

Salmo salar  正體中文

System: Marine

Kingdom	Phylum	Class	Order	Family
Animalia	Chordata	Actinopterygii	Salmoniformes	Salmonidae

Common name

caplin-scul salmon (English), parr (English), hengst (Dutch), Atlanterhavslaks (Danish), outside salmon (English), lax (Icelandic), silver salmon (English), losos (Russian), schaanexw (Salish), Amerikanskiy atlanticheskii losos' (Russian), slhop' schaanexw (Salish), spring salmon (English), laks (Danish), sãlmao-do-atlântico (Portuguese), skællaks (Danish), solomós (Greek), Atlantisk laks (Danish), las (German), nedfaldslaks (Danish), k'wolexw (Salish), semga (Russian), k'wit'thet (Salish), fiddler (English), Jacobzalm (Dutch), echter lachs (German), sk'wel'eng's schaanexw (Salish), common atlantic salmon (English), zalm (Dutch), breeder (English), grayling (English), ouinanish (English), grilse (English), tacon atlantique (French), lije zalm (Dutch), Atlantischer salmon (German), spring fish (English), sebago salmon (English), shamet skelex (Salish), sea salmon (English), grilt (English), saumon d'eau douce (French), ouananiche (English), salmó (Catalan), kelt (English), shmexwalsh (Salish), landlocked salmon (English), N. Atlantic salmon (English), losos atlantsky (Czech), slink (English), smolt (English), losos szlachetny a. atlantycki (Polish), salmon (English), saumon atlantique (French), lohi (Finnish), kutenut lohi (Finnish), sináech (Salish), hoplax (Icelandic), spak'ws schaanexw (Salish), lax (Swedish), kapisilik (English), winnish (English), salmon peel (English), st'thkway' (Salish), losos (Serbian), Atlantic salmon (English), kapisalirksoak (English), salmón del atlántico (Spanish), salmón (Spanish), salmão (Portuguese), black salmon (English), bradan (English), vraklax (Swedish), alabalik atlantik (Turkish), lachs (German), Atlantic salmon (English), salmling (German), saama (English), lax (Norwegian), laks (Norwegian), laks atlantisk (Norwegian), salmo (Italian), sake masu-rui (Japanese), salmone del reno (Italian), salmone (Italian), salmone atlantico (Italian), losos (Polish), kumaliq (English), keblerikorsoak (English), salmao (Portuguese), solomos (Greek), unaniche (English), somon de atlantic (English), braddan (English), saamarug (English), saamakutaak (English), sãma (English), gullspångslax (Swedish), losos obecny (Czech), salmão-do-atlântico (Portuguese)

Synonym

Trutta salar , (Linnaeus, 1758)
Salmo salar , Linnaeus, 1758
Salmo nobilis , Olafsen, 1772
Salmo goedenii , Bloch, 1784
Salmo salmulus , Walbaum, 1792
Salmo caerulescens , Schmidt, 1795
Salmo nobilis , Pallas, 1814
Salmo hamatus , Cuvier, 1829
Salmo ocla , Nilsson, 1832
Salmo salmo , Valenciennes, 1848
Salmo salar , lacustris Hardin, 1862
Trutta relictus , Malmgren, 1863
Salmo gracilis , Couch, 1865
Salmo brevipes , Smitt, 1882
Salmo renatus , Lacepède, 1803
Salmo rilla , Lacepède, 1803
Salmo salar brevipes , Smitt, 1882
Salmo salar biennis , Berg, 1912
Salmo salar brevipes relictus , Berg, 1932
Salmo salar saimensis , Seppovaara, 1962
Salmo salar europaeus , Payne, Child & Forrest, 1971
Salmo hardinii , Günther, 1866

Similar species

Summary

Salmo salar ranks among the most popularly cultivated fish in the world. Commercial stocks have inflicted significant impacts of wild populations of wild salmon and other fish by way of competition, hybridization, and spread of disease. Great care should be taken to protect these wild fish populations while cultivating *S. salar*.



