

# Catfish

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**Catfishes** (order **Siluriformes**) are a diverse group of ray-finned fish. Named for their prominent barbels, which resemble a cat's whiskers, catfish range in size and behavior from the heaviest and longest, the Mekong giant catfish from Southeast Asia and the second longest, the wels catfish of Eurasia, to detritivores (species that eat dead material on the bottom), and even to a tiny parasitic species commonly called the candiru, *Vandellia cirrhosa*. There are armour-plated types and also naked types, neither having scales. Despite their name, not all catfish have prominent barbels; members of the Siluriformes order are defined by features of the skull and swimbladder. Catfish are of considerable commercial importance; many of the larger species are farmed or fished for food. Many of the smaller species, particularly the genus *Corydoras*, are important in the aquarium hobby. Catfish are nocturnal.<sup>[2][3]</sup>

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## Distribution and habitat

Extant catfish species live inland or in coastal waters of every continent except Antarctica. Catfish have inhabited all continents at one time or another.<sup>[4]</sup> Catfish are most diverse in tropical South America, Africa, and Asia.<sup>[5]</sup> More than half of all catfish species live in the Americas. They are the only ostariophysans that have entered freshwater habitats in Madagascar, Australia, and New Guinea.<sup>[6]</sup>

They are found in freshwater environments, though most inhabit shallow, running water.<sup>[6]</sup> Representatives of at least eight families are hypogean (live underground) with three families that are also troglobitic (inhabiting caves).<sup>[7][8]</sup> One such species is *Phreatobius cisternarum*, known to live underground in phreatic habitats.<sup>[9]</sup> Numerous species from the families Ariidae and Plotosidae, and a few species from among the Aspredinidae and Bagridae, are found in salt water.<sup>[10][11]</sup>

In the United States, catfish species may be known by a variety of slang names, just as *mud cat*, *polliwogs*, or *chuckleheads*.<sup>[12]</sup> These nicknames are not standardized, so one area may call a Bullhead catfish by the nickname *chucklehead*, while in another state or region, that nickname refers to the Blue catfish.

## Physical characteristics

### External anatomy of catfish

Most catfish are bottom feeders. In general, they are negatively buoyant, which means that they will usually sink rather than float due to a reduced gas bladder and a heavy, bony head.<sup>[6]</sup> Catfish have a variety of body shapes, though most have a cylindrical body with a flattened ventrum to allow for benthic feeding.<sup>[6]</sup>

A flattened head allows for digging through the substrate as well as perhaps serving as

### Catfish

**Temporal range:**  **Late**

**Cretaceous - present**



Black bullhead

### Scientific classification

Kingdom:	Animalia
Phylum:	Chordata
Superclass:	Osteichthyes
Class:	Actinopterygii
Subclass:	Neopterygii
Infraclass:	Teleostei
Superorder:	Ostariophysii
Order:	<b>Siluriformes</b>
	G. Cuvier, 1817

### Families<sup>[1]</sup>

- Extant Families -

Akysidae  
Amblycipitidae  
Amphiliidae  
Anchariidae  
Ariidae  
Aspredinidae  
Astroblepidae  
Auchenipteridae  
Austroglanididae  
Bagridae  
Callichthyidae  
Cetopsidae  
Chacidae  
Clariidae  
Claroteiidae  
Cranoglanididae  
Diplomystidae  
Doradidae  
Erethistidae  
Heptapteridae  
Heteropneustidae  
Ictaluridae  
Lacantuniidae  
Loricariidae  
Malapteruridae  
Mochokidae  
Nematogenyiidae  
Olyridae  
Pangasiidae  
Pimelodidae  
Plotosidae  
Pseudopimelodidae  
Schilbeidae  
Scoloplacidae  
Siluridae



The armor plates are evident in *Corydoras semiaquilus*.

a hydrofoil. Most have a mouth that can expand to a large size and contains no incisiform teeth; catfish generally feed through suction or gulping rather than biting and cutting prey.<sup>[6]</sup> However, some families, notably Loricariidae and Astroblepidae, have a suckermouth that allows them to fasten themselves to objects in fast-moving water. Catfish also have a maxilla reduced to a support for barbels; this means that they are unable to protrude their mouths as other fish such as carp.<sup>[6]</sup>

