U.S. Fish & Wildlife Service

Singida Tilapia (*Oreochromis esculentus*)

Ecological Risk Screening Summary

U.S. Fish & Wildlife Service, January 2012
Revised, May 2017
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1 Native Range and Status in the United States

Native Range

From Twongo et al. (2006):

"Present within the Lake Victoria drainage and Lake Kanyaboli. […] It is still present in some of the satellite lakes of Lakes Victoria and Kyoga. It is, however, virtually extinct from the main Lakes Victoria and Kyoga."

Status in the United States

This species has not been reported in the United States.

From FFWCC (2017):

"Prohibited nonnative species are considered to be dangerous to the ecology and/or the health and welfare of the people of Florida. These species are not allowed to be personally possessed or used for commercial activities. Very limited exceptions may be made by permit from the Executive Director […]
Freshwater Aquatic Species […]
Tilapia […]
Oreochromis esculentus(Singida Tilapia)"

Means of Introduction into the United States
This species has not been reported in the United States.

Remarks
From Twongo et al. (2006):

"This species has almost been eliminated from its previous range in lakes Victoria and Kyoga through predation, competitive exclusion and ecological displacement by introduced fishes (Twongo 1995, Nagayi Kalule 1999). The main population (in Lake Victoria) has declined by >80% over the past 20 years (FIRRI fishery records, Mugeriya, pers. comm.). The remaining population is limited to sub-populations in a few satellite lakes, which are themselves undergoing continued environmental degradation and heavy fishing pressure. This species is assessed as Critically Endangered."

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing
From ITIS (2017):

"Kingdom Animalia
Subkingdom Bilateria
Infrakingdom Deuterostomia
Phylum Chordata
Subphylum Vertebrata
Infraphylum Gnathostomata
Superclass Actinopterygii
Class Teleostei
Superorder Acanthopterygii
Order Perciformes
Suborder Labroidei
Family Cichlidae
Genus *Oreochromis*
Species *Oreochromis esculentus* (Graham, 1928)"

"Current Standing: valid"

Size, Weight, and Age Range
From Froese and Pauly (2017):

“Maturity: L_m 24.8, range 17 - 27 cm
Max length : 50.0 cm SL male/unsexed; [Trewavas 1983]; common length : 31.0 cm SL male/unsexed; [van Oijen 1995]; max. published weight: 2.5 kg [Trewavas 1983]; max. reported age: 10 years [Trewavas 1983]”

Environment
From Froese and Pauly (2017):

“Freshwater; benthopelagic; depth range 0 - 50 m [Witte and de Winter 1995], usually ? - 20 m [van Oijen 1995].”

“Tolerant of low oxygen concentrations (<1ppm) [Fish 1956; Philippart and Ruwet 1982; Goudswaard et al. 2002] and high levels of carbon dioxide [Fish 1956; Philippart and Ruwet 1982].”

Climate/Range
From Froese and Pauly (2017):

“Tropical; 24°C - 29°C [Philippart and Ruwet 1982; unknown if this temperature refers to air or water].”

Distribution Outside the United States
Native
From Twongo et al. (2006):

“Present within the Lake Victoria drainage and Lake Kanyaboli. […] It is still present in some of the satellite lakes of Lakes Victoria and Kyoga. It is, however, virtually extinct from the main Lakes Victoria and Kyoga.”

Introduced
From Twongo et al. (2006):

“It has been introduced into several dams and waters, including the Pangani system (Lake Jipe) [border of Kenya and Tanzania].”

From Froese and Pauly (2017):

“Rwanda”

“Tanzania”

Means of Introduction Outside the United States

From Froese and Pauly (2017):

"Reason: aquaculture"

"Reason: fill ecological niche"

"Introduced in the 1950s into small lakes of the Kagera system [in Rwanda] where it has become established and forms a basis for a valuable commercial fishery [Lever 1996]."

"Introduced [within Tanzania] in the 1950s. A highly successful species used for stocking into small dams where it fills a planktonophage niche. Gave rise to valuable fisheries especially in Lake Nyumba ya Mungu [Welcomme 1988]."