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

Notes

The ecological impacts of *Salmo salar* stem from cultivated populations which exert negative impacts on wild *S. salar* and other fish populations within native and introduced ranges. These farmed populations may be considered invasive even in native locations as it affects the long-term survival or genetic variation of native species, or the integrity or sustainability of natural communities (Chadderton, 2001).

Lifecycle Stages

The Alaskan Department of Fish and Game (2002) reports that, "*Salmo salar* spawn in medium to large rivers from fall through spring. Juveniles can spend up to three years in streams and rivers before they migrate to the sea where they then spend up to three more years before returning to their birthplace to spawn and continue the cycle. Some *S. salar* may survive the spawning event (Pacific salmon do not) and return to the ocean to spawn again".

Uses

Salmo salar is an extremely important food fish with over 1,000,000 tons cultivated annually. *S. salar* comprises over 90% of farmed salmon and over 50% of total salmon harvested. It is also a highly desirable sport fish by anglers (FAO, 2009).

Habitat Description

Salmo salar is an anadromous species which inhabits the benthopelagic zone of freshwater watercourses and sea. Large, cool rivers with extensive, gravelly bottom headwaters are essential to early development. As they grow, older juveniles prefer deeper waters and faster currents. They spend 1-6 years in rivers before moving to sea in spring or summer when the sea surface temperature in coastal areas are above 8 °C. Although, some populations remain landlocked. While at sea, *S. salar* roam vast feeding ranges, preferring temperatures of 4-12 °C, for 1-5 years and grow quickly. They return to rivers in the autumn to spawn. Most were found to return to the same river in which they were spawned. *S. salar* may withstand depths of up to about 210 m and temperatures 0-28 °C for short periods of time (Renzi, 1999; Fiske, 2006; FishBase, 2009).

Reproduction

Renzi (1999) reports that, "*S. salar* spawn in late fall/early winter. As spawning time nears, males undergo conspicuous changes in head shape: the head elongates and a pronounced hook, or kype, develops on the tip of the lower jaw. The nesting site is chosen by the female, usually a gravel-bottom riffle above a pool. The female digs the nest, called the "redd," by flapping strongly with her caudal fin and peduncle while on her side; the redd is formed by her generated water currents. The female rests freely during redd preparation while the male continues to court her and drive away other males. When the redd is finished, the male aligns himself next to the female, the eggs and sperm are released, and the eggs are fertilized during the intermingling of the gametes. On average, a female deposits 700-800 eggs per pound of her body weight. The eggs are pale orange in colour, large and spherical, and somewhat adhesive for a short time. The female then covers the eggs with gravel, using the same method used to create the redd. The eggs are buried in gravel at a depth of about 12.7 to 25.4cm. The female rests after spawning and then repeats the operation, creating a new redd, depositing more eggs, and resting again until spawning is complete. The male continues to court and drive off intruders. Complete spawning by individuals may take a week or more, by which time the spawners are exhausted. Some Atlantic salmon die after spawning but many survive to spawn a second time; a very few salmon spawn three or more times. Spawning completed, the fish, now called "kelts," may drop downriver to a pool and rest for a few weeks, or they may return at once to the ocean. Some may also remain in the river over winter and return to sea in the spring."

Nutrition

Salmo salar spend up to 4 years in deep-sea feeding grounds feeding on pelagic species such as herring, sprat and squid (FAO, 2009).

General Impacts

The negative ecological impacts associated with *Salmo salar* seem to be limited only to domestic fish farm stocks. Sea cages used are prone to tearing from storms, human error, predators or other causes, resulting in the mass escape of fish annually. For example a single storm in Norway resulted in the release of 490,000 farmed Atlantic salmon whose total weight exceeded the wild salmon harvest there for a whole year. Domesticated farm stocks of *S. salar* that escape can wreak havoc on wild populations by spreading disease and parasites to, competing with, and hybridizing with native salmon and other fish. Fish farming also fouls sea waters with various toxicants associated with and produced by fish cultivation (Alaskan Department of Fish and Game, 2002; Thorstad *et al*, 2006; Volpe, undated; Hindar *et al*, 2006).