Sisoridae  
Trichomycteridae

*incertae sedis*  
*Conorhynchos*

- Extinct Family -  
Andinichthyidae †

Catfish may have up to four pairs of barbels: nasal, maxillary (on each side of mouth), and two pairs of chin barbels, even though pairs of barbels may be absent depending on the species. Catfish also have chemoreceptors across their entire bodies, which means they "taste" anything they touch and "smell" any chemicals in the water. "In catfish, gustation plays a primary role in the orientation and location of food".<sup>[13]</sup> Because their barbels and chemoreception are more important in detecting food, the eyes on catfish are generally small. Like other ostariophysans, they are characterized by the presence of a Weberian apparatus.<sup>[4]</sup> Their well-developed Weberian apparatus and reduced gas bladder allow for improved hearing as well as sound production.<sup>[6]</sup>

Catfish have no scales; their bodies are often naked. In some species, the mucus-covered skin is used in cutaneous respiration, where the fish breathes through its skin.<sup>[6]</sup> In some catfish, the skin is covered in bony plates called scutes; some form of body armor appears in various ways within the order. In loricarioids and in the Asian genus *Sisor*, the armor is primarily made up of one or more rows of free dermal plates. Similar plates are found in large specimens of *Lithodoras*. These plates may be supported by vertebral processes, as in scoloplacids and in *Sisor*, but the processes never fuse to the plates or form any external armor. By contrast, in the subfamily Doumeinae (family Amphiliidae) and in hoplomyzontines (Aspredinidae), the armor is formed solely by expanded vertebral processes that form plates. Finally, the lateral armor of doradids, *Sisor*, and hoplomyzontines consists of hypertrophied lateral line ossicles with dorsal and ventral lamina.<sup>[14]</sup>



The channel catfish has four pairs of barbels.

All catfish, except members of Malapteruridae (electric catfish), possess a strong, hollow, bonified leading spine-like ray on their dorsal and pectoral fins. As a defense, these spines may be locked into place so that they stick outwards, which can inflict severe wounds.<sup>[5]</sup> In several species catfish can use these fin rays to deliver a stinging protein if the fish is irritated.<sup>[15]</sup> This venom is produced by glandular cells in the epidermal tissue covering the spines.<sup>[4]</sup> In members of the family Plotosidae, and of the genus *Heteropneustes*, this protein is so strong it may hospitalize humans, those unfortunate enough to receive a sting; in *Plotosus lineatus*, the stings may result in death.<sup>[4]</sup>

Juvenile catfish, like most fish, have relatively large heads, eyes and posterior median fins in comparison to larger, more mature individuals. These juveniles can be readily placed in their families, particularly those with highly derived fin or body shapes; in some cases identification of the genus is possible. As far as known for most catfish, features that are

often characteristic of species such as mouth and fin positions, fin shapes, and barbel lengths show little difference between juveniles and adults. For many species, pigmentation pattern is also similar in juveniles and adults. Thus, juvenile catfishes generally resemble and develop smoothly into their adult form without distinct juvenile specializations. Exceptions to this are the arid catfishes, where the young retain yolk sacs late into juvenile stages, and many pimelodids, which may have elongated barbels and fin filaments or coloration patterns.<sup>[16]</sup>

Sexual dimorphism is reported in about half of all families of catfish.<sup>[17]</sup> The modification of the anal fin into an intromittent organ (in internal fertilizers) as well as accessory structures of the reproductive apparatus (in both internal and external fertilizers) have been described in species belonging to 11 different families.<sup>[18]</sup>

## Size

Catfish have one of the greatest ranges in size within a single order of bony fish.<sup>[6]</sup> Many catfish have a maximum length of under 12 cm.<sup>[4]</sup> Some of the smallest species of Aspredinidae and Trichomycteridae reach sexual maturity at only 1 centimetre (0.39 in).<sup>[5]</sup>

The wels catfish, *Silurus glanis*, is the only native catfish species of Europe, besides the much smaller related Aristotle's catfish found in Greece. Mythology and literature record wels catfish of astounding proportions, yet to be proven scientifically. The average size of the species is about 1.2–1.6 m (3.9–5.2 ft), and fish more than 2 metres (6.6 ft) are very rare. The largest specimens on record measure more than 2.5 metres (8.2 ft) in length and sometimes exceeded 100 kilograms (220 lb).

