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## Critical status review on a near threatened ornamental gourami, *Ctenops nobilis*: A recapitulation for future preservation

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### Abstract

Fish keeping in aquarium which was started from the Roman Empire in 50AD now become a very popular hobby among the world. Small ornamental species are mostly preferable in aquarium industry. Gourami is one of the most valuable and popular in small ornamental fish world. In India presently 8 indigenous Gourami species are very common and highly demanding. *Ctenops nobilis* is one of the highly demanding and important among the 8 indigenous Gourami species. It is the only known species in its genus. The fish is mainly cold water species. The species is widely distributed but it is a naturally scarce species. As per IUCN Red list, 2010 status the species is assessed as Near Threatened for its population declines in the wild. Very little data available of the fish resulting problems occur during maintenance of the fish in aquarium. So the proper study on the fish, captive breeding and rearing procedure of the fish is very important to meet the increasing demand of the fish among aquarium hobbyist.

**Keywords:** Aquarium fish, gourami, *Ctenops nobilis*, biology, conservation

### Introduction

Ornamental fishes usually mean attractive colourful fishes of various unusual characteristics, which are kept as pets in confined space of an aquarium or a garden pool for fun and fancy. All small water living animals of class Pisces (fish) which are kept as pets and as decorative pieces can be called ornamental fish. From Ancient period to till now aquarium keeping is the second largest hobby in the world next to photography and the ornamental fish and aquatic plant industry is fast gaining importance due to its tremendous economic opportunities and prospects. All the major cities in India have public aquariums for display of ornamental fishes and amusement of children and adults. About 7.2 million houses in the USA and 3.2 million in the European Union have an aquarium and the number is increasing day by day throughout the world [1]. About 80% of ornamental fishes are from fresh waters and the rest from brackish and marine waters. In India too keeping ornamental fish also very popular hobby and demand is more on the exotic ornamental fish. As such in India to meet their need about 261 egg layerers and 27 live bearing exotic fish are very popular among the hobbyist [2]. Indian Indigenous Ornamental fish are also popular in the overseas market and used by the hobbyist in different trade name. Gourami plays a significant role among the small indigenous ornamental fish. It is beautiful looking and easy to manage so this fish is very much popular to the aquarists. In the world's most beautiful freshwater fishes Gourami stands in rank 7. Among the 8 native gourami species *Ctenops nobilis* is one of the important ornamental fish. This species is the only known member of its genus *Ctenops* [3]. The species currently is in near threatened condition due to habitat loss [4] so the details study on this species become very much important for future prospects on captive propagation of the species.

### Status of World Gourami

The word Gourami is derived from Malayan or Javanese word 'Gurami' which means 'Carp'. The plural "Gouramis" so commonly used among aquarists. In its original language, 'Gourami' is already plural. Gourami or gourami is a group of freshwater Perciformes (perchlike) fishes which also called the Percomorphi or Acanthopteri, are the largest order of vertebrates, containing about 41% of all bony fish [5]. The order contains about 18 sub orders

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and 160 families, which is the most of any order within the vertebrates. The suborder Anabantoidei contains 3 orders i.e. Anabantidae (climbing gouramies), Osphronemidae (gouramies), Helostomatidae (kissing gourami) and 16 genera and 80 species they are distributed throughout most of southern Asia, India and central Africa [6]. The Anabantoidei suborder is characterized by the presence of a chamber above the gills for the retention of air for breathing [7]. According to taxonomists classify the labyrinth fishes into four families: Anabantidae (genera: *Sandelia*, *Ctenopoma* and *Anabas*); Belontiidae (genera: *Trichopsis*, *Trichogaster*, *Sphaerichthys*, *Pseudosphromenus*, *Parosphromenus*, *Malpulutta*, *Helostoma*, *Ctenops*, *Colisa*, *Betta* and *Belontia*); Osphronemidae (genera: *Osphronemus*); and Helostomatidae (genera: *Helostoma*) [8]. The Osphronemidae (Greek, *osphra*, = smell + Greek, *nema* = filament) family is composed of approximately 4 subfamily, 14 Genus and approx. 133 species and subspecies [9]. Scientists have studied the genetical relationships of the 17-anabantoid fishes, and based on similarity of their alleles, divided them into three groups [10]. Based on these studies, the Anabantidae, Macropodinae (excluding *Ctenops*) and Trichogastrinae are considered to be suitable taxonomic units. The Helostomatidae family is composed of single genus *Helostoma* which represent a single species. The family Anabantidae (Greek, *anabas* = aoristo of *anabainein* = to climb) is made up of two genera; *Anabas* and *Ctenopoma* and 19 species. The name Gourami is given quite properly to the monotypic genus *Osphronemus*. Lacepede in