Crowding fish in net pens increases stress, which makes them more susceptible to disease. Therefore, when outbreaks do occur they tend to spread rapidly through the captive population. Diseases that occur in captive populations, such as furunculosis and sea lice *Lepeophtheirus salmonis* can spread to wild fish (Alaskan Department of Fish and Game, 2002; Amundrud & Murray, 2009; Naylor *et al*, 2005).

Escaped *S. salar* compete with wild populations and other native fishes for resources. Farmed salmon and hybrids (farm x wild) can be expected to interact and compete directly with wild fish for food, habitat, and territory. Farm juveniles are generally more aggressive and consume similar resources as wild fish. They grow faster than wild fish, which may give them a competitive advantage at some life stages (Thorstad *et al*, 2006). Farm-raised *S. salar* also hybridize with wild stocks and other fishes, thereby reducing the wild stock's ability to survive in the wild by changing the level of genetic variability and frequency and types of alleles in the gene pools. The extremely high abundance of escaped salmon can completely dominate wild populations, comprising up to 80% of all breeders in smaller wild populations. Such an influx in these genetically divergent farmed Atlantic salmon can have dire consequences to wild populations and their genetics (Thorstad *et al*, 2006; Hindar *et al*, 2006).

The net 'walls' of sea cages or net pens allow virtually complete interaction between the farm and the surrounding environment. Therefore, clean, oxygenated water is free to pass into the net pen while uneaten food pellets, feces, antibiotics and toxic anti-foulants flow out. The exchange of clean water into the farm and dispersal of industrial wastes away from the farm means that the industry benefits from a subsidy from nature (Volpe, undated).

The likelihood of *S. salar* establishing reproducing populations in introduced habitats is extremely low. Over 130 attempts to introduce Atlantic salmon across 32 states in the United States, over 60 attempts in British Columbia, Canada, several attempts in Tasmania, and numerous attempts in Chile have all failed (Thorstad *et al*, 2006).

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 impacts of farmed *Salmo salar* may be prevented by a number of strategies and technologies. Care should be taken in choosing farm sites as to prevent or reduce the spread of infectious diseases and parasites such as sea lice (*Lepeophtheirus salmonis*) to wild fish populations (Thorstad et al, 2006; Amundrud & Murray, 2009). Sterilization of farm stocks by high pressure induction of triploidy in newly fertilized eggs would reduce the effects of hybridization of escaped *S. salar* with wild populations and other fishes. It may also reduce the competitive effects of these escapees as well. This practice may reduce their survival and growth rate, increase the likelihood of deformities and susceptibility to disease, and induce negative market reactions. Culture of triploid *S. salar* was attempted and abandoned in Fundy, Canada due to high susceptibility to the infectious salmon anemia virus. However, promising studies on this method continue (Thorstad et al, 2006). Domestication of *S. salar* to the point that individuals can no longer breed or even survive in nature is another possible means of negating possible impacts of farmed stocks on wild populations. It would be a complicated and long term process to do so without compromising characteristics necessary for a quality yield (Thorstad et al, 2006).

Physical: The establishment of protected zones that prohibit the cultivation of *S. salar* is a means of retaining unaffected wild populations of Atlantic salmon. Norway, the top cultivator of *S. salar*, maintains 29 national salmon fjords and 52 national salmon rivers where new Atlantic salmon farming is prohibited. This protects 75% of wild salmon within the country. Large zones without existing salmon farms exhibited the intended effect, but existing farms were allowed to remain. Establishing these zones before salmon farms are begun is essential to the effectiveness of this method. Recapture of escaped farmed salmon has been deemed ineffective (Thorstad et al, 2006).

Pathway

The commercial culture of *S. salar* in sea-cages in Tasmania has recently become a major part of the aquaculture industry (Kailola et al. 1993). *S. salar* are also farmed commercially in fish farms in mainland south eastern Australia, primarily in New South Wales and Victoria (Cadwallader, 1996).

