

First record of the invasive Chinese sleeper *Perccottus glenii* (Gobiiformes: Odontobutidae) in Finland

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In recent decades, the Chinese sleeper *Perccottus glenii*, a freshwater fish originally from eastern Asia, has become an invasive species in many parts of Europe. Here, we describe the first record of this species from Finland. A probably deliberately introduced population, which is living in a small pond in Southwest Finland, was discovered in 2022. The population appears to be established, and the presence of juveniles suggests that the fishes are reproducing.

The Chinese sleeper, also known as Amur sleeper and rotan, *Perccottus glenii* Dybowski, 1877, is a small freshwater fish in the family Odontobutidae (freshwater sleepers). The natural distribution of the species is in northeastern China, the Amur region in Russia, and the Korean Peninsula (Elovenko 1981). In 1912, the Chinese sleeper was introduced to the St. Petersburg region in Russia as an aquarium fish. In 1916, some individuals were released into garden ponds from which they later escaped (Reshetnikov 2004, 2010). Another introduction of Chinese sleepers took place in the Moscow region in the 1940s; this introduction, too, resulted in the release of individuals into the wild (Reshetnikov 2004).

In the latter part of the twentieth century, the Chinese sleeper began rapidly spreading westwards, into East and Central Europe. Today, populations are known to exist in several countries and regions, including Belarus (Lukina 2011), Ukraine (Kvach 2012, Reshetnikov 2013, Kvach

et al. 2016, 2022, Kutsokon 2017), Romania (Nalbant et al. 2004, Popa et al. 2006, Naštase 2008, Covaciu-Marcov et al. 2011, 2017, Naštase et al. 2019), the Balkans (Jurajda et al. 2006, Hegediš et al. 2007, Čaleta et al. 2011, Horvatić et al. 2022), Poland (Nowak et al. 2008, Grabowska et al. 2009, Terlecki & Pałka 2012), Slovakia (Koščo et al. 2003), Hungary (Harka 1998, Harka & Farkas 1998), Germany (Reshetnikov & Schliewen 2013, Nehring & Steinhof 2015), and the Baltic countries (Tambets & Järvekülg 2005, Pupiņa & Pupiņš 2012, Rakauskas et al. 2021). It seems likely that the species will eventually find its way to other countries in Europe, and perhaps North America too (Reshetnikov & Ficetola 2011). In Europe, studies have shown that Chinese sleepers are voracious predators of other aquatic organisms, including juvenile fishes and amphibians, and they are therefore considered harmful to the native fauna (Reshetnikov 2003, Grabowska et al. 2009, Pupiņa & Pupiņš 2012, Kati et al. 2015).

Most European records of the Chinese sleeper are from freshwater, but the species has also been recorded in the Gulf of Yavorlyk in the Black Sea (Kvach et al. 2021), and the Gulf of Finland (see below). Many new populations originated as the unintentional result of individuals escaping from commercial fish farms, where Chinese sleepers had been accidentally introduced together with stock of other fish species, while others resulted from secondary, deliberate translocations by fishermen who use Chinese sleepers as live bait (Reshetnikov 2004, Kutsokon 2017, Grabowska et al. 2020, Rakauskas et al. 2021). Analysis of cytochrome *b* sequence diversity among Chinese sleepers from different parts of Europe suggest that their origin in this continent can be traced back to three genetically distinct founding populations (Grabowska et al. 2020).

The Chinese sleeper has occurred in the very low-saline, easternmost part of the Gulf of Finland, the Neva Estuary, since as long ago as 1922 (Reshetnikov 2010, Popov 2014). However, it appears that the species has never managed to disperse significantly westwards from that locality. This is consistent with observations from elsewhere within the introduced range of the Chinese sleeper, which suggest that the species is a relatively poor disperser that usually requires human assistance for long-distance dispersal (Rakauskas et al. 2021). However, the dispersal of the Chinese sleeper to Finland has been anticipated (Lehtonen 2006, Urho 2011, Halonen & Pennanen 2015, Lehtiniemi et al. 2016, Yrjölä et al. 2016). The first discovery of this species happened fortuitously during the recording of a digital podcast programme about invasive fish species in Southwest Finland (Figure 1) in August 2022 (Satto 2022). This discovery was reported in the popular press (Suomi 2022, Vehmanen 2022).

