

Oreochromis 正體中文

System: Freshwater

Kingdom	Phylum	Class	Order	Family
Animalia	Chordata	Actinopterygii	Perciformes	Cichlidae

Common name St. Peters fish (English), mojara (English), freshwater snapper (English), tilapia (English), boulti (English), pla nil (English), ngege (English)

Synonym

Similar species *Oreochromis*

Summary Tilapia (*Oreochromis* spp.) is the common name applied to three genera of fish in the family Cichlidae: *Oreochromis*, *Sarotherodon* and *Tilapia*. These include over 70 species of fish, at least eight of which are used for aquaculture. Tilapia belong to a family of fish known as cichlids, among which most African members are mouthbrooders. The cage culturing of tilapia results in a reduction of water quality in the surrounding environment, which is particularly worrying when close to ecologically important areas. The unavoidable escape and establishment of wild tilapia from cages has sometimes resulted in other serious problems, such as the decline of culturally valued native fish species, particularly cichlids, and the alteration of natural benthic communities.



[view this species on IUCN Red List](#)

Notes

As males grow faster and are more uniform in size than the females manual sexing techniques and reverse sex hormones have been used for tilapia farming. Hybridisation between certain *Oreochromis* species has also been used to create male-only offspring generations (Lazard 1996, in Gupta and Acosta 2004).

Lifecycle Stages

Members of *Oreochromis* spp. commonly exhibit the following sequence of reproductive events (Riedel 1965, Fryer and Iles 1972, in Ven den Berghe Undated). The male will dig a “nest” or “display site” in which to court females. These are constructed in sandy or muddy ground, are up to 15cm deep and 100cm wide, and are subject to aggressive defence (McCrary *et al.* 2001, in Ven den Berghe Undated). The entire bottom of a water body can become covered with these craters, which may become so densely packed that they resemble cells on a bee hive (Mc Kaye *et al.* 1995, in Ven den Berghe Undated). The male fertilises the eggs that have been laid by the courted female. The female will then incubate the eggs directly inside her mouth for three to five days. Larvae will hatch and will be retained in her mouth for a further two weeks. The female will guard her free-swimming young, which hide in her mouth when danger threatens.

Uses

Today tilapia (*Oreochromis* spp.) makes up about 3.5% of the total amount of global aquaculture production. Nile tilapia (*Oreochromis niloticus*) is the most predominant species of tilapia cultured, but at least seven other and a number of hybrids are also commonly farmed (Gupta and Acosta 2004). Tilapia are well adapted to artificial culture environments, gain weight quickly at optimum conditions and reproduce on the farm without special management or infrastructure (Meyer 2002). About 85 countries farm tilapia on some scale including China (an aquaculture giant responsible for half the total production of tilapia) and many South East Asian countries. A huge 98% of these tilapia farms occur outside the fish's native habitat (FOA 2002, Shelton 2002, in Gupta and Acosta 2004). Tilapia is generally produced in relatively low-input farms for both domestic markets and exportation. Earthen ponds and cage culture in open water bodies are the most common culture systems. Development of the tilapia trade and marketing coupled with the development of the aquaculture industry is becoming more intensive as the fisheries industry comes to rely more and more on fish harvested from farms rather than sea-caught fish. For example, the Genetically Improved Tilapia programme (based on selective breeding) produced a strain of *O. niloticus* with growth rate increased by 85% (Ek Nath and Acosta 1998, in Gupta and Acosta 2004). Hybrids of tilapia have also been used to create increasingly adaptable and hardy fish (commonly referred to as red or golden tilapia). Concerns have been raised about the environmental risk of introductions of ever-improved strains and hybrids of tilapia environmental risk.

Habitat Description

Tilapia (*Oreochromis* spp.) exhibit maximum growth rates at temperatures between 25 and 30°C (Meyer 2002), making them more likely to become established and invasive in tropical climates. However, both tolerance to water temperature and to salinity varies greatly between species. Nile tilapia (*O. niloticus*) are the least cold tolerant of the farmed tilapia and prefer tropical to subtropical climates. Blue tilapia (*O. aureus*) is able to tolerate temperatures as low as 8-9°C, making it more likely to establish in countries with pronounced seasonal temperature variations (Gupta and Acosta 2004).