Principal source: Alaskan Department of Fish and Game, 2002. Atlantic Salmon: White Paper - March 5 2002. [Renzi, 1999. *Salmo salar* Atlantic salmon.](#)

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

Review: Version 1: Dr John Volpe, Adjunct. University of Alberta Faculty of Biological Sciences Canada \ Dr John Volpe, Adjunct. University of Alberta Faculty of Biological Sciences Canada

Publication date: 2006-04-11

ALIEN RANGE

[1] ARGENTINA

[7] AUSTRALIA

[7] CANADA

[1] CHINA

[1] FALKLAND ISLANDS (MALVINAS)

[1] GREECE

[1] KOREA, REPUBLIC OF

[1] SINGAPORE

[1] TURKEY

[1] ATLANTIC - WESTERN CENTRAL

[1] BRAZIL

[1] CHILE

[1] CYPRUS

[2] FRENCH SOUTHERN TERRITORIES

[1] ISRAEL

[2] NEW ZEALAND

[1] SOUTH AFRICA

[37] UNITED STATES

BIBLIOGRAPHY

67 references found for *Salmo salar*

Management information

Alaskan Department of Fish and Game. 2002. Atlantic Salmon: A White Paper - March 5, 2002.

Amundrud, T. L.; Murray, A. G., 2009. Modelling sea lice dispersion under varying environmental forcing in a Scottish sea loch. *Journal of Fish Diseases*. 32(1). JAN 2009. 27-44.

Cadwallader, P. L. 1996. Overview of the impacts of introduced salmonids on Australian native fauna. Australian Nature Conservation Agency.

[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).

The decision support tools are available from:

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

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

[Chadderton, W. Lindsay., 2001. Management of invasive freshwater fish: striking the right balance!](#)

Summary: Available from: <http://www.conservation.org.nz/upload/documents/science-and-technical/PF08chadderton1.pdf> [Accessed 10 April 2009]

[Champion, P. Clayton, J. and Rowe, D. 2002. Alien Invaders Lake Managers Handbook. Ministry for the Environment.](#)

Summary: Available from: <http://www.mfe.govt.nz/publications/water/lm-alien-invaders-jun02.pdf> [Accessed 3 February 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](#)

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.cefas.co.uk/publications/techrep/tech129.pdf> [Accessed 1 September 2005]

[Crossman, E. J. 1991. Introduced Freshwater Fishes: A Review of the North American Perspective With Emphasis on Canada. Can. J. Fish. Aquat. Sci., Vol. 48 \(Suppl. 1\), 1991.](#)

[Fiske, P. 2006. NOBANIS Invasive Alien Species Fact Sheet Salmo salar. From: Online Database of the North European and Baltic Network on Invasive Alien Species NOBANIS](#)

Summary: Available from: http://www.nobanis.org/files/factsheets/salmo_salar.pdf [Accessed 10 April 2009]

[Gajardo, G & L Laikre., 2003. Chilean aquaculture boom is based on exotic salmon resources: a conservation paradox. Conservation Biology 17: 1173-1174.](#)

[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]

Global Invasive Species Database (GISD) 2026. Species profile *Salmo salar*. Available from:

<https://www.iucngisd.org/gisd/species.php?sc=376> [Accessed 02 May 2026]



GLOBAL INVASIVE SPECIES DATABASE

FULL ACCOUNT FOR: *Salmo salar*

Institute of Freshwater Research. 2002. Performance and Ecological Impacts of Introduced and Escaped fish: Physiological and Behavioral Mechanisms. National Board Of Fisheries, Sweden. Goteborg Univeristy.

[Invasive Alien Species in Northern Ireland., 2008. *Salmo salar*, Farmed Atlantic salmon](#)

Summary: Available from: <http://www.habitas.org.uk/invasive/species.asp?Item=5006> [Accessed 10 April 2009]

[Iriarte, J.A., Lobos, G., & Jaksic, F.M. \(2005\). Invasive vertebrate species in Chile and their control and monitoring by governmental agencies. Revista Chilena de Historia Natural, 78, 143-151.](#)

[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, Montreal \(Quebec\), 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. 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].