Short Description

From Froese and Pauly (2017):

"Dorsal spines (total): 16 - 18; Dorsal soft rays (total): 10-12; Anal spines: 3-4; Anal soft rays: 9 - 12; Vertebrae: 30 - 31. Diagnosis: head somewhat pointed; snout with relatively steep forehead; eyes positioned low [Seegers 1996]. No enlargement of the jaws in mature males [Trewavas 1983]. Preorbital bone rather shallow, its depth not exceeding 21% head length [Trewavas 1983; Seegers 1996]. Pharyngeal bone 33.0-35.5% head length; male genital papilla opening between a pair of often spongy lobes (papilla conical or with a slight distal notch) [Trewavas 1983]. Length:depth ratio of caudal peduncle 0.9-1.15 [Trewavas 1983; van Oijen 1995]. Males without genital tassel [Lowe-McConnell 1956; Bailey 1968; Seegers 1996]. Body not conspicuously spotted [Greenwood 1966; Bailey 1968]. Male breeding coloration a general reddish colour with black ventral parts and dorsal fin; lappets of dorsal fin not bright red or orange [Trewavas 1983]. No vertical stripes on caudal fin [Trewavas 1983; Eccles 1992]. Young and females with *Tilapia*-mark in soft dorsal fin [Seegers 1996]."

Biology

From Froese and Pauly (2017):

"Occasionally forms schools [Graham 1929; Lowe-McConnell 1956; Copley 1958; Welcomme 1964; Philippart and Ruwet 1982; Trewavas 1983]. Mainly diurnal [Trewavas 1983]. Filter feeder [Garrod 1959]. Food consist almost entirely of phytoplankton [Beadle 1981; Philippart and Ruwet 1982], mainly diatoms [Bailey et al. 1978; Witte and de Winter 1995] but also higher plants [Seegers 1996], and small animals such as insects and their larvae, crustaceans [Greenwood 1966; Seegers 1996] and worms [Seegers 1996], are taken as well, but they occur less frequently and may contribute to the diet of young fishes [Greenwood 1966; Witte and de Winter 1995]. Only diatoms [Greenwood 1966; Kiss 1977] and some blue-green and green algae [De Kimpe 1964] appear to be digested . Agamous [Baensch and Riehl 1995], maternal moutbrooder [Lowe-McConnell 1956; Trewavas and Fryer 1965; Greenwood 1966; Baensch and Riehl 1995; Witte and de Winter 1995; Seegers 1996]."

“Reproduction probably triggered by the rains [Fryer 1961], with the time of maximum spawning activity coinciding with the wettest months of the year [Lowe-McConnell 1956]. Males form a crater-like spawning nest without a distinct wall [Seegers 1996]. The pit is about 30cm in diameter and 10cm deep, and is probably made in the early morning [Seegers 1996]. Ovaries show that a female may have a succession of three or more broods in a spawning period; brooding females often shelter in weed beds and swampy places [Lowe-McConnell 1956; Trewavas 1983]. Males defend their breeding territory [Trewavas 1983] for weeks or on and off for several months, while females only make short visits to the spawning grounds and leave the territory immediately after spawning [Lowe-McConnell 1956]. Males eat little while actively guarding the nest [Lowe-McConnell 1956]. Papyrus swamp channels [Lowe-McConnell 1956; Nayyar 1962; Welcomme 1964] and beaches with weed grown swamps [Nayyar 1962] function as nursery areas. Young become independent at a length of about 1.5cm [Lowe-McConnell 1956; Trewavas 1983] by which size the yolk sac is occluded and they have strated to feed [Lowe-McConnell 1956], and at about 12cm TL they move from the nursery areas to the open water [Trewavas 1983].”

From Twongo et al. (2006):

“This species was originally (before competitive exclusion by the introduced species) confined to water less than 20 m deep and was most abundant in sheltered gulfs and bays where the bottom is composed of soft algaceous mud (Witte and de Winter 1995). It is a plankton feeder, using the mucus-trap mechanism combined with the combing action of the pharyngeal teeth. It is non selective all organisms of a size capable of being retained are passed into the stomach (Trewavas 1983). Breeding fish are found throughout the year and distinct spawning areas can be identified in the lake. Females brooding eggs often move off to the shelter of macrophyte beds or swampy areas.”