1802 first utilized the genus *Osphronemus*, later changed to *Osphronemus* by most early writers, then back to its original spelling, to house his species *Osphronemus goramy* [11]. Certain fishes of the genera *Ctenops*, *Trichogaster*, *Helostoma*, *Colisa*, *Betta*, *Macropodus* and *Polyacanthus* have been called gourami as they are very closely taxonomically related to the true gourami *Osphronemus goramy*. Even the great Cuvier and Valenciennes in 1831 placed the tiny little *Ctenops vittatus* in the genus *Osphronemus* with that giant [12]. Of course it was removed later, but not for a great many years even though McClelland as early as 1844 [13] had created *Ctenops* for an Indian species. Giinther, in his great work "The Catalogue of Fishes in the British Museum", listed *Trichogaster trichopterus*, *Trichogaster leeri* and *Trichogaster microlepis*, all from Thailand, as being in the genus *Osphronemus*. Even the beautiful Chocolate Gourami, *Sphaerichthys osphromenoides* and the tiny Sumatran Gourami, *Par osphronemus desiineri*, have at one time or another has been placed into the genus *Osphronemus*. The fish of the family are widespread in Asia, in the fresh waters of Pakistan, India, Korea, Bangladesh and other water areas and to the Malay Archipelago.

**Details on Indian Gourami**

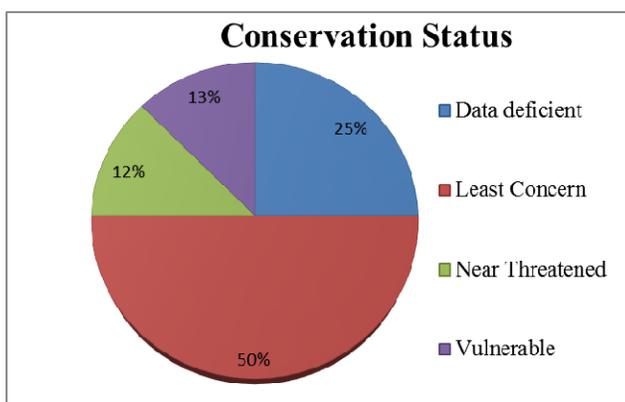
Among the 152 gourami species found globally, India represents only 8 gourami species, out of which 6 species are from Osphronemidae family and 2 species described from Anabantidae family [14] (Table 1).

**Table 1:** Details of Indian Gourami

Scientific name	Common name	Local name	Culture practice	Utilization
<i>Anabas testudineus</i>	Climbing perch	Koi/ Kai/ Kawai	Yes	Food
<i>Anabas cobojius</i>	Gangetic koi	Gangetic koi	No	Food
<i>Pseudosphromenus cupanus</i>	Spike tailed paradise fish/ Rosy paradise fish	Champarke/ Chittu/ Tabuti/ Pauni/ Hebbuti/ Nannathikaili	No	Food
<i>Pseudosphromenus dayi</i>	Brown Spike-tailed Paradise Fish		No	Ornamental
<i>Ctenops nobilis</i>	Frail gourami/ Indian paradisefish	Nefte khoira	No	Ornamental
<i>Trichogaster fasciata</i>	Banded gourami/ Giant gourami/ Striped gourami	Kholisha/ Ngapemma/ Kholiana	No	Food/ Ornamental
<i>Trichogaster chuna</i>	Honey gourami/ Sunset gourami	Chona kholisha	No	Food/ Ornamental
<i>Trichogaster lalius</i>	Dwarf gourami	Lalkholisa/ Khosti/ Gowra/ Lolholisha	No	Food/ Ornamental

Apart from this some gourami species are introduced in this country before a long time ago. The Gourami species named *Osphronemus goramy* is considered the "True Gourami". Due to different factors such as human modifications to the environment, overexploitation, habitat loss, exotic species and

others, aquatic biodiversity is greatly threatened. Out of 8 indigenous gourami species, *Pseudosphromenus dayi* is vulnerable position [4], *Ctenops nobilis* is near threatened [4], 4 species are in least concern condition and 2 species are in data deficient condition (Fig 1).

