drainage and it is absent in some sites where it was noted previously (Terlecki 2000).

Impact

Affected habitats and indigenous organisms
Although there is a lack of information on the impact of *L. gibbosus* on the habitat and native fish species (Witkowski 1989, 1996, 2002), *L. gibbosus* may have adverse ecological impacts in the area of its introduction (FishBase), such as competition with other species. For example, in Mediterranean reservoirs and a Danish lake *L. gibbosus* has been observed to reduce the abundance of larger forms of zooplankton, which may lead to an increase of eutrophication effects (Brabrand and Saltveit 1989, Jan K. Jensen, pers. comm.). The high diet overlap found between native (gudgeon, roach) and non-native (e.g. pumpkinseed) fish in ponds in the De Maten (Belgium) nature reserve (Declerck *et al.* 2002) may also indicate high potential for interspecific exploitative competition. Furthermore, the species has been found to be heavily infected (intensity < 100) with non-native monogenean parasites (Sterud and Jørgensen 2006). The identity of these is not yet fully resolved, and the possible impact on native fish communities is thus not clear.

Genetic effects
No genetic defects have been reported, but *L. gibbosus* will hybridise with most other *Lepomis*, especially with *L. cyanellus*, which is also introduced in some European countries. The result is usually fast-growing, sterile male hybrids (Moyle 1976 cited in Fuller *et al*. 1999).

Human health effects
No human health effects have been reported.

Economic and societal effects (positive/negative)
Due to its low abundance and narrow distribution *L. gibbosus* has not been observed to produce significant effects.

Management approaches

Prevention methods
Introduction of alien fish into open waters is prohibited in most European countries (Copp *et al*. 2005). Due to the fact that *L. gibbosus* is spread mainly by aquarists and owing to its temperature preferences *L. gibbosus* populations could easily be kept under control. However, increasing water temperatures may favour *L. gibbosus* and change the situation in the future (Zięba *et al*. 2010). In favourable habitats (*i.e.* heated water), *L. gibbosus* may become very abundant and perhaps impossible to eliminate. It seems that the main preventive method should be shifting interest of aquarists to keep native fish in garden ponds instead of ornamental species such as *L. gibbosus*. Additionally, it is important to inform that it is forbidden to release aquarium fish into open waters.

Eradication, control and monitoring efforts
In general, no eradication project should begin unless a specific assessment study has shown its technical and financial feasibility. The main constraint is the lack of species-specific eradication techniques to be applied to fish (Scalera and Zaghi 2004). In Germany, for example, there is no coordinated monitoring programme to document the spreading and impacts of *L. gibbosus*. Thus, it is still a challenge to act on this alien species. Therefore, existing management initiatives and instruments as well as the implementation of new and relevant projects, must be carefully applied (Nehring and Klingenstein 2005).

Information and awareness
There are no reports of information or awareness campaigns regarding the species.

Knowledge and research
Further, detailed studies on the biology and especially the effect of the species on the native biota are necessary.

Recommendation or comments from experts and local communities:
None

References and other resources:

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Links

www.fishbase.org
Aquatic alien species in German inland and coastal waters - database

www.iop.krakow.pl
Alien species in Poland – database of the Institute of Nature Conservation Polish Academy of Sciences [in English] last access 14/05/2010

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