Tilapia usually inhabit freshwater habitats, but some species and hybrids are known to be highly euryhaline (capable of tolerating a wide range of salt water concentrations). Blue tilapia, redbelly tilapia (*Tilapia zillii*) and a red tilapia hybrid (*O. mossambicus* and *O. hornorum*) are extremely tolerant of saline waters and used in seawater aquaculture. Saline tolerance is also evident in other red tilapia hybrids, gallilee tilapia (*Sarotherodon galilaeus*), black-chinned tilapia (*S. melanotheron*) and Mozambique tilapia (*O. mossambicus*) and Zanzibar tilapia (*O. hornorum*) (Gupta and Acosta 2004).

Reproduction

Nile tilapia (*Oreochromis niloticus*) and blue tilapia (*O. aureus*) reach sexual maturity at about 5 to 6 months. Mozambique tilapia (*O. mossambicus*) exhibits early reproduction with sexual maturity occurring at 8-9cm (Gupta and Acosta 2004).

Female tilapia may reproduce once every two months under optimal conditions, with *O. mossambicus*, for example, laying 300 to 500 eggs each time (equivalent to a maximum of 3600 eggs per year) (Riedel 1965, in Ven den Berghe Undated).

Nutrition

The feeding habits of tilapia (*Oreochromis* spp.) are very broad, considering they feed on benthic algae, phytoplankton, macrophytes, zooplankton, fish eggs, fish larvae, and detritus (Alceste and Jory 2000). At least one species, Mozambique tilapia (*O. mossambicus*), has been observed to prefer feeding on macrophytes (aquatic plants), switching to an omnivorous diet only when such sources are depleted or absent (Riedel 1965, in Ven den Berghe Undated). It has been noted that several species of tilapia are stimulated to include fish fry in their diet under oligotrophic low-nutrient conditions (Riedel 1965, De Moor *et al.* 1986, Popma and Green 1990, in Ven den Berghe Undated).

General Impacts

Please follow this link for a description of the impacts of this species '[general impacts](#)' compiled by the ISSG.

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)).

Please follow this link for details on control of this species '[management information](#)' compiled by the ISSG.

Pathway

Intentional unofficial release of fish into new locations or environments: In Mexico it is suspected that the intentional release of tilapia (*Oreochromis* spp.) into water bodies is responsible for its detection in lakes that it has never been previously officially farmed (and that are not connected to water bodies where tilapia is farmed) (Schmitter-Soto and Caro 1997). Cage culture of tilapia (*Oreochromis* spp.) in natural open water bodies has promoted the worldwide proliferation of the fish and allowed for its introduction into new geographic regions, escape into the wild and establishment in native ecosystems.

Principal source:

Compiler: IUCN/SSC Invasive Species Specialist Group (ISSG)

Review:

Publication date: 2006-01-12

ALIEN RANGE

[1] BANGLADESH
[1] CAMBODIA
[1] COLOMBIA
[1] CUBA
[1] ETHIOPIA
[1] HONG KONG
[1] INDONESIA
[1] JAMAICA
[1] MALAYSIA
[1] MYANMAR
[2] NICARAGUA
[1] PHILIPPINES
[1] SRI LANKA
[1] THAILAND
[1] ZIMBABWE

[1] BRAZIL
[1] CHINA
[1] COSTA RICA
[2] ECUADOR
[1] HONDURAS
[1] INDIA
[1] ISRAEL
[1] LAKE VICTORIA
[1] MEXICO
[1] NEPAL
[1] PERU
[1] SINGAPORE
[1] TAIWAN
[1] VIET NAM

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Management information

[Alagarswami, K. 1995. Annex II-5: India. In: FAO/NACA. 1995. Regional Study and Workshop on the Environmental Assessment and Management of Aquaculture Development \(TCP/RAS/2253\). NACA Environment and Aquaculture Development Series No. 1. Network of Aquaculture Centres in Asia-Pacific: Bangkok.](#)

Summary: An overview of aquaculture development (including country-specific statistics and records) for South East Asia with emphasis on environmental issues.

<http://www.fao.org/docrep/field/003/AC279E/AC279E00.htm#TOC> [Accessed 10 June 2005]

[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. Sheloung, P.A. Williams & S.R. Halloy (1999).

The decision support tools are available from:

<http://cefes.defra.gov.uk/our-science/ecosystems-and-biodiversity/non-native-species/decision-support-tools.aspx> [Accessed 13 October 2011]

[The guidance document](#) is available from http://www.cefes.co.uk/media/118009/fisk_guide_v2.pdf [Accessed 13 January 2009].