The largest *Ictalurus furcatus*, caught in the Missouri River on July 20, 2010, weighed 130 pounds (59 kg). The largest flathead catfish, *Pylodictis olivaris*, ever caught was in



A sting from the striped eel catfish, *Plotosus lineatus*, may be fatal.

Independence, Kansas, weighing 123 lb 9 oz (56.0 kg). In July 2009, a catfish weighing 193 pounds was caught in the River Ebro, Spain, by an 11-year old British schoolgirl.<sup>[19]</sup> However, these records pale in comparison to a giant Mekong catfish caught in northern Thailand on May 1, 2005 and reported to the press almost 2 months later that weighed 293 kilograms (650 lb). This is the largest giant Mekong catfish caught since Thai officials started keeping records in 1981.<sup>[20]</sup> The giant Mekong catfish are not well studied since they live in developing countries and it is quite possible that they can grow even larger.

## Internal anatomy

In many catfish, the *humeral process* is a bony process extending backward from the pectoral girdle immediately above the base of the pectoral fin. It lies beneath the skin where its outline may be determined by dissecting the skin or probing with a needle.<sup>[21]</sup>

The retina of catfish are composed of single cones and large rods. Many catfish have a tapetum lucidum which may help enhance photon capture and increase low-light sensitivity. Double cones, though present in most teleosts, are absent from catfish.<sup>[22]</sup>

The anatomical organization of the testis in catfish is variable among the families of catfish, but the majority of them present fringed testis: Ictaluridae, Claridae, Auchenipteridae, Doradidae, Pimelodidae, and Pseudopimelodidae.<sup>[23]</sup> In the testes of some species of Siluriformes, organs and structures such as a spermatogenic cranial region and a secretory caudal region are observed, in addition to the presence of seminal vesicles in the caudal region.<sup>[24]</sup> The total number of fringes and their length are different in the caudal and cranial portions between species.<sup>[23]</sup> Fringes of the caudal region may present tubules, in which the lumen is filled by secretion and spermatozoa.<sup>[23]</sup> Spermatozoa are formed from cytoplasmic extensions of Sertoli cells; the release of spermatozoa is allowed by breaking of the cyst walls.<sup>[23]</sup>

The occurrence of seminal vesicles, in spite of their interspecific variability in size, gross morphology and function, has not been related to the mode of fertilization. They are typically paired, multi-chambered, and connected with the sperm duct, and have been reported to play a glandular and a storage function. Seminal vesicle secretion may include steroids and steroid glucuronides, with hormonal and pheromonal functions, but it appears to be primarily constituted of mucoproteins, acid mucopolysaccharides, and phospholipids.<sup>[18]</sup>

Fish ovaries may be of two types: gymnovarian or cystovarian. In the first type, the oocytes are released directly into the coelomic cavity and then eliminated. In the second type, the oocytes are conveyed to the exterior through the oviduct.<sup>[24]</sup> Many catfish are cystovarian in type, including *Pseudoplatystoma corruscans*, *P. fasciatum*, *Lophiosilurus alexandri*, and *Loricaria lentiginosa*.<sup>[23][24]</sup>

## Catfish as food

Catfish have widely been caught and farmed for food for hundreds of years in Africa, Asia, Europe, and North America. Judgments as to the quality and flavor vary, with some food critics considering catfish as being excellent food, while others dismiss them as watery and lacking in flavor.<sup>[25]</sup> In Central Europe, catfish were often viewed as a delicacy to be enjoyed on feast days and holidays. Migrants from Europe and Africa to the United States brought along this tradition, and in the Southern United States, catfish is an extremely popular food. The most commonly eaten species in the United States are the channel catfish and the blue catfish, both of which are common in the wild and increasingly widely farmed. Farm-raised catfish became such a staple of the diet of the United States that on June 25, 1987, President Ronald Reagan established National Catfish Day to recognize "the value of farm-raised catfish."

Catfish is eaten in a variety of ways. In Europe it is often cooked in similar ways to carp, but in the United States it is popularly crumbed with cornmeal and fried.<sup>[25]</sup>

In Indonesia, catfish is usually served grilled in street stalls called *warung* and eaten with vegetables and soy sauce; the dish is called *pecel lele*. Catfish can also be eaten with chili sambal as *lele penyyet* (minced catfish). (*Lele* is the Indonesian word for catfish.)

