The Bullhead in Britain:
a small fish with an identity problem

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A Bullhead on the bed of a Wiltshire river. Mark Everard

To many of us who dabble in streams and the margins of lakes across England and Wales, the Bullhead *Cottus gobio s.l.* is a familiar sight. A previous article in *British Wildlife* described the biology and conservation of this species (Perrow *et al.* 2006), and a short refresher on its ecology is given below. Here, however, we focus on research conducted two decades ago, largely overlooked in Britain, which revised the taxonomy of this fish here and elsewhere in Europe. At least in Britain, it seems that this fish has been suffering from a case of mistaken identity.

What are Bullheads?

The Bullhead is a small benthic freshwater fish (maximum recorded length 18cm) with a relatively large head and mouth, the body tapering away behind the gills and prominent pectoral fins. This unusual shape also explains why 'miller's thumb' is another common name, as described by the Reverend W. Houghton (1879) in his book, *British Fresh-Water Fishes*: 'The Miller's Thumb is supposed to resemble that organ in the miller, which is said to assume a flattened form from frequently testing the flour' (Houghton 1879).

Bullheads favour well-aerated water in streams and along lake margins. They are solitary fish, potentially living out their whole lives in suitable 'caves' beneath sunken rocks or woody material or among tree roots, and exhibiting no migratory behaviour. Bullheads are also known to be able to adapt to living in complete darkness in underground streams running through some cave systems, particularly in Wales. They are exclusively carnivorous, feeding on invertebrates and fish fry.

During their springtime breeding season, starting from as early as February and continuing through until June, often with multiple broods (Fox 1978), male Bullheads display to females dwelling in adjacent territories. They attract them into the paternal cave where, if receptive, the female will deposit a clump of approximately 100 sticky eggs on the roof. The male fish fertilises these eggs before driving the female away, and then proceeds to guard the brood for between three or four weeks. On hatching, the juveniles emerge with an attached yolk sac. The male Bullhead protects the hatchlings for around 12 more days, during which time the latter consume their yolk sacs. After this, hatchlings leave the parental cave to become free-living, whereupon they could well attract the predatory attentions of their parent or other fish. The juveniles then disperse over the riverbed or lakebed to seek their own territories.

Bullhead taxonomy

Bullheads are a type of sculpin. The sculpins are a group of fishes in the superfamily Cottoidea, which contains seven families, 94 genera and 387 species (Nelson *et al.* 2016). Sculpins are generally small fishes lacking swim bladders, adapted to living on the bottom in many types of marine and freshwater habitats. The single British freshwater sculpin species, the Bullhead, lives on the beds of rivers and some still waters, whereas all other British sculpin species are marine and live among cover on the sea floor.

The European Bullhead is in the genus *Cottus*, which contains 66 species distributed across the Pacific and Atlantic drainage basins of the Holarctic (Fishbase 2024). *Cottus* is a Latinisation of the Greek *kottos* (the original form being *koviós* or *kóthos*), roughly translating to 'head', which has been applied to small fish with a large head and is now used for all sculpins (Scharpf 2024). Most *Cottus* species live in fresh waters, but a few inhabit coastal marine environments. Given their relative immobility, *Cottus* species tend to live cryptically with a high degree of loyalty to suitable habitat. Consequently, they are prone to a significant degree of speciation.

The taxonomy of bullheads is complicated and contested. Initially, it was thought that a single species, *Cottus gobio*, described by Linnaeus in 1758, occurred across Europe. Even within single drainage basins, however, fragmented distribution was observed. Based on mark-recapture studies, the majority (61–72%) of tagged bullheads recaptured during different sampling occasions were found at or near (<10m) their initial tagging site, although some more mobile individuals were identified moving up to 270m, with most movement witnessed during the spawning season (Knaepkens *et al.* 2004, 2005). DNA analysis revealed important differences between populations, even over relatively small geographical areas within the same catchment (Knapen *et al.* 2003).

Taxonomic revision in 2005 based on molecular studies and morphological characters revealed that *Cottus gobio* actually comprised 15 distinct species,

Former extent of the Paratethys Sea – where the original bullhead likely emerged – during its peak in the late Miocene (23.03–5.333 mya). Josh Pickett