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# Intentional release of tropical aquarium fishes? Orange chromide (*Pseudetroplus maculatus*) found in Finland

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Ornamental fish keeping is a popular hobby around the world, including Finland. Occasionally, aquarium fish end up in the wild either accidentally or via intentional release. Most such escapees undoubtedly perish quickly, but some may survive long enough to have a negative impact on the native fauna. Impacts of alien species on native fish may include predation, competition, hybridization, and the spread of diseases. These effects are especially noticeable if the alien species manage to form self-sustaining populations. While anecdotal reports of exotic aquarium fish encountered in the wild have been published from Finland and other European countries, the true scale of this phenomenon is difficult to establish. Here, we report the discovery of two individuals of the South Asia-native orange chromide (*Pseudetroplus maculatus*, Cichlidae, Cichliformes) that were discovered freshly dead on a riverbank in southern Finland. We discuss the possible biological risks associated with the release of exotic aquarium fishes in a Finnish context.

## Introduction

During the first decades of the 2000s, several fish species have been recorded as new to Finland. These include e.g. Prussian carp *Carassius gibelio* (Urho 2005, 2011), pumpkinseed or common sunfish *Lepomis gibbosus* (Anonymous 2014, Huusela et al. 2021) and Chinese sleeper *Percottus glenii* (Kuningas & Salmi 2022, Pihlström et al. 2022). The initial records of new species are frequently acquired through citizen science. Many first observations come from recreational fishers and are then reported in the popular press (e.g., Ojanperä 2005, Anonymous 2014, Halonen 2022, Suomi 2022, Vehmanen 2022). In Finland, people can report sightings of various alien taxa,

including fish, through an online reporting form (see the [www.vieraslaajit.fi](http://www.vieraslaajit.fi) website). These fish records are verified by experts before acceptance.

Some populations of alien cold-water fish species in Europe are known or suspected to have their origin in accidental or intentional releases from aquaria. One such example is the pumpkinseed (*Lepomis gibbosus*), which is now widely distributed in Europe, including parts of southwestern Finland (Huusela et al. 2021, Kuningas & Jauni 2024; but see Lovas-Kiss et al. 2024 for the dispersal potential via endozoochory of this species). Published records of tropical aquarium fish found in Finnish nature are few, with isolated cases of sail-fin plecos (*Pterygoplichthys* sp.) and Oscar cichlids (*Astronotus ocellatus*) report-

ed (Tast 2000, Varjo 2020). These exceptional occurrences are undoubtedly the results of human-aided introductions, since the natural range of these tropical pet fish is too far from Finland for colonisation through any natural vectors (e.g. via waterfowl) to occur. Here, we describe the discovery of a tropical cichlid fish species, the orange chromide (*Pseudetroplus maculatus*; sometimes known as *Etroplus maculatus*, see Pethiyagoda et al. 2014), in Finland.

## Materials and Methods

On 6th May 2024, three small and brightly coloured, recently dead fishes were found by recreational anglers in the Keravanjoki river, at Kellokoski village in the municipality of Tuusula, southern Finland. The fishes were found among the reeds, by the riverbank. The ambient air temperature was between  $-2.0$  and  $8.9$  °C on the day of discovery, according to the Finnish Meteorological Institute's Mäntsälä Hirvivaara measuring station, located circa 10 km NE from the site. The anglers mistook the fishes as pumpkinseed because of their exotic appearance. The fishes were not collected immediately, and when the original discoverers returned to retrieve the specimens later the same day, only two of them could be found. The anglers reported the observation through the online reporting form. These two specimens were then delivered to the authors for identification.