Moffitt, C. M. 2003. The Implications of Aquaculture Production and Development on Sustainable Fisheries. U.S. Geological Survey, Idaho Cooperative Fish and Wildlife Research Unit, Department of Fish and Wildlife Resources, University of Idaho.

Naylor, Rosamond; Hindar, Kjetil; Fleming, Ian A.; Goldburg, Rebecca; Volpe, John; Whoriskey, Fred; Eagle, Josh; Kelso, Dennis; Mangel, Marc; Williams, Susan. 2005. Fugitive Salmon: Assessing the Risks of Escaped Fish from Net-Pen Aquaculture. Bioscience, May 2005, Vol. 55 Issue 5, p427-437, 11p, 1 chart, 1 graph; (AN 16978376)

Naylor, Rosamond L., Susan L. Williams, Donald R. Strong., 2001. Aquaculture--A Gateway for Exotic Species. Science 23 November 2001: Vol. 294. no. 5547, pp. 1655 - 1656 DOI: 10.1126/Science.1064875

Olaussen, Jon Olaf; Skonhoft, Anders., 2008. On The Economics of Biological Invasion: An Application to Recreational Fishing. Natural Resource Modeling. 21(4). WIN 2008. 625-653

Pedersen, S., G. Rasmussen & E. E. Nielssen, L. Karlsson & P. Nybergs., 2007. Straying of Atlantic salmon, *Salmo salar*, from delayed and coastal releases in the Baltic Sea, with special focus on the Swedish west coast. Fisheries Management and Ecology, 2007, 14, 21-32

[Schrader, Barbara and Paul Hennon., 2005. Assessment of Invasive Species in Alaska and its National Forests August 30, 2005](#)

Summary: Available from: http://www.uaf.edu/ces/aiswg/pdf-documents/R10_Inv_Spp_Assessmt.pdf [Accessed 10 April 2009]

[Stokes, K., O'Neill, K. & McDonald, R.A. 2006. Invasive species in Ireland. Report to Environment & Heritage Service and National Parks & Wildlife Service by Quercus, Queens University. Environment & Heritage Service, Belfast and National Parks & Wildlife Service, Dublin.](#)

Summary: Available from:

<http://www.invasivespeciesireland.com/files/public/General%20Information/Invasive%20Species%20in%20Ireland.pdf> [Accessed 10 April 2009]

[Vigliano, Pablo H. & Gustavo Darrigran., 2002. Argentina's Freshwater Systems, Aliens In Wonderland. Proceedings](#)

Summary: Available from: <http://filaman.uni-kiel.de/Country/CountryList.php?ID=236&GenusName=Salmo&SpeciesName=salar> [Accessed 10 April 2009]

Volpe, J. Undated. Super un-Natural Atlantic Salmon in BC Waters. The David Suzuki Foundation.

Cole, R. 2002. Impacts of marine farming on wild fish populations. Final Research Report for Ministry of Fisheries Research Project ENV2000/08 Objective One. National Institute of Water and Atmospheric Research.

General information

Carr, J. W., J. M. Anderson, F. G. Whoriskey and T. Dilworth., 1997. The occurrence and spawning of cultured Atlantic salmon (*Salmo salar*) in a Canadian river. ICES Journal of Marine Science: Journal du Conseil 1997 54(6):1064-1073; doi:10.1016/S1054-3139(97)80010-0

Dextrase, Alan J. & Nicholas E. Mandrak., 2006. Impacts of alien invasive species on freshwater fauna at risk in Canada. Biological Invasions (2006) 8: 13-24 Springer 2006 DOI 10.1007/s10530-005-0232-2

Dietrich, Jason P.; Bowlby, James N.; Morrison, Bruce J.; Jones, Nicholas E., 2008. The Impacts of Atlantic Salmon Stocking on Rainbow Trout in Barnum House Creek, Lake Ontario. Journal of Great Lakes Research. 34(3). SEP 2008. 495-505.