[Chen, Y.C. 2001. Immobilized microalga *Scenedesmus quadricauda* \(Chlorophyta, Chlorococcales\) for long-term storage and for application for water quality control in fish culture \[Abstract\], *Aquaculture* 195 \(1/2\): 71-80.](#)

[Clearwater, Susan J.; Chris W. Hickey and Michael L. Martin. 2008. Overview of potential piscicides and molluscicides for controlling aquatic pest species in New Zealand. *Science for conservation* 283. March 2008, New Zealand Department of Conservation](#)

Summary: Available from: <http://www.doc.govt.nz/upload/documents/science-and-technical/sfc283entire.pdf> [Accessed 20 March 2008]

[Copp, G.H., Garthwaite, R. and Gozlan, R.E., 2005. Risk identification and assessment of non-native freshwater fishes: concepts and perspectives on protocols for the UK. *Sci. Ser. Tech Rep., Cefas Lowestoft*, 129: 32pp.](#)

Summary: The discussion paper 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.

Available from: <http://www.cefes.co.uk/publications/techrep/tech129.pdf> [Accessed 1 September 2005]

[De Silva, S.S; Subasinghe, R.P.; Bartley, D.M.; Lowther, A. 2004. Tilapias as alien aquatics in Asia and the Pacific: a review. *FAO Fisheries Technical Paper. No. 453. Rome, FAO. 2004. 65p.*](#)

Summary: This document reviews and analyses published literature, grey literature, and personal communications on the social, economic and environmental impacts of tilapias in the Asia and the Pacific.

Available from: <http://www.fao.org/docrep/007/y5728e/y5728e00.htm> [Accessed 3 March 2008]

[Fitzsimmons, K. 2002. Tilapia market in the Americas, 2001 and beyond \(CRSP Research Report 02-176\). CRSP \(Aquaculture Collaborative Research Support Program\). \[Abstract extract from original paper published in: D. Meyer \(Ed\). *Simposio Centroamericano de Acuicultura Proceedings: Tilapia Sessions, 22-24 August 2001. Tegucigalpa, Honduras, pp. 72-81*\].](#)

Summary: The CRSP Research Reports provide relevant research abstracts about tilapia farming technologies and the development of tilapia aquaculture industry from practical and marketing perspectives.

Available from: <http://pdacrsp.oregonstate.edu/pubs/nops/noporderpage.html> [Accessed 9 June 2005]

[Gebre-Mariam, Z. 1998. Human Interactions and Water Quality in the Horn of Africa, *Science in Africa: Emerging Water Management Issues. \(Symposium Proceedings\)*. 1998. AAAS \(American Association for the Advancement of Science\): Philadelphia.](#)

Summary: Available from: <http://www.aaas.org/international/africa/ewmi/zinabu.htm> [Accessed June 10 2005]

[Gupta, M.V. and Acosta, B.O. 2004. A Review of Global Tilapia Farming Practices, *Aquaculture Asia Magazine IX \(1\)*.](#)

Summary: An overview of the types of farming methods used to farm tilapia and some good general information.

Available from: <http://www.enaca.org/modules/news/article.php?storyid=453> [Accessed 8 June 2005]

[Heping, A. 1995. Annex II-3: People's Republic of China. In: FAO/NACA. 1995. Regional Study and Workshop on the Environmental Assessment and Management of Aquaculture Development \(TCP/RAS/2253\). NACA Environment and Aquaculture Development Series No. 1. Network of Aquaculture Centres in Asia-Pacific: Bangkok.](#)

Summary: An overview of aquaculture development (including country-specific statistics and records) for South East Asia with emphasis on environmental issues.

Available from: <http://www.fao.org/docrep/field/003/AC279E/AC279E00.htm#TOC> [Accessed 10 June 2005]

[Hewitt, C.L, Campbell, M.L. and Gollasch, S. 2006. Alien Species in Aquaculture. Considerations for responsible use. *IUCN, Gland, Switzerland and Cambridge, UK. viii + 32 pp.*](#)

Summary: This publication 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 (New Zealand, Australia and Chile).