## Results

The standard lengths of the two specimens were 59.0 mm and 60.0 mm, respectively. Their body shape was oval in lateral profile, moderately compressed, with a short snout and relatively large eye. Their overall colouration shortly after death was orange-yellow, and on the upper dorsal sides, there were slightly darker areas. The identification was based on the morphology and colouration of the fresh specimens. The ovate shape, small size, vibrant colours, and single, continuous, spiny dorsal fin identified them as cichlids (Cichlidae). Several small, yellowish cichlid species are fairly common in the aquarium trade in Finland. For example, the Central American ge-

nus *Amphilophus* contains species (as well as aquarium hybrids thereof) that are yellowish in colour. Although juvenile *Amphilophus* spp. are superficially similar yellowish fish, they typically have a more oblong body shape, dorsal and anal fins with an elongated, tapering ends as well as fairly elongate snouts compared to the two specimens in question. Some of the popular Lake Malawi cichlids e.g. certain *Labidochromis*, *Pseudotropheus*, and *Petrotilapia*, are also more or less yellow in colour. Again, their fusiform body shape is different from the deep-bodied specimens discussed here.

Deep, oval and laterally compressed body shape with a small mouth and a short snout is typical for members of the genera *Pseudetroplus* and *Etroplus*. *Pseudetroplus maculatus* is similar to the closely related species *Eutroplus suratensis* and *E. canarensis*, but the latter two have a large black patch near the base of the pectoral fin and seven to nine distinct dark lateral bands (Sparks 2008). The vivid yellow colouration is typical for *P. maculatus* individuals from aquarium stock, whereas the natural colour of wild orange chromides is usually more subdued. After identification, the specimens were preserved in ethanol and deposited in the ichthyological collections of the Finnish Museum of Natural History (Luomus) in Helsinki under the collection identifier <http://id.luomus.fi/HT.49356> and collection number KK 3271 (Figure 1).

## Discussion

The orange chromide is native to the Indian Peninsula and Sri Lanka (Ward & Wyman 1977, Bindu & Padmakumar 2012, Shilta et al. 2016). In addition to its attractive colour, its small size makes it an interesting species for aquarium hobbyists (Bindu & Padmakumar 2012, Raghavan et al. 2013, Shilta et al. 2016). It is an euryhaline species that can tolerate and survive in salinities ranging from freshwater to marine conditions (Bindu & Padmakumar 2012, Shilta et al. 2016). In its natural habitat it has been recorded in waters with temperatures ranging from 27 to 33°C (Ward & Wyman 1977). The recommended temperature range for the species in the aquarium literature is slightly lower, 25–28 °C (Riehl & Baensch 1997).



Fig. 1. One of the two *Pseudetroplus maculatus* specimens that were found on 6th May 2024 in Tuusula. Note that the original colours have faded. Scale bar = 60 mm. Photo: Janne Granroth.

Except for the warmest months of summer, it is highly unlikely the species could survive in Finnish waters. The individuals discussed here possibly perished due to thermal shock.

The ornamental fish trade for aquaria and garden ponds has been recognised as a potential source for new alien species (Padilla & Williams 2004, Gozlan et al. 2010, Strecker et al. 2011, Urho et al. 2014, Maceda-Veiga et al. 2017). On a global scale, it is estimated that large numbers of pet fish are released into the wild annually (Gertzen et al. 2008, Strecker et al. 2011). One such estimate suggests that up to 21,000 fish are released by aquarists into the wild annually in the Puget Sound region, Washington, USA, alone (Strecker et al. 2011). Anecdotal reports on discovery of tropical aquarium fish in temperate regions can be found in both the popular and the scientific literature (Tast 2000, Ellis 2006, Popov 2014, Holmqvist 2017, Varjo 2020). However, many discoveries are not published, and the phenomenon likely remains underreported (Zięba et al. 2010).

Tropical and subtropical fish are usually overlooked in the literature on Finnish alien fish (however, see Urho et al. 2014, Huusela et al. 2021). This is mostly due to the belief that tropical fish do not survive or are able to establish themselves in a country with cold boreal climate, such as Finland.