In Malaysia catfish, called "ikan keli", is fried with spices or grilled and eaten with tamarind and Thai chillies gravy and also is often eaten with steamed rice.

In Bangladesh and the Indian states of Odisha, West Bengal and Assam catfish (locally known as Magur) is eaten as a favored delicacy during the monsoons. Catfish, locally known as *thedu or etta* in Malayalam, is very famous in the Indian state Kerala. In the inland ponds in Kerala, 2 varieties of catfish is abundant- Muzhi and Kari while "Etta" is a basically a salt water fish. The smaller, slender Kari is notorious for its ability to sting, and Muzhi is much bigger and easy to catch, especially during Monsoon when this seems to literally walk where very little water is present from the rain water. All the catfish are eaten as curry and their extra-large eggs, especially that of Etta,



Tuscaloosa Catfish served with corn bread and rice



Fried hito (catfish) with vinegar and kalamansi dip sauce

is fried and is a delicacy. It is also believed that catfish meat helps in blood purification. Catfish curry is consumed in these parts to promote faster recovery to patients suffering from fever or other ailments.

In Hungary catfish is often cooked in paprika sauce (Harcsapaprikás) typical of Hungarian cuisine. It is traditionally served with pasta smothered with curd cheese (túrós csusza).

Catfish is high in Vitamin D.<sup>[26]</sup> Farm-raised catfish contains low levels of omega-3 fatty acids and a much higher proportion of omega-6 fatty acids.<sup>[27]</sup>

Vietnamese catfish cannot be legally marketed as catfish in the United States, and is subsequently referred to as *swai* or *basa*.<sup>[28]</sup> Only fish of the family Ictaluridae may be marketed as catfish in the United States.<sup>[29]</sup>

As catfish lack scales, they are judged not to be kosher and may not be eaten by observant Jews, some Christians who follow the Torah's food restrictions, and observant Muslims of various schools.

## Aquaculture

*Main article: Aquaculture of catfish*

Catfish are easy to farm in warm climates, leading to inexpensive and safe food at local grocers. About 60% of U.S. farm-raised catfish are grown within a 65-mile (100-km) radius of Belzoni, Mississippi.<sup>[30]</sup> Channel catfish (*Ictalurus punctatus*) supports a \$450 million/yr aquaculture industry.<sup>[5]</sup>

Catfish raised in inland tanks or channels are considered safe for the environment, since their waste and disease should be contained and not spread to the wild.<sup>[31]</sup>

In Asia, many catfish species are important as food. Several walking catfish (Clariidae) and shark catfish (Pangasiidae) species are heavily cultured in Africa and Asia. Exports of one particular shark catfish species from Vietnam, *Pangasius bocourti*, has met with pressures from the U.S. catfish industry. In 2003, The United States Congress passed a law preventing the imported fish from being labeled as catfish.<sup>[32]</sup> As a result, the Vietnamese exporters of this fish now label their products sold in the U.S. as "basa fish." Trader Joe's has labeled frozen fillets of Vietnamese *Pangasius hypophthalmus* as "striper."<sup>[33]</sup>

There is a large and growing ornamental fish trade, with hundreds of species of catfish, such as *Corydoras* and armored suckermouth catfish (often called plecos), being a popular component of many aquaria. Other catfish commonly found in the aquarium trade are banjo catfish, talking catfish, and long-whiskered catfish.

## Catfish as invasive species

Representatives of the genus *Ictalurus* have been introduced into European waters in the hope of obtaining a sporting and food resource. However, the European stock of American catfishes has not achieved the dimensions of these fish in their native waters, and have only increased the ecological pressure on native European fauna. Walking catfish have also been introduced in the freshwaters of Florida, with the voracious catfish becoming a major alien pest there. Flathead catfish, *Pylodictis olivaris*, is also a North American pest on Atlantic slope drainages.<sup>[5]</sup> *Pterygoplichthys* species, released by aquarium fishkeepers, have also established feral populations in many warm waters around the world.<sup>[34][35]</sup>  
[36][37][38]



Walking catfish is an invasive species in Florida.