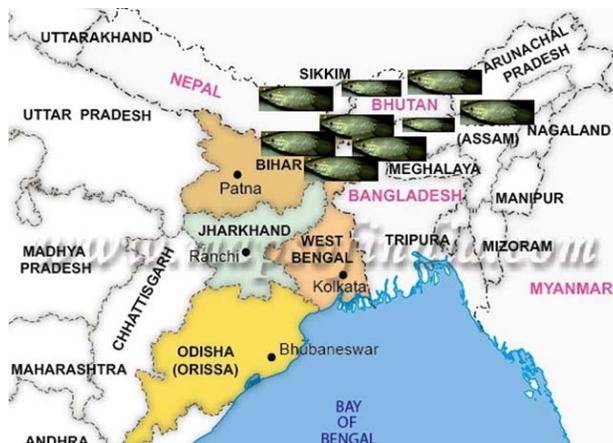


**Fig 1:** Conservation status of gourami species

**About *Ctenops nobilis***

*Ctenops nobilis* McClelland, 1845, is one of the important native ornamental fish under Perciformes order and genus Osphronemidae under subfamily Luciocephalinae. Gene bank date: rRNAs + tRNA-Val: AY763702; cytb: AY763748; RAG1: AY763781 [15]. This species is the only known member of its genus. *Ctenops nobilis* is described by

McClelland in the year 1845 from the rivers at the foot of Bhutan. The fish is mainly temperate region fish. The species is described from Sikkim state, north-eastern India and also known from West Bengal, Bihar and Assam states plus rivers, ponds, beels of Bangladesh [16, 17, 28] and more recently in Nepal (Fig 2).



**Fig 2:** Distribution of *Ctenops nobilis*

All records thus pertain to the Ganges and Brahmaputra river [18] systems in the region north of their confluence. It is found in lakes, ponds, rivers, and streams with plentiful vegetation overgrowth [32]. Found mostly in clean water with bladderwort

and a small quantity of water hyacinth. The fish is commonly known as Frail gourami, Noble gourami and Indian paradise fish (Table 2).

**Table 2:** List of Common Names of *Ctenops nobilis*

Common Name	Place & Language	Source
Frail gourami	Global, English	Fishbase [29]
Neftani, Madhumala, Napte khoira, Napte kolisha	Bangladesh, Bengali	Shafi and Quddus, 2001 [22]
Indian paradise fish, Frail gourami, Noble gourami	India, English	BdFISH feature and Fishbase [28, 29]
Neftani	India, Bengali	Fishbase [29]
Kolechona	Assam	Talwar and Jhingran, 1991 [24]
Nokkarihmakala	Finland, Finnish	Fishbase [29]
Frail gourami	USA, English	Fishbase [29]
Spitzkopf gurami	Germany, German	Fishbase [29]
Grate intended betta	China, Mandarin Chinese	Fishbase [29]

The fish has many more synonyms but now *Ctenops nobilis* is the accepted scientific name (Table 3). This fish is in endangered condition due to habitat loss [19].

**Table 3:** List of Synonyms of *Ctenops nobilis* (Fishbase)

Synonym	Author	Status	Valid
<i>Ctenops nobilis</i>	McClelland, 1845	Accepted	Yes
<i>Osphronemus nobilis</i>	(McClelland, 1845)	Synonym	No
<i>Osphromenus nobilis</i>	(McClelland, 1845)	Synonym	No (Marked as misspelled)

**Systematic Position of *Ctenops nobilis***

- Phylum:** Chordata
- Class:** Actinopterygii (Rayfinned fishes)
- Order:** Perciformes (Perchlikes)
- Sub-order:** Anabantoidei
- Family:** Osphronemidae (Gouramis)
- Subfamily:** Luciocephalinae
- Genus:** *Ctenops*
- Species:** *C. nobilis* McClelland, 1845