Duhamel, G., Gasco, N. et Davaine, P. 2005. Poissons des Iles Kerguelen et Crozet, guide régional de l'océan Austral. (Patrimoines naturels 63).

Elvira, B. 2001. Identification of non-native freshwater fishes established in Europe and assessment of their potential threats to the biological diversity. Convention on the conservation of European wildlife and natural habitats: T-PVS (2001) 6.

Fausch, Kurt D., Interspecific competition and juvenile Atlantic salmon (*Salmo salar*): on testing effects and evaluating the evidence across scales. Can. J. Fish. Aquat. Sci. 55(Suppl. 1): 218-231 (1998)

Global Invasive Species Database (GISD) 2026. Species profile *Salmo salar*. Available from:

<https://www.iucngisd.org/gisd/species.php?sc=376> [Accessed 02 May 2026]

[FishBase, 2005. *Salmo salar*. Froese, R. and D. Pauly. Editors.](#)

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/Nomenclature/SynonymsList.cfm?ID=236&GenusName=Salmo&SpeciesName=salar> [Accessed 4 April 2005]

[FishBase, 2009. *Salmo salar* Linnaeus, 1758 Atlantic salmon Common names](#)

Summary: Available from:

<http://filaman.uni-kiel.de/comnames/CommonNamesList.php?ID=236&GenusName=Salmo&SpeciesName=salar&StockCode=250> [Accessed 10 April 2009]

[FishBase, 2009. *Salmo salar* Linnaeus, 1758 Atlantic salmon Countries](#)

Summary: Available from: <http://filaman.uni-kiel.de/Country/CountryList.php?ID=236&GenusName=Salmo&SpeciesName=salar> [Accessed 10 April 2009]

[FishBase, 2009. *Salmo salar* Linnaeus, 1758 Atlantic salmon Species summary](#)

Summary: Available from: <http://filaman.uni-kiel.de/Summary/speciesSummary.php?ID=236&genusname=Salmo&speciesname=salar> [Accessed 10 April 2009]

[FishBase, 2009. *Salmo salar* Linnaeus, 1758 Atlantic salmon Synonyms](#)

Summary: Available from:

<http://filaman.uni-kiel.de/Nomenclature/SynonymsList.php?ID=236&SynCode=29501&GenusName=Salmo&SpeciesName=salar> [Accessed 10 April 2009]

[Frenot, Y., Chown, S.L., Whinam, J., Selkirk, P., Convey, P., Skotnicki, M., & Bergstrom, D. 2005. Biological invasions in the Antarctic: extent, impacts and implications. *Bio. Rev.* 80, 45-72.](#)

Summary: Article de synthèse sur les invasions biologiques (plantes, invertébrés et vertébrés) en antarctique.

Available from: <http://www.anta.canterbury.ac.nz/resources/non-native%20species%20in%20the%20antarctic/Talk%20%20Frenot.pdf> [Accessed 4 April 2008]

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.

Available from: <https://secure.niwa.co.nz/fbis/validate.do?search=common> [Accessed 5 August 2005]

[Global Biodiversity Information Facility \(GBIF\), 2010. *Salmo salar* Linnaeus, 1758](#)

Summary: Available from: <http://www.gbif.net/species/13544062/> [Accessed 15 June 2010]

Gozlan, Rodolphe Elie., 2008. Introduction of non-native freshwater fish: is it all bad? *Fish & Fisheries*, 2008, 9, 106-115

Gross, Mart R., 1998. One species with two biologies: Atlantic salmon (*Salmo salar*) in the wild and in aquaculture. *Can. J. Fish. Aquat. Sci.* Vol. 55(Suppl. 1), 1998

[Gross, R. Mart., 2001. Will Farmed Atlantic Salmon Invade The Ecological Niches of Wild Pacific Salmon. SFU Workshop 2001](#)

Summary: Available from: <http://labs.eeb.utoronto.ca/gross/SFUworkshop2001.pdf> [Accessed 10 April 2009]

Hickley, P., and S. Chare. 2004. Fisheries for non-native species in England and Wales: angling or the environment?. *Fisheries Management & Ecology* Volume 11 Issue 3-4 Page 203 - June 2004.