Human Uses

From Froese and Pauly (2017):

“Fisheries: commercial; aquaculture: experimental”

Diseases

From Froese and Pauly (2017):

“*Acanthogyrus* Infestation, Parasitic infestations (protozoa, worms, etc.)
Alitropus Infestation, Parasitic infestations (protozoa, worms, etc.)
Dactylosoma Infection 1, Parasitic infestations (protozoa, worms, etc.)”

From AU-IBAR (2016):

“*Myxobolus brachysporus* [Akoll and Mwanja 2012]”

“*Myxobolus heterosporus* [Akoll and Mwanja 2012]”

"*Myxobolus homeospora* [Akoll and Mwanja 2012]"

"*Cichlidogyrus thurstonae* [Vanhove et al. 2011]"

"CRUSTACEA (*Branchiura*) [Akoll and Mwanja 2012]"

"*Lamproglena monody* [Akoll and Mwanja 2012]"

"*Lernaea barnimiana* [Akoll and Mwanja 2012]"

"*Dolops ranarum* [Mwita and Nkwengulila 2008]"

"Lymphocystis virus [Akoll and Mwanja 2012]"

Threat to Humans

From Froese and Pauly (2017):

"Potential pest [Lever 1996]"

3 Impacts of Introductions

From Froese and Pauly (2017):

"Significant ecological interactions: some – adverse"

"Significant socio-economic effects: some – beneficial"

"Has also established in Lake Kitangiri [in Tanzania], where it both competes and hybridizes with the endemic *Sarotherodon amphimelas* [Lever 1996]."

From FFWCC (2017):

"Prohibited nonnative species are considered to be dangerous to the ecology and/or the health and welfare of the people of Florida. These species are not allowed to be personally possessed or used for commercial activities. Very limited exceptions may be made by permit from the Executive Director […]
Freshwater Aquatic Species […]
Tilapia […]
Oreochromis esculentus(Singida Tilapia)"

4 Global Distribution

Figure 1. Known global established locations of *O. esculentus* around Lake Victoria on the border of Uganda, Kenya, and Tanzania. Map from GBIF (2016).

5 Distribution Within the United States

O. esculentus has not been reported in the United States.

6 Climate Matching

Summary of Climate Matching Analysis

The climate match (Sanders et al. 2014; 16 climate variables; Euclidean Distance) was low throughout the country except for medium matches in southern California, southern New Mexico, Florida, around the Gulf of Mexico, and along the Atlantic coast as far north as North Carolina. Climate 6 proportion indicated that the contiguous U.S. has a low climate match overall. The range of proportions indicating a low climate match is 0.000 - 0.005; the Climate 6 proportion for *O. esculentus* was 0.001.