**Biology of *Ctenops nobilis***

The study of fish biology is considered to be one of the most fundamental aspects of applied fishery research. It is clearly impossible to gain any real understanding of practical fish husbandry without some appreciation of fish biology [20]. A large number of ichthyologists worked on the biology of fishes. After reviewing the concerned literature it became explicit that no details study on the biology of *C. nobilis* has been performed so far. Of course, some scattered information on the fish is collected from different literature. Body of the fish is elongate and relatively compressed. Head structure is acute and depressed. Lower jaw is longer and somewhat pipe-shaped (Fig 3). Fish possess protruding eyes with moderate sized subterminal mouth. The posterior extremity of the intermaxillaries reaches upto the front edge of the eye. Preorbital length of the fish is large and coarsely serrated. The lower edge of opercle is serrated. Teeth are present on both jaws. Head length of the fish is near about one fourth of total body length. Fins contain both hard spines and soft rays. The pectoral fin of the fish contains a large fin ray [31]. Body covered with small ctenoid scales. A superbranchid labyrinthine auxiliary respiratory organ is present in the fish.

Dorsal and anal spines are strong. Dorsal originates above the last third of anal. Pelvic fin is with one spine and five soft rays and inserted well back on body. Pelvic fins thoracic. Anal commences immediately behind pelvic fin, separated from caudal, caudal rounded. The ventral fins are small and soft, the dorsal and anal broad, the former commencing on the back just above the pectorals [13]. Different authors give different fin formula for the fish (Table 4).

**Table 4:** Fin formula of *C. nobilis* given by different authors.

Author	Fin formula
McClelland, 1845	P.14: D.48: V.5: A.34: C.13
Talwar and Jhingran, 1991	D IV-VI 6-8; IV_V 23-28; P13; V 15
Bhattacharya et. al., 2015	D IV-VII/4-8; P 8-12; V I/5; A IV-V/23-28; C 14-16
Shafi and Quddus, 2001	D. V-VI/7-8; P. 12; V. I/5; A. IV-V/23-25; C. 16
Rahman, 1989 and 2005	D V-VI/7-8; P1. 12; P2. 1/5; A. V/23-25
IUCN Bangladesh, 2000	D IV-VI/6-8, P1 12, P2 I/5, A IV-V/23-28

The body is covered with ctenoid scales. Lateral line when present is a simple orifice at centre of each scale. 28 to 33 scales is present in longitudinal series [16, 17]. Transverse scale 12-16, and caudal peduncle scale 5-8 [3]. The colouration of the fish is mainly brown with a silvery white band (generally interrupted), from the eye to the base of caudal. The dark sombre colours are relieved by minute dots of vermilion and small blue, dispersed indiscriminately over the upper parts of the body and sides, more particularly about the head [13] (Fig. 3). The fish attain maximum 10cm in total length [19, 21, 22]. The osteology of *Ctenops* and *Trichopsis* was investigated by [23]. The ratio of the lengths of the ascending process and body of the premaxillary is 2:1 [23]. Head length is 3.5-4.0 parts in total length. Height is 2.3-3.0 parts in standard and 3.0-3.3 parts in total length. Eye is 3.5 parts of snout length. Inter-orbital length is longer than eye diameter [16, 17]. Body depth is near 24.86% of total length and eye diameter is 28.55% of head length [3]. Like others in the suborder Anabantoidei this species possesses an accessory breathing organ known as the labyrinth organ.



**Fig 3:** Identification of *Ctenops nobilis*

**Habitat of *Ctenops nobilis***

The fish is mainly found in streams of upland hills [24]. The fishes are generally comfortable between the temperature 20-24°C with even greater extremes being tolerated for short periods [25]. In many countries/well-insulated homes artificial heating is not required, but it is necessary to maintain a constant temperature somewhere around the middle of the range suggested above should suffice. Warmer temperatures

may cause an increase in aggressive behaviour or the fish may even stop feeding. The suitable pH: 5.0 – 7.5 and hardness: 36 – 215 ppm. Average air temperatures tend to fall within the range 59 – 90°F/15 – 32°C depending on locality and time of year, though in the northern extreme of its range it can be significantly cooler during winter [18]. Many of its habitats are therefore subject to severe seasonal alteration in terms of water depth, volume and flow. *C. nobilis* is not an especially gregarious species except when juvenile. During winter season the fishes abundantly found in roots of water hyacinth [22]. Adults are often openly hostile towards and may even kill conspecifics given the opportunity. It is possible to maintain a group but to do so would require a very large tank or well-structured set-up with dense plant growth and other décor arranged so as to break lines of sight (Fig. 4). The aggression is apparently not restricted to a particular gender and heightened when the fish are inbreeding condition or maintained at higher temperatures.