Hindar, Kjetil ; Ian A. Fleming, Philip McGinnity, and Ola Diserud., 2006. Genetic and ecological effects of salmon farming on wild salmon: modelling from experimental results. *ICES Journal of Marine Science*, 63: 1234e1247 (2006) doi:10.1016/j.icesjms.2006.04.025

[ITIS \(Integrated Taxonomic Information System\), 2005. Online Database *Salmo salar*.](#)

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.

Available from: http://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=161996 [Accessed 4 April 2005]

Josefsson, Melanie and Berta Andersson., 2001. The Environmental Consequences Species in the Swedish Lakes Mälaren, Hjälmaren, Vänern and Vättern. *Ambio* Vol. 30 No. 8, Dec. 2001

Klemetsen, A., P. A. Amundsen, J. B. Dempson, B. Jonsson, N. Jonsson, M. F. O'Connell, E. Mortensen., 2003. Atlantic salmon *Salmo salar* L., brown trout *Salmo trutta* L. and Arctic charr *Salvelinus alpinus* (L.): a review of aspects of their life histories. *Ecology of Freshwater Fish* Volume 12 Issue 1, Pages 1 - 59

Laikre, Linda., Anna Palme, Melanie Josefsson, Fred Utter and Nils Ryman., 2006. Release of Alien Populations in Sweden. *Ambio* Vol. 35, No. 5, August 2006

Lien, Marianne, E., 2005. `King of fish or `feral peril : Tasmanian Atlantic salmon and the politics of belonging. *Environment and Planning D: Society and Space* 2005, volume 23, pages 659 - 671

McGinnity, P., C. Stone, J. B. Taggart, D. Cooke, D. Cotter, R. Hynes, C. McCamley, T. Cross and A. Ferguson., 1997. Genetic impact of escaped farmed Atlantic salmon (*Salmo salar* L.) on native populations: use of DNA profiling to assess freshwater performance of wild, farmed, and hybrid progeny in a natural river environment. *ICES Journal of Marine Science: Journal du Conseil* 1997 54(6):998-1008; doi:10.1016/S1054-3139(97)80004-5

McGinnity, Philip., Paulo Prodohl, Andy Ferguson, Rosaleen Hynes, Niall O' Maoileidigh, Natalie Baker, Deirdre Cotter, Brendan O' Hea, Declan Cooke, Ger Rogan, John Taggart and Tom Cross., 2003. Fitness Reduction and Potential Extinction of Wild Populations of Atlantic Salmon, *Salmo salar*, as a Result of Interactions with Escaped Farm Salmon. *Proceedings: Biological Sciences*, Vol. 270, No. 1532 (Dec. 7, 2003), pp. 2443-2450

Morris, Matthew R. J.; Fraser, Dylan J.; Heggelin, Anthony J.; Whoriskey, Frederick G.; Carr, Jonathan W.; O Neil, Shane F.; Hutchings, Jeffrey A., 2008. Prevalence and recurrence of escaped farmed Atlantic salmon (*Salmo salar*) in eastern North American rivers. Canadian Journal of Fisheries & Aquatic Sciences. 65(12). DEC 2008. 2807-2826.

Perez, J. E., C. Alfonsi, M. Nirchio, C. Munoz, J. A. Gomez. 2003. The introduction of exotic species in aquaculture: A solution or part of the problem. Eassays. Apr 2003, Vol. 28 N^o 4

[Ray, Gary L. 2005a. Invasive Marine and Estuarine Animals of the Pacific Northwest and Alaska. Aquatic Nuisance Species Research Programme. ERDC/TN ANSRP-05-6 September 2005](#)

Summary: Available from: <http://el.erdc.usace.army.mil/ansrp/pdfs/ansrp05-6.pdf> [Accessed 10 April 2009]

