GLOBAL INVASIVE SPECIES DATABASE

FULL ACCOUNT FOR: ***Oreochromis niloticus***

Oreochromis niloticus 正體中文

System: Freshwater

Kingdom	Phylum	Class	Order	Family
Animalia	Chordata	Actinopterygii	Perciformes	Cichlidae

Common name Nile tilapia (English)

Synonym
Perca nilotica , (Linnaeus, 1758)
Tilapia nilotica , (Uyeno & Fujii, 1984)
Tilapia cancellata , Nichols, 1923
Tilapia regani , (Poll, 1932)
Tilapia eduardiana , (Boulenger, 1912)
Tilapia calciati , (Gianferrari, 1924)
Tilapia vulcani , (Trewavas 1933)
Tilapia inducta , (Trewavas, 1933)
Oreochromis niloticus filoa , (Trewavas, 1983)
Oreochromis niloticus sugutae , (Trewavas, 1983)
Oreochromis niloticus baringoensis , (Trewavas, 1983)
Oreochromis niloticus tana , (Seyoum & Kornfield, 1992)
Chromis guentheri , (Steindachner, 1864)

Similar species *Oreochromis mossambicus, Oreochromis aureus*

Summary Oreochromis niloticus (Nile tilapia) is a highly invasive fish that plagues a variety of ecosystems, particularly those located in the tropics. Oreochromis niloticus' effective mouthbrooding reproductive strategy allows it to increase in numbers at a rate which, not only crowds native species, but pollutes and unbalances the water column. Oreochromis niloticus is a frequently farmed aquatic species, due to its relative ease of culture and rapid reproduction rates. Most infestations are a result of aquaculture.

view this species on IUCN Red List

Species Description
Compressed body; caudal peduncle depth equal to length. Cycloid scales. Lacks knobby feature on dorsal surface of snout. Sexual dimorphism not displayed in upper jaw length. First gill arch has 27 to 33 gillrakers. Interrupted lateral line (FAO, 2006; FAO, 2007). \"Spinous and soft ray parts of dorsal fin continuous; dorsal fin with 16 - 17 spines and 11 to 15 soft rays. Anal fin with 3 spines and 10-11 rays. Caudal fin truncated. Colour in spawning season: pectoral, dorsal and caudal fins becoming reddish; caudal fin with numerous black bars\" (FAO, 2006; FAO, 2007)

Notes
Genetically Improved Farmed Tilapia (GIFT tilapia) is a selective breeding project that aims to increase the effeciency of tilapia aquaculture efforts. Spearheaded by the International Centre for Living Aquatic Resources Management, the UN Development Program, and the Asian Development Bank, GIFT tilapia is derived from natural *Oreochromis niloticus* stock (Day & Gupta, 2000). GIFT tilapia is \"exceptionally hardy and requires little or no expensive high protein feed to grow quickly\" (ICLARM, 2007). ICLARM's website also notes that \"the fish eats anything, from grass clippings to vegetable matter and suspended solids\" (ICLARM, 2007). GIFT grows 60% faster and demonstrates a 50% higher survival rate compared to its base species, *O.niloticus* (ICLARM, 2007). Researchers express concern about biodiversity issues stemming from unintentional introductions. GIFT tilapias reproduce at an extremely high rate, can withstand crowded conditions and can thrive in a variety of brackish, fresh and saltwater conditions (Canonico *et al*. 2005).

Lifecycle Stages
Sexual maturity begins at 5-6 months. Nile tilapia (*Oreochromis niloticus*) can live up to 10 years and reach weights of 5kg (FAO, 2006; FAO, 2007).

Uses
Nile tilapia (*Oreochromis niloticus*) is a hugely important fish in aquaculture. The development of sex-reversal procedures in the mid-1970's allowed farmers to maintain high density all male populations, thus avoiding stunted and unmarketable fish that often resulted from crowded mixed-sex tanks.
The tilapia family (of which *O. niloticus* is a member) is the second most intensively farmed species in the world. China produces almost half of the worlds' tilapia crop, usually in the form of frozen whole fish (FAO, 2006; FAO, 2007). Tilapia is packaged in a variety of ways depending on the country of origin, including fresh or frozen fillets in \"skin-on, skin-off, deep skinned, individually quick frozen, smoked, [or] sashimi...\" forms (FAO, 2006; FAO, 2007).

Habitat Description
Nile tilapia (*Oreochromis niloticus*) is a tropical fish. It exists in a variety of freshwater and brackish habitats. Diurnal species. Its preferred temperature is 31-36 degrees Celsius but can survive from 12-42 degrees Celsius. *O.niloticus* prefers shallow water (FishBase, 2007).