Following instructions by the original discoverer (Satto 2022), the authors of the present report were able to locate and visit the pond where the Chinese sleepers were living. The authors visited the site on two separate occasions, independently of each other; JG and HP visited it on 28 August 2022, and SK and JAS on 6 September 2022. This unnamed pond is less than one hectare (ha) in surface area and has no drainage. The pond is surrounded by mixed forest and farmland. As the Chinese sleeper has adverse impacts on the local

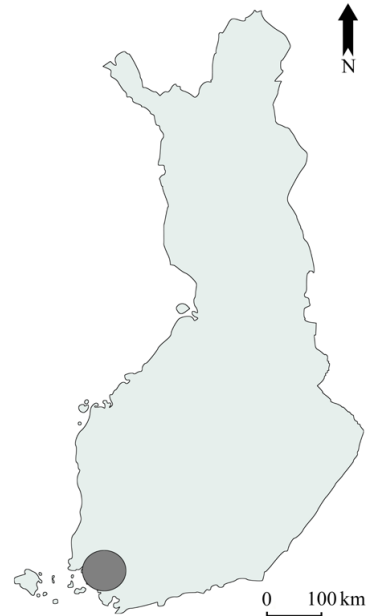


Figure 1. Map of Finland. The dark circle covers the region in Southwest Finland where the Chinese sleepers were found. The exact locality of the site is not shown.

fauna and is considered an invasive alien species throughout the European Union (Commission Implementing Regulation 2016/1141), we do not provide the pond's exact location. Invasive alien species of European Union concern must not be intentionally kept, transported, bred, or released into the environment (Regulation 1143/2014).

The pond had only moderate amount of aquatic vegetation, and Chinese sleepers appeared to be mostly hiding among submerged stones and branches. We made visual observations of another fish species present in the pond. Judging by its size and appearance, it was most likely either invasive Prussian carp *Carassius gibelio* or native crucian carp *Carassius carassius*. We did not observe any amphibian species at the site. We captured Chinese sleepers by using fishing rods and hand nets. The capturing required relatively little effort, which suggested that the size of the Chinese sleeper population in the pond is quite substantial. In a matter of only a few hours, we captured altogether 58 individuals of different size (ranging from 10 to 91 mm total length) and age. The smallest individuals included in the catch were juveniles, which suggests that the species



Figure 2. One of the nine *Perccottus glenii* specimens that were collected for the Finnish Museum of Natural History (Luomus), Helsinki. Total length of this specimen is 84.0 mm. All these specimens have subsequently been assigned the museum collection number KK 3247, and the collection identifier <http://id.luomus.fi/HT.38396>. Photo: Janne Granroth.

reproduces in the pond. Nine individuals, ranging in total length from 34 to 91 mm, were euthanized and preserved in formaldehyde. They were later deposited in the collections of the Finnish Museum of Natural History (Luomus) in Helsinki (Figure 2). Specimens were also collected and preserved in ethanol for further analysis by the Natural Resources Institute Finland (Luke). A participant of the 28 August visit also took underwater photographs of live Chinese sleepers (Figure 3). A few Finnish-language accounts of the results of these collecting trips have been published (Anonymous 2022, Anttila 2022, Hiltunen 2022, Salonen 2022).

In recent years, many alien fish species have been discovered in a geographically fairly limited region in Southwest Finland. For example, the originally North American pumpkinseed or common sunfish *Lepomis gibbosus* was first recorded in 2014 (Anonymous 2014, Urho 2021a), and since then it has been found in more than 25 different locations in different parts of Finland (Luonnonvarakeskus 2022). Two Central European cyprinids, nase *Chondrostoma nasus* and European bitterling *Rhodeus amarus*, were discovered in 2020 (Urho 2021b). Finland's first verified records of *Carassius gibelio* were made in another part of the country, Uusimaa, in 2005; however, a well-established Prussian carp population, whose origin possibly predates these observations, was later found in Salo, Southwest Finland (Urho 2011).

While the Chinese sleeper has ultimately spread to this country through human agency, the question of when and how this particular population originated is still open. As noted, the pond has no direct contact with other bodies of water. Endozoochory is a potential explanation. The eggs of at least some freshwater fish species, such as Prussian carp and common carp *Cyprinus carpio*, can sometimes survive ingestion and gut passage by waterfowl (Lovas-Kiss et al. 2020). Thus, at least in principle it may be possible that Chinese sleepers originally spread to this site from some nearby region with the help of native birds. However, in our opinion, direct human transport of individual fishes, either deliberately or inadvertently, to this pond remains the most likely explanation (see also Kuningas & Salmi 2022).

The presence of a large population of Chinese sleepers in this pond in Southwest Finland suggests that the fishes are thriving and able to tolerate the local climatic conditions, and the presence of several age classes strongly suggests that they are reproducing successfully. In other parts of Europe, it has been noted that once established in a new locality, the Chinese sleeper is difficult to eradicate. Clearly, strong and ongoing efforts are needed to prevent the further spread of this invasive alien species in Finland and elsewhere in Europe. In particular, the deliberate release of Chinese sleepers, or for that matter any other invasive alien species, into waterbodies must be prevented and the general public informed about the



Figure 3. Live *Percottus glenii* individual, photographed underwater. Photo: Pekka Tuuri.

illegality of such action. As for the recently discovered Chinese sleeper population in Southwest Finland, an eradication attempt is currently in progress (Salmi 2022).

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