Among the popular aquarium fish species in Finland, the goldfish (*Carassius auratus*), which is a temperate rather than a tropical species, could potentially survive in Finnish waters. In Sweden, records of escaped or released goldfish have increased in recent years and the species is classified as high risk of becoming invasive (SLU Art-databanken 2025). The goldfish is closely related to the Prussian carp (Kottelat & Freyhof 2007), a species that has already successfully established itself in the wild in Finland (Urho 2005, 2011). Mosquitofish (*Gambusia holbrooki*, *G. affinis*; see Haynes & Cashner 1995 on taxonomy), originally from subtropical regions of the southern United States and northern Mexico, may also

have potential to become established in regions that are far to the north of their natural distribution (Smith 1960, Vooren 1972, Jourdan et al. 2021).

Tropical aquarium fish species require exceptionally favourable local thermal circumstances if they are to survive or form self-sustaining populations in temperate or boreal climate conditions. In Western, Central, and South Europe, suitable local habitats can occur near natural, geothermal warm water springs or near heated effluent of industrial operations. Such sometimes ephemeral places with locally adapted tropical fish populations occur in, for example, Austria (Honsig-Erlenburg 2001, Petutschnig et al. 2008), Germany (Lukas et al. 2017a, b, Lukas & Bierbach 2018, Bierbach et al. 2022), Italy (Piazzini et al. 2010), Serbia (Milenković et al. 2013) and the United Kingdom (Meadows 1968, Wheeler & Maitland 1973, Zięba 2010). However, Finland does not have natural warm water springs and has only few locations where industrial thermal pollution (e.g. cooling water of nuclear power plants) might increase the water temperature enough to facilitate the long-term survival of tropical aquatic species. Especially the low Finnish winter temperatures limit the potential habitats of subtropical or tropical species into highly localised pockets of warm water. However, this thermal constraint may diminish as water temperatures rise due to climate change.

Despite having been available in the aquarium trade in Europe for more than a century (Novák et al. 2020), the orange chromide has always been an uncommon aquarium fish species in Finland (Mikkonen 1997, Ahola 2000, Mäkynen 2001). While the present finding of orange chromides is the first record of its kind for this species, it may be part of a broader phenomenon of aquarium fish ending up in the wild in Finland.

Most aquarium fishes that are released in the wild likely perish quickly due to suboptimal temperatures or water conditions or fall prey to native fish or other predators. Dead fish may be scavenged and even if they are found by humans, they are rarely reported in the media or in the zoological literature. While the likelihood of orange chromide or other truly tropical fish species establishing themselves under present circumstances in a country like Finland must be considered

extremely low, released alien fish species may under optimal circumstances survive long enough to act as vectors for novel parasites and pathogens (Viljamaa-Dirks 1999, Blanc 2001, Gozlan et al. 2005, Emde et al. 2016). They therefore represent a potential risk towards native fishes and other species.

The EU and Finnish invasive alien species legislations aim to prevent the spread of alien species and limit the damage they cause. According to the national Act on Managing the Risks Caused by Alien Species (1709/2015), no alien species should be allowed to escape into the environment. Chapter 8 of the national Fishing Act (379/2015) guides the stocking of fish and crayfish and prohibits the introduction and spread of fish species that harm biodiversity. Species classified as harmful invasive alien species by the EU or Finland, such as pumpkinseed, are subject to stricter bans, and they must not be kept even in aquaria. Additionally, they are subject to import and sales bans.

Such 'blacklisting' of species is often unpopular among fish hobbyists (Varjo 2020). However, pre-emptively stopping invasions from taking place is preferable to attempting eradication of already established local populations, as such efforts are often costly and may not succeed (Kuningas et al. 2024). Thus far, only a handful of species with potential relevance in the aquarium hobby have been included in the EU list of harmful invasive alien species (eastern and western mosquitofish, *Gambusia holbrooki*, *G. affinis*; striped eel catfish, *Plotosus lineatus*; northern weatherfish, *Misgurnus bipartitus*; northern snakehead, *Channa argus*). Most of the aquarium fish hobby community is interested in tropical species, which are less likely to end up facing import or sale bans. Thus, this subject is relevant not only in the context of invasion ecology, but also of animal welfare. Continuous education of the public on the risks of invasive species and information on humane euthanasia of pet fishes is needed.

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