Reproduction
Sexual maturity begins at 5-6 months. Spawning begins at 24 degrees Celcius (FishBase, 2007). Nile tilapia (*Oreochromis niloticus*) establishes a territory and digs a nest and then the females deposit eggs in the nest. After fertilisation by the male, the female collects eggs in her mouth and leaves. The female incubates the eggs in her mouth until hatching, approximately 1-2 weeks later (FAO, 2006; FAO, 2007). \"After fry are realeased, they may swim back into her mouth\" if threatened (FAO, 2006; FAO, 2007). Because of mouthbrooding techniques, the number of eggs per spawn is smaller than other pond species, but survival rates of young are comparitively higher. Males can fertilise eggs from a succession of females, and if there is no drop in temperature females can spawn continuously (FAO, 2006; FAO, 2007). In large scale aquaculture settings, reproduction takes place in a series of tanks and incubation spaces. Between 21-28 days of age, fish are given a food containing a male hormone that changes the sex of female members. Male specimens of *O. niloticus* grow twice as fast, and maintainnig a mono-sex population avoids stunted growth of individuals due to overcrowding. Other farming techniques include pond culture, floating cage culture and recirculation tank methods (FAO, 2006; FAO, 2007).

Nutrition
Nile tilapia (*Oreochromis niloticus*) is omnivorous. It feeds on phytoplankton, periphyton, aquatic plants, small invertebrates, benthic fauna, and detritus. *O. niloticus* can filter feed but it usually grazes the surface of periphyton mats (FAO, 2006; FAO, 2007).

General Impacts
Giani & Figurerdo (2005) write that \"environmental problems may arise in aquatic environments after the introduction of *Oreochromis niloticus*\" especially in areas with slow water renewal rates. Eutrophic water conditions frequently are a result of intensive *O. niloticus* production. *O. niloticus*' selective feeding regime can also unbalance algal constituents of the water column (Giani & Figurerdo, 2005). Although aquaculture helps meet population protein needs and can be a path to economic gain, biodiversity must be recognized as the basis for sustainable production (Ogutu-Ohwayo and Balirawa 2006). Because *O. niloticus* reproduce at such a rapid rate, they overcrowd and out-compete native species. This loss of biodiversity leads to genetic erosion and greater susceptibility to disease (Mahmud-ul-Ameen, 2000).

Management Info
Preventative measures: The use of potentially invasive alien species for aquaculture and their accidental release/or escape can have negative impacts on native biodiversity and ecosystems. Hewitt *et al*, (2006) Alien Species in Aquaculture: Considerations for responsible use aims to first provide decision makers and managers with information on the existing international and regional regulations that address the use of alien species in aquaculture, either directly or indirectly; and three examples of national responses to this issue (Australia, New Zealand and Chile). The publication also provides recommendations for a 'simple' set of guidelines and principles for developing countries that can be applied at a regional or domestic level for the responsible management of Alien Species use in aquaculture development. These guidelines focus primarily on marine systems, however may equally be applied to freshwater.
Copp *et al*, (2005) Risk identification and assessment of non-native freshwater fishes presents a conceptual risk assessment approach for freshwater fish species that addresses the first two elements (hazard identification, hazard assessment) of the UK environmental risk strategy. The paper presents a few worked examples of assessments on species to facilitate discussion. The electronic Decision-support tools- Invasive-species identification tool kits that includes a freshwater and marine fish invasives scoring kit are made available on the Cefas (Centre for Environment, Fisheries & Aquaculture Science) page for free download (subject to Crown Copyright (2007-2008)).
The dramatic rise in Nile tilapia (*Oreochromis niloticus*) aquaculture in the last two decades is considered a concern from a management perspective. Low-cost tilapia aquaculture operations are closely linked to reductions in water quality, since small scale farmers generally opt for cage culture, a method that interfaces directly with open water systems. This method is closely linked to water pollution issues as well as declines in native fish and aquatic plant populations. In Central America, most attempts to bring about local prosperity by tilapia farming have failed. While tilapia fetches a good price in American markets, native markets in countries like Nicaragua generally offer a lower quality and a rather unappetising fish product. Furthermore, tilapia often does not have a place in native diets (GISD, 2006).
Preventative measures: Mahmud-ul-Ameen (2000) writes that \"tiliapia may be recommended for those areas where native species are scarce or absent…[but] in a country…rich in diversity, introductions should be very restricted.\"
Chemical Faced with a tilapia threat, the island nation of Palau embarked on an eradication programme to remove tilapia from the country. A chemical (Rotenone) was applied directly to 5 infested sites. This effort was successful (Tilapia Eradication Project, 2004; Palau Biodiversity, undated).
Cultural: The island nation of Palau used education campaigns to warn the population about the negative impacts of tilapia infestation to local flora and fauna (Tilapia Eradication Project, 2004).