## Dangers to humans

While the vast majority of catfish are harmless to humans, a few species are known to present some risk. Perhaps the most notorious of these is the candiru, due to the way it is reputed to parasitize the urethra, though there is only one documented case of a candiru attack on a human.

Since 2007, the Goonch catfish has also gained attention<sup>[39][40]</sup> following a series of fatal underwater attacks which have been alleged by biologist Jeremy Wade to have been from unusually large goonch.

The Wels catfish has also been reputed to kill humans (especially young children), and while there are no documented cases of fatalities, larger specimens are known to cause serious injuries in rare instances.<sup>[41]</sup> In addition, other species are reputed to be dangerous to humans as well, but with less definitive evidence.

Many catfish species have "stings" (actually non-venomous in most cases) embedded behind their fins; thus precautions must be taken when handling them.

## Taxonomy

The catfishes are a monophyletic group. This is supported by molecular evidence.<sup>[42]</sup>

Catfish belong to a superorder called the Ostariophysi, which also includes the Cypriniformes, Characiformes, Gonorynchiformes and Gymnotiformes, a superorder characterized by the Weberian apparatus. Some place Gymnotiformes as a sub-order of Siluriformes, however this is not as widely accepted. Currently, the Siluriformes are said to be the sister group to the Gymnotiformes, though this has been debated due to more recent molecular evidence.<sup>[4]</sup> As of 2007 there are about 36 extant catfish families, and about 3,093 extant species have been described.<sup>[43]</sup> This makes the catfish order the second or third most diverse vertebrate order; in fact, 1 out of every 20 vertebrate species is a catfish.<sup>[5]</sup>

The taxonomy of catfishes is quickly changing. In a 2007 and 2008 paper, *Horabagrus*, *Phreatobius*, and *Conorhynchos* were not classified under any current catfish families.<sup>[44]</sup> There is disagreement on the family status of certain groups; for example, Nelson (2006) lists Auchenoglanididae and Heteropneustidae as separate families, while the All Catfish Species Inventory (ACSI) includes them under other families. Also, FishBase and the Integrated Taxonomic Information System lists Parakysidae as a separate family, while this group is included under Akysidae by both Nelson (2006) and ACSI.<sup>[4][45][46][47]</sup> Many sources do not list the recently revised family Anchariidae.<sup>[48]</sup> The family Horabagridae, including *Horabagrus*, *Pseudeutropius*, and *Platytrapius*, is also not shown by some authors but presented by others as a true group.<sup>[42]</sup> Thus, the actual number of families differs between authors. The species count is in constant flux due to taxonomic work as well as description of new species. On the other hand, our understanding of catfishes should increase in the next few years due to work by the ACSI.<sup>[4]</sup>

The rate of description of new catfishes is at an all-time high. Between 2003 and 2005, over 100 species have been named, a rate three times faster than that of the past century.<sup>[49]</sup> In June, 2005, researchers named the newest family of catfish, Lacantuniidae, only the third new family of fish distinguished in the last 70 years (others being the coelacanth in 1938 and the megamouth shark in 1983). The new species in Lacantuniidae, *Lacantunia enigmatica*, was found in the Lacantun river in the Mexican state of Chiapas.<sup>[50]</sup>

According to morphological data, Diplomystidae is usually considered to be the most primitive of catfishes and the sister group to the remaining catfishes, grouped in a clade called **Siluroidei**. Recent molecular evidence contrasts the prevailing hypothesis, where the suborder Loricarioidei are the sister group to all catfishes, including Diplomystidae (Diplomystoidei) and Siluroidei; though they were not able to reject the past hypothesis, the new hypothesis is not unsupported. Siluroidei was found to be monophyletic without Loricarioid families or Diplomystidae with molecular evidence; morphological evidence is unknown that supports Siluroidei without Loricarioidea.<sup>[42]</sup>

Below is a list of family relationships by different authors. Lacantuniidae is included in the Sullivan scheme based on recent evidence that places it sister to Claroteidae.<sup>[51]</sup>

