**Oncorhynchus mykiss**

**System:** Freshwater

<table>
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<th>Kingdom</th>
<th>Phylum</th>
<th>Class</th>
<th>Order</th>
<th>Family</th>
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<tr>
<td>Animalia</td>
<td>Chordata</td>
<td>Actinopterygii</td>
<td>Salmoniformes</td>
<td>Salmonidae</td>
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</table>

**Common name**

Regenbogenforelle (German), Kamchatka steelhead (English, Russian Federation), trucha arco iris (English, Dominican Republic), Truta (Portuguese), steelhead trout (English), Hardhead (English, United States), Coast range trout (English, United States), redband trout (English), Forelle (German), truite arc-en-ciel (French), Regnbogasilungur (Icelandic), Forel rajdushna (Ukrainian), Dagova pastarva (Bulgarian), K’wsech (Salish, British Columbia, Canada), Kamchatka trout (English, Russian Federation), Kirjolohi (Finnish, Finland), Kamloops trout (English, Canada), Kamloops (English, United States), Nijimasu (Japanese), Masu (Japanese, Japan), Rainbow trout (English), Lord-fish (English, Newfoundland, Canada), Pastrva (Serbian, Yugoslavia), Pestropha (Greek), Orret (Norwegian), Rainbow trout (English, Alaska, United States), Summer salmon (English, United Kingdom), Regenoogforel (Dutch), Regenbogenforelle (German, Germany), Redband (English, United States), Steelhead (English, United States), Pstruh duhový (Czech), Regnbåge (Swedish), Regnbågs lax (Swedish), Stahlkopfforelle (German), Alabalik (Turkish), Silver trout (English), Salmon trout (English, United States), Coast rainbow trout (English, Canada), Trucha arco iris (Spanish), Coast angel trout (English), Steelhead trout (English), Brown trout (English, Nepal), Aure (Norwegian), Regnbueørret (Norwegian), Stålhovedørr (Danish), Salmones del Pacífico (Spanish), Baiser (English, Newfoundland, Canada), Baja California rainbow trout (English, Mexico), Troaty ylberi (Albanian), Amerikaniki Pestrofa (Greek), Sxew’kem (Salish, British Columbia, Canada), Troaty ylberi (Albanian), Truta-arco-iris (Portuguese), Trucha (Spanish), Trota (Italian), Trota iridea (Italian), Trucha arcoiris (Spanish, Mexico), Úrriöi (Icelandic), Alabalik türü (Turkish), Pstrag teczowy (Polish, Poland), Pstruh dúhový (Slovak), Regnbueørr (Danish)
Synonym

Salmo mykiss, (Walbaum, 1792)
Fario gairdneri, (Richardson, 1836)
Onchorrhychus mykiss, (Walbaum, 1792)
Oncorhynchus kamloops, (Jordan, 1892)
Oncorhynchus mykiss nelsoni, (Evermann, 1908)
Parasalmo mykiss, (Walbaum, 1792)
Salmo gairdneri irideus, (Gibbons, 1855)
Salmo gairdneri shasta, (Jordan, 1894)
Salmo gairdneri, (Richardson, 1836)
Salmo gairdnerii gairdnerii, (Richardson, 1836)
Salmo gairdnerii irideus, (Gibbons, 1855)
Salmo gairdnerii, (Richardson, 1836)
Salmo gilberti, (Jordan, 1894)
Salmo iridea, (Gibbons, 1855)
Salmo irideus argentatus, (Bajkov, 1927)
Salmo irideus, (Gibbons, 1855)
Salmo kamloops whitehousei, (Dymond, 1931)
Salmo kamloops, (Jordan, 1892)
Salmo masoni, (Suckley, 1860)
Salmo nelsoni, (Evermann, 1908)
Salmo purpuratus, (Pallas, 1814)
Salmo rivularis kamloops, (Jordan, 1892)
Salmo rivularis, (Ayres, 1855)
Salmo stellatus, (Girard, 1856)
Salmo truncatus, (Suckley, 1859)
Salmo mykiss, (Walbaum, 1792)