Pathway

Principal source: FAO. 2006. Cultured Aquatic Species Information Programme - *Oreochromis niloticus*. Text by Rakocy, J. E. In FAO Fisheries and Aquaculture Department [online]. Rome.
FAO, 2007. Fisheries and Aquaculture Department. Species Fact Sheets *Oreochromis niloticus* (Linnaeus, 1758)
FishBase., 2007. *Oreochromis niloticus niloticus* Nile tilapia: Summary

Compiler: National Biological Information Infrastructure (NBII) & IUCN SSC Invasive Species Specialist Group (ISSG)

Review: Pam Fuller USGS/BRD, Nonindigenous Aquatic Species Program. Florida Integrated Science Center. USA

Pubblication date: 2008-03-27

ALIEN RANGE

[1] BANGLADESH
[4] JAPAN
[1] PHILIPPINES
[1] SAINT LUCIA
[1] THAILAND
[1] INDIA
[1] PERU
[1] REUNION
[1] TAIWAN
[6] UNITED STATES

Red List assessed species 10: CR = 6; VU = 2; NT = 1; LC = 1;

Amphilophus zaliosus **CR**
Neolebias lozii **CR**
Oreochromis esculentus **CR**
Oreochromis mortimeri **CR**
Oreochromis variabilis **CR**
Atherinella jiloaensis **CR**
Oreochromis andersonii **VU**
Oreochromis macrochir **VU**
Oreochromis mossambicus **NT**
Pharyngochromis acuticeps **LC**

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Managment information

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Summary: Available from: http://www.gaianicaragua.org/Canonico%20et%20al%202005%20Aquatic%20Conservation.pdf [Accessed 14 July 2008]

Centre for Environment, Fisheries & Aquaculture Science (CEFAS)., 2008. Decision support tools-Identifying potentially invasive non-native marine and freshwater species: fish, invertebrates, amphibians.
Summary: The electronic tool kits made available on the Cefas page for free download are Crown Copyright (2007-2008). As such, these are freeware and may be freely distributed provided this notice is retained. No warranty, expressed or implied, is made and users should satisfy themselves as to the applicability of the results in any given circumstance. Toolkits available include 1) FISK- Freshwater Fish Invasiveness Scoring Kit (English and Spanish language version); 2) MFISK- Marine Fish Invasiveness Scoring Kit; 3) MI-ISK- Marine invertebrate Invasiveness Scoring Kit; 4) FI-ISK- Freshwater Invertebrate Invasiveness Scoring Kit and AmphISK- Amphibian Invasiveness Scoring Kit. These tool kits were developed by Cefas, with new VisualBasic and computational programming by Lorenzo Vilizzi, David Cooper, Andy South and Gordon H. Copp, based on VisualBasic code in the original Weed Risk Assessment (WRA) tool kit of P.C. Pheloung, P.A. Williams & S.R. Halloy (1999).
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http://cefas.defra.gov.uk/our-science/ecosystems-and-biodiversity/non-native-species/decision-support-tools.aspx [Accessed 13 October 2011]
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Global Invasive Species Database. 2006. *Oreochromis* spp.
Summary: Provides detailed background and management information on the tilapia family.
Available at: http://www.invasivespecies.net/database/species/ecology.asp?fr=1&si=813&sts=

Mahmud-ul-Ameen, 2000. Development of Guiding Principles for the prevenvtion of impacts of alien species. Government Grant Proposal submitted to Bangledesh, Ministry of Environment and Forest.
Summary: This paper outlines necessary standards for developing a nationwide invasive species protocol. It also touches on a few examples of invasive species in Bangladesh and discusses ways in which they have affected the country s ecosystems.