**Fig 4:** Aquarium condition for *Ctenops nobilis*.

**Feeding of *Ctenops nobilis***

The fish is mainly larvivorous in nature [19]. It accepts chiefly a micropredator feeding on small aquatic crustaceans, worms, red midge larvae, insect larvae and other zooplankton. Mosquito larvae, white worm, tubifex are the main preferable food of the fish (Fig. 5). They also accept small frozen red midge larvae, *Artemia* nauplii, *Daphnia*, grindal worm, micro worm, etc. [26].



**Fig 5:** Food of *Ctenops nobilis*

**Reproduction of *Ctenops nobilis***

The sexes can be tricky to tell apart when newly-imported or not in good condition though females always possess a uniformly straight lower jaw profile and overall more

acuminate head shape than males. In the latter the lower jaw is slightly rounded due to the presence of distensible skin that is expanded during mouth brooding. The fishes – it were males with their broad “spouts” clearly recognizable, a bigger and a presumably female – did not display any of the infamous intraspecific aggressiveness which they are accused of [26]. Fishes are mouth-brooder in nature. Parental care is observed by male fish [15]. It can be bred in a group or single pair in a set-up as suggested above, and provided the quality of both water and diet is maintained should not prove too difficult. Courtship may be initiated by the female, or alpha female if multiple individuals are present. The spawning process may take several hours with the male catching each batch of eggs in his anal fin from where the female collects them in her mouth and transfers them to the male by literally ‘spitting’ them at him. The surrounding area is defended by both fish until the female is exhausted of eggs. Brooding males tend to take refuge in a quiet area of the tank where they assume a cryptic, marble-like patterning and eat very little, if at all. One of the most unusual characters that *Luciocephalus* shares with the osphronemid genera *Parasphaerichthys*, *Ctenops*, and *Sphaerichthys* is the presence of spiraling ridges and intermittent grooves on the egg surface that lead to the micropyle [15]. The almost spherical eggs of *C. nobilis* measure from 1.9 to 2.1 mm in diameter [31]. At higher magnifications the pore canal openings are visible on the whole egg surface. The eggs show a zonaradiata with a special surface structure of parallel ridges. All surface structures including the projections are already present in ovarian eggs of the fish [27].

#### Conservation of *Ctenops nobilis*

As known a long time ago there were plenty of this fish in the pond from where the fish collected to meet the needs of the market. The population has declined in Assam (due to habitat loss), but there is no information on the population or its habitat in other parts of its range [4]. The species appears to be threatened in part of its range, and the same is inferred in the rest of its range as the habits and uses of people are similar. *C. nobilis* is assessed as Near Threatened by IUCN, 2010 as there is insufficient information to determine its population declines in the wild, however the status must be re-evaluated after urgent studies on the species' distribution, biology, use, trends and threats reveal more information. The species is likely to be more threatened than what is assessed currently. In order to decline the amount of fish, suppliers cannot meet the market demand so large scale seed production of *C. nobilis* is very important.

#### Conclusion

From the present study it is suggested that for conservation of the fish biological study of the fish is very important. As *Ctenops nobilis* is under near threatened condition, captive maturation, breeding and large scale seed production is very much needed for future conservation of the fish. Since the River basin is undergoing drastic deterioration as a consequence of anthropogenic changes, the conservation strategies must be innovative and integrated. Among the indigenous ornamental fish, *Ctenops nobilis* is one of the most high demand aquarium fish for both local and export market. Price in local market varies between Rs. 12/- to 30/- per piece and export value varies between Rs. 2\$ to 3\$ per piece. As the fish is highly promising in aquarium industry the artificial propagation of the fish is very important. There is need to

improve knowledge on biodiversity by strengthening the taxonomic capacity using computer, image analysis, and molecular tools etc.

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