Similar species

Salmo trutta

Summary

Oncorhynchus mykiss (rainbow trout) are one of the most widely introduced fish species in the world. Native to western North America, from Alaska to the Baja Peninsula, Oncorhynchus mykiss have been introduced to numerous countries for sport and commercial aquaculture. Oncorhynchus mykiss is highly valued as a sportfish, with regular stocking occurring in many locations where wild populations cannot support the pressure from anglers. Concerns have been raised about the effects of introduced trout in some areas, as they may affect native fish and invertebrates through predation and competition.
Species Description
Rainbow trout are a deep-bodied, compressed species of fish, with extremely large sea-run individuals growing to 1220mm and 16.3kg. The general body shape is typical for a trout, with a moderately large head and a mouth that extends back behind the eyes. Rainbow trout have highly variable colouration. Rainbow trout that live in lakes have a very silvery appearance, usually with a dark olive-green colour on the back. Occasionally the back is a deep steely blue, mostly in Rainbow trout that live well offshore in deep lakes or in small fish that have not yet spawned. Numerous spots are present on the back and extend about two-thirds of the way to the lateral line down the sides. The sides are silvery and largely free of spots, while the belly and ventral surface of the head are whitish. Eyes are an olive to bronze colour. Sometimes a soft, metallic-pink colour is present along the sides of the body and the head.

When rainbow trout leave lakes to spawn, their colours become more intense. The pinkish stripe that is present on the sides of lake fish becomes a rich crimson colour, the fins become a stronger red colour, and there is sometimes a red slash in the folds below the lower jaw. The belly and the lower sides turn a smoky grey and spots on the sides and upper fins become bolder and more clearly delineated. Rainbow trout parr (juveniles) have an olive-green colour on the back and silvery olive high on the sides. There are 8-13 oval-shaped marks along the sides, which may also have smaller dark spots along them. Rosy-yellow markings occur along the lateral lines between the oval marks. As the parr grows, adult colouration is attained (McDowall, 1990)

Lifecycle Stages
Lake fish usually spawn in lake tributaries, where the young trout feed and grow before migrating downstream after about a year. Growing to maturity in the lake takes around 2 to 4 years, at which time they migrate back to the tributaries to spawn. Most fish will return to the tributary in which they hatched (McDowall, 1990). Some lake populations may spawn in lake-shore gravels rather than travel into tributaries (ibid)

Uses
Rainbow trout are highly valued as both a sport and table fish. They are the basis of many sport fisheries and are highly sought-after by anglers. In many locations rainbow trout are raised in hatcheries, then liberated into rivers and streams for recreational anglers to catch. They have also been introduced to many countries as an aquaculture species for commercial purposes (FishBase, 2003).

Habitat Description
Rainbow trout are primarily a freshwater fish, although sea-run populations, often known as steelhead, exist in some areas. It is unclear whether this migration to sea water is genetic or simply opportunistic, but it appears that any population of rainbow trout is capable of migrating to or surviving in the sea if the need arises (FishBase, 2003)

Well-oxygenated, clean fresh water, with a temperature of around 12°C is preferred, although a range from 10°C to 24°C is tolerated (FishBase, 2003). Rainbow trout tend to thrive better in lakes than in streams or rivers, although large fish are often present in remote headwaters (McDowall, 1990).
Reproduction
Sexual. Fertilisation is external, with the female trout excavating a hollow in streambed gravel for
the eggs to be laid in. Between 700 and 4000 orange-red eggs are laid per spawning event. The
male then fertilises the eggs and they are covered with a layer of gravel. This ‘nest’ is known as a
redd (McDowall, 1990; FishBase, 2003).

Nutrition
Adult rainbow trout eat insects (both aquatic and terrestrial), crustaceans, molluscs, fish eggs, and
small fish. Young trout feed predominantly on zooplankton (Cadwallader & Backhouse, 1983 in
Fishbase, 2003).