Nelson, 2006 <sup>[4]</sup>		Sullivan et al., 2006 <sup>[42]</sup>	
<ul style="list-style-type: none"> <li>■ Unresolved families               <ul style="list-style-type: none"> <li>■ Cetopsidae</li> <li>■ Pseudopimelodidae</li> <li>■ Heptapteridae</li> <li>■ Cranoglanididae</li> <li>■ Ictaluridae</li> </ul> </li> <li>■ Loricarioidea               <ul style="list-style-type: none"> <li>■ Amphiliidae</li> <li>■ Trichomycteridae</li> <li>■ Nematogenyiidae</li> <li>■ Callichthyidae</li> <li>■ Scoloplacidae</li> <li>■ Astroblepidae</li> <li>■ Loricariidae</li> </ul> </li> <li>■ Sisoroidea               <ul style="list-style-type: none"> <li>■ Amblycipitidae</li> <li>■ Akysidae</li> <li>■ Sisoridae</li> <li>■ Erethistidae</li> <li>■ Aspredinidae</li> </ul> </li> <li>■ Doradoidea               <ul style="list-style-type: none"> <li>■ Mochokidae</li> <li>■ Doradidae</li> <li>■ Auchenipteridae</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>■ Siluroidea               <ul style="list-style-type: none"> <li>■ Siluridae</li> <li>■ Malapteruridae</li> <li>■ Auchenoglanididae</li> <li>■ Chacidae</li> <li>■ Plotosidae</li> <li>■ Clariidae</li> <li>■ Heteropneustidae</li> </ul> </li> <li>■ Bagroidea               <ul style="list-style-type: none"> <li>■ Austroglanididae</li> <li>■ Claroteidae</li> <li>■ Ariidae</li> <li>■ Schilbeidae</li> <li>■ Pangasiidae</li> <li>■ Bagridae</li> <li>■ Pimelodidae</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>■ Unresolved families               <ul style="list-style-type: none"> <li>■ Cetopsidae</li> <li>■ Plotosidae</li> <li>■ Chacidae</li> <li>■ Siluridae</li> <li>■ Pangasiidae</li> </ul> </li> <li>■ Suborder Loricarioidei               <ul style="list-style-type: none"> <li>■ Trichomycteridae</li> <li>■ Nematogenyiidae</li> <li>■ Callichthyidae</li> <li>■ Scoloplacidae</li> <li>■ Astroblepidae</li> <li>■ Loricariidae</li> </ul> </li> <li>■ Clarioidea               <ul style="list-style-type: none"> <li>■ Clariidae</li> <li>■ Heteropneustidae</li> </ul> </li> <li>■ Arioidea               <ul style="list-style-type: none"> <li>■ Ariidae</li> <li>■ Anchariidae</li> </ul> </li> <li>■ Pimelodoidea               <ul style="list-style-type: none"> <li>■ Pimelodidae</li> <li>■ Pseudopimelodidae</li> <li>■ Heptapteridae</li> <li>■ <i>Conorhynchos</i></li> </ul> </li> <li>■ Ictaluroidea</li> </ul>	<ul style="list-style-type: none"> <li>■ Doradoidea (sister to Aspredinidae)               <ul style="list-style-type: none"> <li>■ Doradidae</li> <li>■ Auchenipteridae</li> </ul> </li> <li>■ "Big Asia"               <ul style="list-style-type: none"> <li>■ Sisoroidea                   <ul style="list-style-type: none"> <li>■ Amblycipitidae</li> <li>■ Akysidae</li> <li>■ Sisoridae</li> <li>■ Erethistidae</li> </ul> </li> <li>■ <i>Ailia + Laides</i> (Asian schilbeids)</li> <li>■ Horabagridae (<i>Horabagrus</i> + <i>Pseudeutropius</i> + <i>Platytrapius</i>)</li> <li>■ Bagridae (without <i>Rita</i>)</li> </ul> </li> <li>■ "Big Africa"               <ul style="list-style-type: none"> <li>■ Mochokidae</li> <li>■ Malapteruridae</li> <li>■ Amphiliidae</li> <li>■ Claroteidae</li> <li>■ Lacantuniidae</li> <li>■ Schilbeidae</li> </ul> </li> </ul>

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|  | <ul style="list-style-type: none"> <li>■ Ictaluridae</li> <li>■ Cranoglanididae</li> </ul> |  |
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## See also

- Catfish clonk fishing method Clonk fishing

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