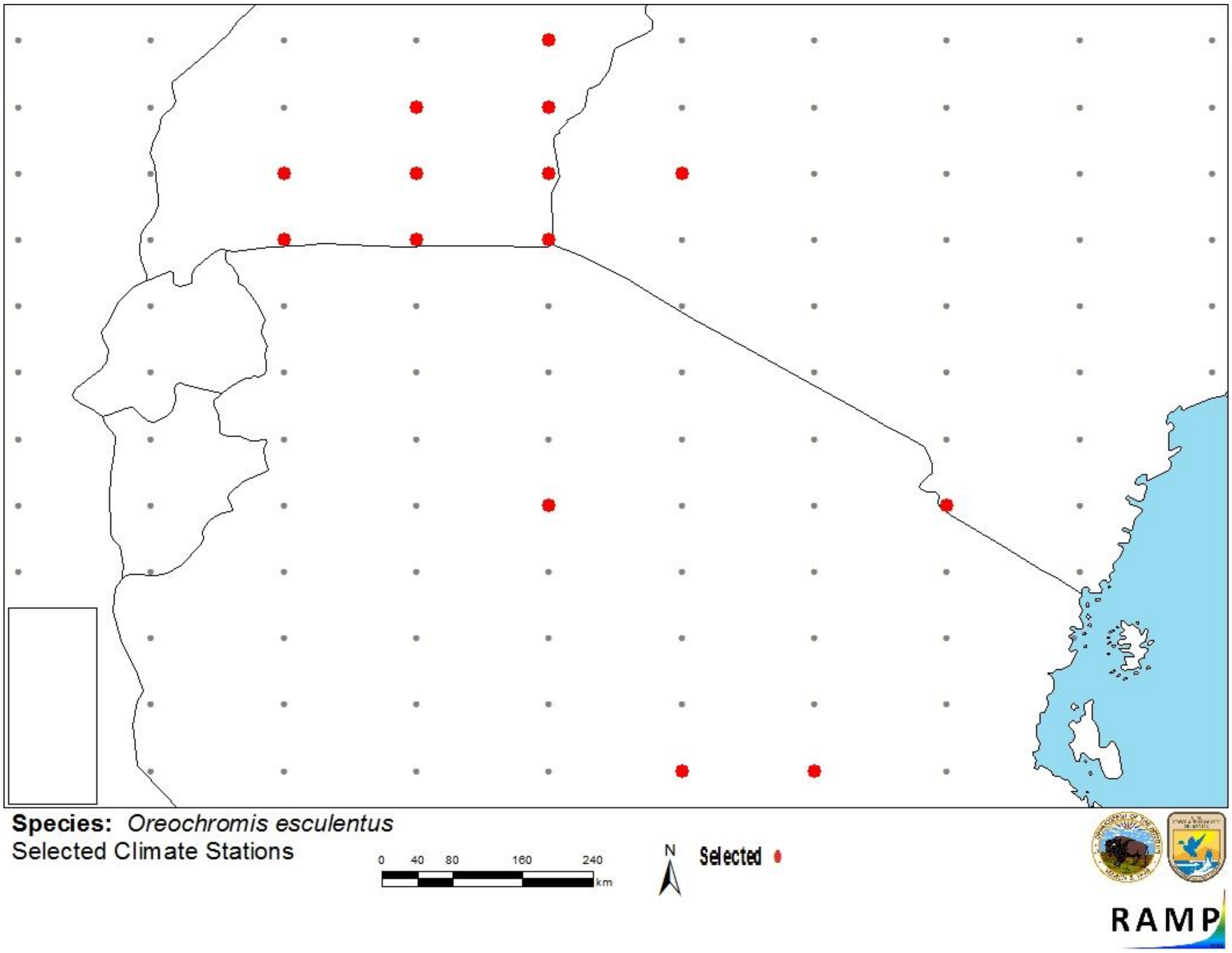

Figure 2. RAMP (Sanders et al. 2014) source map showing weather stations selected as source locations (red) and non-source locations (gray) for *O. esculentus* climate matching. Source locations from GBIF (2016). Additional source locations in Tanzania (Lake Nyumba ya Mungu and Lake Kitangiri) from Froese and Pauly (2017).