General Impacts
Impacts include hybridisation, disease transmission, predation and competition with native
species.
In the United States, the introduction of rainbow trout into areas outside of their native range has
caused problems due to their ability to hybridise with native salmonid species, affecting their
 genetic integrity. Some species, such as the Alvord cutthroat (Oncorhynchus clarki subsp1.) have
become virtually extinct because of this. Other species known to be affected by hybridisation
include the Lahontan cutthroat trout (O. clarki henshawi); golden trout (O. aquabonita); redband
tROUT (O. mykiss subsp.); Gila trout (see O. gilae in IUCN Red List of Threatened Species) and
Arizona trout (see O. apache in IUCN Red List of Threatened Species) (Fuller, 2000).
Whirling disease is a condition caused by a protozoan (Myxobolus cerebralis) that causes
dysfunction in the nervous system of salmonids, and may result in curvature of the vertebral
column. This results in fish losing the ability to maintain a proper orientation, causing them to
swim in a spiral motion (McDowall, 1990). The stocking of hatchery-reared trout into the wild has
causFed outbreaks of this disease in the United States, threatening wild fish populations (Fuller,
2000).
In many countries introduced rainbow trout have been reported to have negative effects on native
fish, amphibians and invertebrates. In New Zealand it is suspected that rainbow trout affect native
fish species through direct predation and competition for feeding areas (McDowall, 1990), while in
the United States there is evidence that the same is happening to fish such as the humpback
chub (see Gila cypha in IUCN Red List of Threatened Species), suckers, and squawfish (Fuller,
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)).

Chemical: Antimycin, an antibiotic, is used to kill rainbow trout in the Great Smoky Mountains National Park in the US, in an effort to protect native brook trout (ESPN, 2003).

Pathway

Introduced to many locations as an aquaculture species. Introduced to many locations to ‘improve’ the native fish fauna for anglers.

Principal source:

Compiler: IUCN SSC Invasive Species Specialist Group
Updates with support from the Overseas Territories Environmental Programme (OTEP) project XOT603, a joint project with the Cayman Islands Government - Department of Environment

Review:

Publication date: 2010-10-04

ALIEN RANGE

[1] AFGHANISTAN
[1] ARGENTINA
[1] AUSTRIA
[1] BOLIVIA
[1] BRAZIL
[1] CAMEROON
[1] CHINA
[1] CONGO
[1] ALBANIA
[1] AUSTRALIA
[2] BELGIUM
[1] BOSNIA AND HERZEGOVINA
[1] BULGARIA
[1] CHILE
[1] COLOMBIA
[1] COSTA RICA
[1] CYPRUS
[1] DENMARK
[1] ECUADOR
[1] ETHIOPIA
[1] FRANCE
[1] FRENCH SOUTHERN TERRITORIES
[1] GREECE
[1] GUYANA
[1] HUNGARY
[1] INDIA
[1] IRAN, ISLAMIC REPUBLIC OF
[1] IRELAND
[1] ITALY
[1] JORDAN
[1] KOREA, REPUBLIC OF
[1] LESOTHO
[1] MADAGASCAR
[1] MALAYSIA
[1] MOROCCO
[1] NETHERLANDS
[1] NEW GUINEA
[1] NORWAY
[1] PANAMA
[1] PERU
[1] PORTUGAL
[1] REUNION
[1] SOUTH AFRICA
[1] SRI LANKA
[1] SWAZILAND
[1] SWITZERLAND
[1] TAIWAN
[1] THAILAND
[1] UGANDA
[45] UNITED STATES
[1] VENEZUELA
[1] ZIMBABWE

Red List assessed species 33: EX = 1; CR = 8; EN = 8; VU = 9; NT = 2; DD = 1; LC = 4;

Amphilius natalensis LC
Anaxyrus canorus EN
Barbus erubescens CR
Chlorolestes apricans EN
Ecchlorolestes peringueyi VU
Lepidomeda vittata VU
Metacbemis angusta VU
Orestias ctenolepis VU
Orestias pentlandii VU