[Ray, Gary L. 2005b. Invasive Marine and Estuarine Animals of the Gulf of Mexico. Aquatic Nuisance Species Research Programme. ERDC/TN ANSRP-05-4 September 2005](#)

Summary: Available from: <http://el.erdc.usace.army.mil/elpubs/pdf/ansrp05-4.pdf> [Accessed 10 April 2009]

[Ray, Gary L. 2005c. Invasive Estuarine and Marine Animals of the North Atlantic. Aquatic Nuisance Species Research Programme. ERDC/TN ANSRP-05-1 August 2005](#)

Summary: Available from: <http://el.erdc.usace.army.mil/ansrp/pdfs/ansrp05-1.pdf> [Accessed 10 April 2009]

[Ray, Gary L. 2005d. Invasive Marine and Estuarine Animals of the South Atlantic and Puerto Rico. Aquatic Nuisance Species Research Programme. ERDC/TN ANSRP-05-5 September 2005](#)

Summary: Available from: <http://el.erdc.usace.army.mil/ansrp/pdfs/ansrp05-5.pdf> [Accessed 10 April 2009]

[Renzi, V. 1999. *Salmo salar*. Animal Diversity Web.](#)

Summary: Available from: http://animaldiversity.ummz.umich.edu/site/accounts/information/Salmo_salar.html [Accessed 4 April 2005]

Seo, Kyung Suk and Yoon Lee., 2009. Chapter 32: A First Assessment of Invasive Marine Species on Chinese and Korean Coasts In G. Rilov, J.A. Crooks (eds.) Biological Invasions in Marine Ecosystems. 577 Ecological Studies 204, Springer-Verlag Berlin Heidelberg 2009

Summary: Available from: <http://filaman.uni-kiel.de/Country/CountryList.php?ID=236&GenusName=Salmo&SpeciesName=salar> [Accessed 10 April 2009]

Soto, Doris., Ivan Arismendi, Jorge Gonzalez, Jose Sanzana, Fernando Jara, Carlos Jara, Erwin Guzman and Antonio Lara., 2006. Southern Chile, trout and salmon country: invasion patterns and threats for native species. Revista Chilena de Historia Natural 79: 97-117, 2006

[Thorstad, Eva B., Fleming, Ian A., McGinnity, Philip, Soto, Doris, Wennevik, Vidar, and Whoriskey, Fred., 2006. Incidence and impacts of escaped farmed Atlantic salmon *Salmo salar* in nature. Report from the Technical Working group on Escapes. World Wildlife Federation.](#)

Summary: Available: <http://www.worldwildlife.org/what/globalmarkets/aquaculture/WWFBinaryitem7602.pdf>. [Accessed 20 May 2009]

Townsend, Colin R., 1996. Invasion biology and ecological impacts of brown trout *Salmo trutta* in New Zealand. Biological Conservation Volume 78, Issues 1-2, October-November 1996, Pages 13-22

Verspoor, V., 1988. Widespread hybridization between native Atlantic salmon, *Salmo salar*, and introduced brown trout, *S. trutta*, in eastern Newfoundland. J. Fish Biol. (1988) 32,321-334

Volpe, John P., Bradley R. Anholt, and Barry W. Glickman., 2001. Competition among juvenile Atlantic salmon (*Salmo salar*) and steelhead (*Oncorhynchus mykiss*): relevance to invasion potential in British Columbia. Can. J. Fish. Aquat. Sci. 58: 197-207 (2001) DOI: 10.1139/cjfas-58-1-197

Young, Kyle A., Jessica Stephenson, Alexandre Terreau, Anne-Flore Thailly, Gonzalo Gajardo, Carlos Garcia de Leaniz., 2008. The diversity of juvenile salmonids does not affect their competitive impact on a native galaxiid. Biol Invasions DOI 10.1007/s10530-008-9372-5

Youngson, A.F. and E. Verspoor., 1998. Interactions between wild and introduced Atlantic salmon (*Salmo salar*). Can. J. Fish. Aquat. Sci. 55(Suppl. 1): 153-160 (1998)