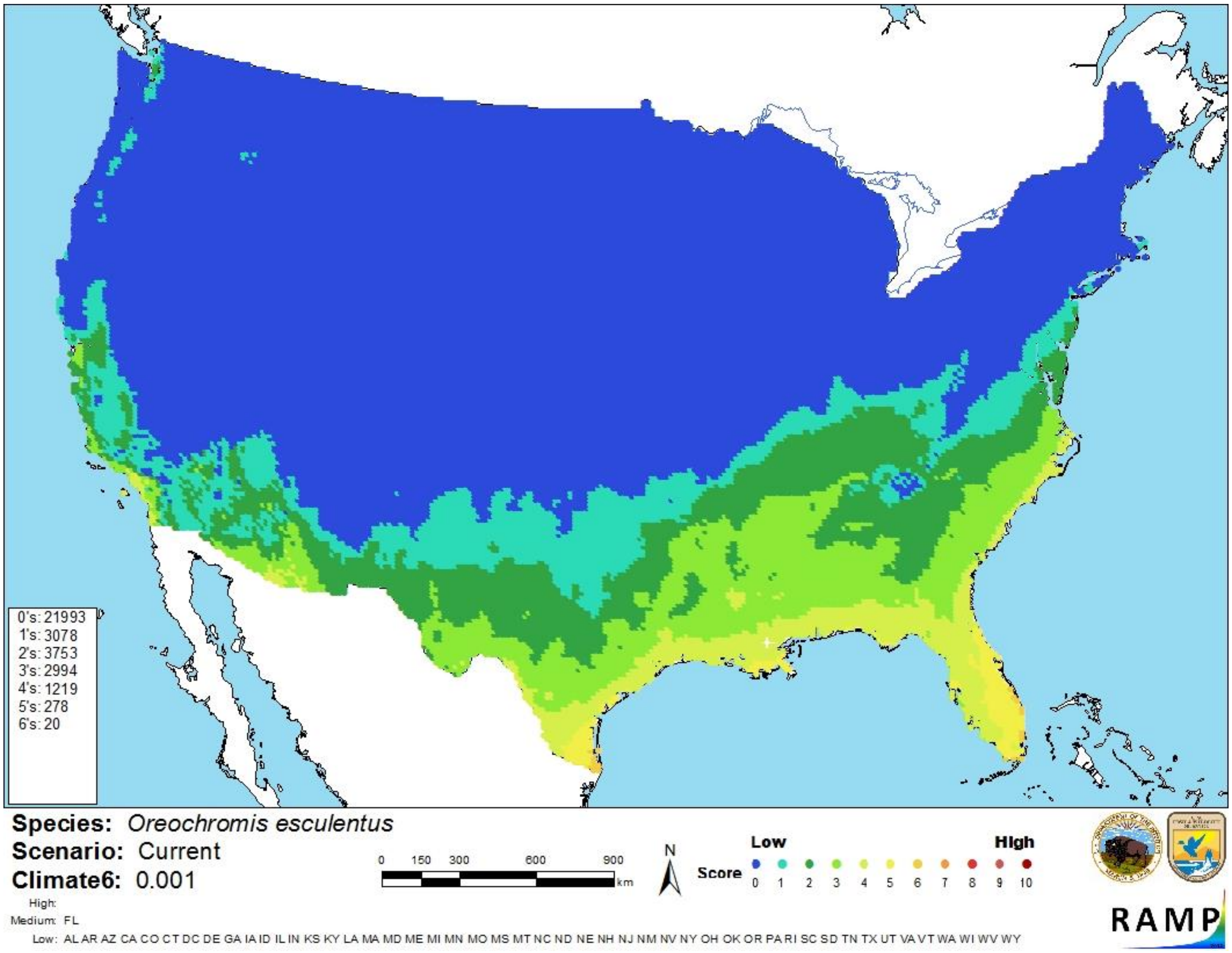

Figure 3. Map of RAMP (Sanders et al. 2014) climate matches for *O. esculentus* in the contiguous United States based on source locations reported by GBIF (2016) and Froese and Pauly (2017). 0=Lowest match, 10=Highest match. Counts of climate match scores are tabulated on the left.

The “High”, “Medium”, and “Low” climate match categories are based on the following table:

Climate 6: Proportion of (Sum of Climate Scores 6-10) / (Sum of total Climate Scores)	Climate Match Category
0.000≤X≤0.005	Low
0.005<X<0.103	Medium
≥0.103	High

7 Certainty of Assessment

Detailed information is available on the biology and ecology of *Oreochromis esculentus*, but the distribution of the species, particularly its introduced locations, has not been documented well. One location reported adverse impacts of introduction but the information available on these impacts is too limited to determine scientific credibility. Certainty of this assessment is low.

8 Risk Assessment

Summary of Risk to the Contiguous United States

Oreochromis esculentus is a Critically Endangered fish tilapiine cichlid, as assessed on the IUCN Red List. The species is native to the Lake Victoria system; it has been introduced to other river systems in Rwanda and Tanzania where it has established successfully. *O. esculentus* has not been reported in the United States. One source suggests that an introduced population of *O. esculentus* in Tanzania competes and hybridizes with a native tilapiine cichlid, but no further information is available about the significance of the interaction. Climate match to the contiguous U.S. was low overall, with a medium match for the state of Florida where *O. esculentus* is listed as a prohibited species. Overall risk posed by *O. esculentus* is uncertain.

Assessment Elements

- **History of Invasiveness (Sec. 3): None Documented**
- **Climate Match (Sec. 6): Low**
- **Certainty of Assessment (Sec. 7): Low**
- **Overall Risk Assessment Category: Uncertain**

9 References

Note: The following references were accessed for this ERSS. References cited within quoted text but not accessed are included below in Section 10.

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10 References Quoted But Not Accessed

Note: The following references are cited within quoted text within this ERSS, but were not accessed for its preparation. They are included here to provide the reader with more information.

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