Massachusets Institute of Technology, 2006. Fish fact sheets. *Oreochromis aureus.*
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Mendoza, R.E.; Cudmore, B.; Orr, R.; Balderas, S.C.; Courtenay, W.R.; Osorio, P.K.; Mandrak, N.; Torres, P.A.; Damian, M.A.; Gallardo, C.E.; Sanguines, A.G.; Greene, G.; Lee, D.; Orbe-Mendoza, A.; Martinez, C.R.; and Arana, O.S. 2009. Trinational Risk Assessment Guidelines for Aquatic Alien Invasive Species. Commission for Environmental Cooperation. 393, rue St-Jacques Ouest, Bureau 200, Montr﹫al (Qu﹫bec), Canada. ISBN 978-2-923358-48-1.
Summary: In 1993, Canada, Mexico and the United States signed the North American Agreement on Environmental Cooperation (NAAEC) as a side agreement to the North American Free Trade Agreement (NAFTA). The NAAEC established the Commission for Environmental Cooperation (CEC) to help the Parties ensure that improved economic efficiency occurred simultaneously with trinational environmental cooperation. The NAAEC highlighted biodiversity as a key area for trinational cooperation. In 2001, the CEC adopted a resolution (Council Resolution 01-03), which created the Biodiversity Conservation Working Group (BCWG), a working group of high-level policy makers from Canada, Mexico and the United States. In 2003, the BCWG produced the ﹫Strategic Plan for North American Cooperation in the Conservation of Biodiversity.﹫ This strategy identified responding to threats, such as invasive species, as a priority action area. In 2004, the BCWG, recognizing the importance of prevention in addressing invasive species, agreed to work together to develop the draft CEC Risk Assessment Guidelines for Aquatic Alien Invasive Species (hereafter referred to as the Guidelines). These Guidelines will serve as a tool to North American resource managers who are evaluating whether or not to introduce a non-native species into a new ecosystem. Through this collaborative process, the BCWG has begun to implement its strategy as well as address an important trade and environment issue. With increased trade comes an increase in the potential for economic growth as well as biological invasion, by working to minimize the potential adverse impacts from trade, the CEC Parties are working to maximize the gains from trade while minimizing the environmental costs.
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French version: http://www.cec.org/Storage/62/5517_07-64-CEC%20invasives%20risk%20guidelines-full-report_fr.pdf [Accessed 15 June 2010]
Spanish version: http://www.cec.org/Storage/62/5518_07-64-CEC%20invasives%20risk%20guidelines-full-report_es.pdf [Accessed 15 June 2010].
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Tilapia eradication Project. Government report for the Palau, prepared by Environmental Quality Protection Board. April 19, 2004
Summary: Provides firsthand account of attempts at tilapia eradication using chemical means. Outlines project goals and plans for long term maintaince of tilapia free ecosystem.
Available at:
http://72.14.209.104/search?q=cache:eqz6chioeyYJ:www.palau.biodiv-chm.org/upload/tilapia.pdf+palau+tilapia&hl=en&ct=clnk&cd=2&gl=us [Accessed July 20 2007]
Woking paper on Palau s National Invasive Species strategy. Undated.
Summary: Provides information about Palau s management attempts to eradicate tilapia from the island country.
Available from: http://www.palau.biodiv-chm.org/upload/tilapia.pdf [Accessed July 20 2007]
Zambrano, Luis, 2006. Invasive potential of common carp *Cyprinus carpio* and Nile tilapia *Oreochromis niloticus* in American Freshwater Systems. Published in *The Canadian Journal of Fish and Aquaculture Science*. Vol 63. 2006.
Summary: This paper discusses a extensive modeling program that located areas of possible and likely spread for the Nile tilapia.

General information

CONABIO. 2008. Sistema de informaci﹫n sobre especies invasoras en M﹫xico. Especies invasoras - Peces. Comisi﹫n Nacional para el Conocimiento y Uso de la Biodiversidad. Fecha de acceso.
Summary: English:
The species list sheet for the Mexican information system on invasive species currently provides information related to Scientific names, family, group and common names, as well as habitat, status of invasion in Mexico, pathways of introduction and links to other specialised websites. Some of the higher risk species already have a direct link to the alert page. It is important to notice that these lists are constantly being updated, please refer to the main page (http://www.conabio.gob.mx/invasoras/index.php/Portada), under the section Novedades for information on updates.
Invasive species - fish is available from: http://www.conabio.gob.mx/invasoras/index.php/Especies_invasoras_-_Peces [Accessed 30 July 2008]
Spanish:
La lista de especies del Sistema de informaci﹫n sobre especies invasoras de m﹫xico cuenta actualmente con informaci﹫n aceca de nombre cient﹫fico, familia, grupo y nombre com﹫n, as﹫ como h﹫bitat, estado de la invasi﹫n en M﹫xico, rutas de introducci﹫n y ligas a otros sitios especializados. Algunas de las especies de mayor riesgo ya tienen una liga directa a la p﹫gina de alertas. Es importante resaltar que estas listas se encuentran en constante proceso de actualizaci﹫n, por favor consulte la portada (http://www.conabio.gob.mx/invasoras/index.php/Portada), en la secci﹫n novedades, para conocer los cambios.
Especies invasoras - Peces is available from: http://www.conabio.gob.mx/invasoras/index.php/Especies_invasoras_-_Peces [Accessed 30 July 2008]
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Summary: This article analyzes the relationship and results of the introduction of *O. niloticus* to resivoir communities in Brazil. The authors discuss eutrophication and other alterations to the water column.
International Center for Living Aquatic Resources Management (ICLARM). 2007. *Oreochromis niloticus.*
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