Amphilius uranoscopus LC
Barbus calidus VU
Chiloglanis bifurcus EN
Diplomystes chilensis DD
Kneria auriculata LC
Litoria spenceri CR
Metacbemis valida EN
Orestias olivaceus VU
Orestias silustani VU
BIBLIOGRAPHY
24 references found for Oncorhynchus mykiss

Management information
Alien Species in Poland 2006 Oncorhynchus mykiss
Centre for Environment, Fisheries & Aquaculture Science (CEFAS)., 2008. Decision support tools-Identifying potentially
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,
The decision support tools are available from:
[Accessed 13 October 2011]
The guidance document is available from http://www.cefas.co.uk/media/118009/fisk_guide_v2.pdf [Accessed 13 January
2009].
2005]
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.
March 2008]
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.cefas.co.uk/publications/techrep/tech129.pdf [Accessed 1 September 2005]
Cossios E. Daniel, 2010. Vertebrados naturalizados en el Per?: historia y estado del conocimiento (Naturalised
Summary: Available from: http://sisbib.unmsm.edu.pe/BVrevistas/biologia/v17n2/pdf/a07v17n2.pdf [Accessed 23
February 2011]
ESPN. 2003. ESPN Outdoors.
Summary: A news article on the planned extermination of rainbow trout from a stream in Great Smoky Mountains National
Park in the US.
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).


Summary: This compilation of information sources can be sorted on keywords for example: Baits & Lures, Non Target Species, Eradication, Monitoring, Risk Assessment, Weeds, Herbicides etc. This compilation is at present in Excel format, this will be web-enabled as a searchable database shortly. This version of the database has been developed by the IUCN SSC ISSG as part of an Overseas Territories Environmental Programme funded project XOT603 in partnership with the Cayman Islands Government - Department of Environment. The compilation is a work under progress, the ISSG will maintain and enhance the database with current and newly published information, reports, journal articles etc.


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.


General information

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.


Spanish: La lista de especies del Sistema de informaci?n sobre especies invasoras en M?xico cuenta actualmente con informaci?n acerca 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 de novedades, para conocer los cambios.


Summary: FishBase is a global information system with all you ever wanted to know about fishes. FishBase on the web contains practically all fish species known to science. FishBase was developed at the WorldFish Center in collaboration with the Food and Agriculture Organization of the United Nations (FAO) and many other partners, and with support from the European Commission (EC). Since 2001 FishBase is supported by a consortium of seven research institutions. You can search on Search FishBase.

This species profile is available from: http://www.fishbase.org/Summary/SpeciesSummary.cfm?id=239&genusname=Oncorhynchus&speciesname=mykiss [Accessed 21 March, 2005]

Freshwater Biodata Information System New Zealand (FBIS), 2005

Summary: The Freshwater Biodata Information System (FBIS) contains fish, algae, aquatic plant and invertebrate data and metadata gathered from New Zealand's freshwater streams, rivers and lakes. FBIS provides different ways to search for biodata: choose a predefined search from a list of common searches; use the map view to draw a box on a map and search for biodata; or create your own search for maximum search flexibility. FBIS is offered as a nationally available resource for the New Zealand public, institutions and companies who need access to a well-maintained long-term data repository.


Summary: Contains useful information on the distribution and effects of rainbow trout within the United States.


ITIS (Integrated Taxonomic Information System). 2005. Online Database Oncorhynchus mykiss

Summary: An online database that provides taxonomic information, common names, synonyms and geographical jurisdiction of a species. In addition links are provided to retrieve biological records and collection information from the Global Biodiversity Information Facility (GBIF) Data Portal and bioscience articles from BioOne journals.


Summary: Cet article propose un bilan complet et actualisé des introductions d'espèces de poissons et de crustacés dans les eaux douces de Nouvelle-Calédonie.


Summary: Synthèse des introductions d'espèces de vertébrés en Nouvelle-Calédonie et évaluation de leurs impacts.