Available from: <http://data.iucn.org/dbtw-wpd/edocs/2006-036.pdf> [Accessed 22 September 2008]

[Holm, T., pers. comm., 2004. Forest Management Coordinator, Forestry Unit, Bureau of Agriculture, P.O. Box 460, Koror, Palau 96940](#)



GLOBAL INVASIVE SPECIES DATABASE

FULL ACCOUNT FOR: *Oreochromis*

[Jayasinghe, J.M.P.K. 1995. Annex II-15: Sri Lanka. In: FAO/NACA. 1995. Regional Study and Workshop on the Environmental Assessment and Management of Aquaculture Development \(TCP/RAS/2253\). NACA Environment and Aquaculture Development Series No. 1. Network of Aquaculture Centres in Asia-Pacific: Bangkok.](#)

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[Kwei Lin, C., Shrestha, M.K., Yi, Y. and Diana, J.S. 2001. Management to minimize the environmental impacts of pond effluent: Harvest draining techniques and effluent quality, Aquacultural Engineering 25 \(2\): 125-135.](#)

[Lopez, N.A. 1995. Annex II-14: Philippines. In: FAO/NACA. 1995. Regional Study and Workshop on the Environmental Assessment and Management of Aquaculture Development \(TCP/RAS/2253\). NACA Environment and Aquaculture Development Series No. 1. Network of Aquaculture Centres in Asia-Pacific: Bangkok.](#)

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<http://www.fao.org/docrep/field/003/AC279E/AC279E00.htm#TOC> [Accessed 10 June 2005]

[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. Trilateral Risk Assessment Guidelines for Aquatic Alien Invasive Species. Commission for Environmental Cooperation. 393, rue St-Jacques Ouest, Bureau 200, Montréal \(Québec\), 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 trilateral environmental cooperation. The NAAEC highlighted biodiversity as a key area for trilateral 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.

Available from: English version: http://www.cec.org/Storage/62/5516_07-64-CEC%20invasives%20risk%20guidelines-full-report_en.pdf [Accessed 15 June 2010]

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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[Phillips, M. and Budhiman, A. 2005. An assessment of the impacts of the 26th December 2004 earthquake and tsunami on aquaculture in the Provinces of Aceh and North Sumatra, Indonesia. FOA \(Food and Agriculture Organization of the United Nations\).](#)

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GLOBAL INVASIVE SPECIES DATABASE

FULL ACCOUNT FOR: *Oreochromis*

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Brown, C.M. 1995. *Tilapia Farming and Trade (Case Number 208: Tilapia and the Environment)*, TED Case Studies 4 (2).

Summary: The Trade Environment Database (part of the Mandala Projects which may be accessed from: <http://www.american.edu/TED/>) has a searchable database of case studies, among other things, which are very informative and well-rounded and provide an easily readable overview of some pressing environmental issues linked to trade.

Available from: <http://www.american.edu/TED/ted.htm> [Accessed June 10 2005]

CONABIO. 2008. *Sistema de información sobre especies invasoras en México. Especies invasoras - Peces. Comisión 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 información sobre especies invasoras de México cuenta actualmente con información acerca de nombre científico, familia, grupo y nombre común, así como el hábitat, estado de la invasión en México, rutas de introducción y ligas a otros sitios especializados. Algunas de las especies de mayor riesgo ya tienen una liga directa a la página de alertas. Es importante resaltar que estas listas se encuentran en constante proceso de actualización, por favor consulte la portada (<http://www.conabio.gob.mx/invasoras/index.php/Portada>), en la sección 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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Flores, N.O. and Engle, C.R. 2002. *Markets for tilapia (Oreochromis sp.) in Nicaragua: a descriptive analysis of restaurants, supermarkets and stands in open markets (CRSP Research Report 02-178)*. CRSP (Aquaculture Collaborative Research Support Program). [Abstract from original paper published in: D. Meyer (Ed). *Simposio Centroamericano de Acuicultura Proceedings: Tilapia Sessions, 22-24 August 2001. Tegucigalpa, Honduras, pp. 87-91*].

Summary: The CRSP Research Reports provide relevant research abstracts about tilapia farming technologies and the development of tilapia aquaculture industry from practical and marketing perspectives.

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Gutierrez, A.T. and Reaser, J.K. 2005. Linkages Between Development Assistance and Invasive Alien Species in Freshwater Systems in Southeast Asia. USAID: Washington.

Summary: Overview of some tilapia farming issues and recent technologies and several case studies about the impact of tilapia.

Horzhiak, J. Undated. CAFTA (Central American Free Trade Agreement) Interim Environmental Review - Lake Nicaragua (letter to the Review Board)

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Summary: The CRSP Research Reports provide relevant research abstracts about tilapia farming technologies and the development of tilapia aquaculture industry from practical and marketing perspectives.



GLOBAL INVASIVE SPECIES DATABASE

FULL ACCOUNT FOR: *Oreochromis*

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Summary: The CRSP Research Reports provide relevant research abstracts about tilapia farming technologies and the development of tilapia aquaculture industry from practical and marketing perspectives.

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