

*Mytilus galloprovincialis* [简体中文](#) [正體中文](#)

**System:** Marine

Kingdom	Phylum	Class	Order	Family
Animalia	Mollusca	Bivalvia	Mytiloidea	Mytilidae

**Common name** Mittelmeer-Miesmuschel (German), blue mussel (English), Mediterranean mussel (English), bay mussel (English)

### Synonym

**Similar species** *Mytilus spp.*, *Mytilus edulis*, *Mytilus trossulus*

### Summary

*Mytilus galloprovincialis* (blue mussel or the Mediterranean mussel) is native to the Mediterranean coast and the Black and Adriatic Seas. It has succeeded in establishing itself at widely distributed points around the globe, with nearly all introductions occurring in temperate regions and at localities where there are large shipping ports (Branch and Stephanni 2004). Ship hull fouling and transport of ballast water have been implicated in its spread and its impact on native communities and native mussels has been suggested by a number of studies and observations (Carlton 1992; Robinson and Griffiths 2002; Geller 1999).



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

### Species Description

*Mytilus galloprovincialis* is dark blue or brown to almost black. The two shells are equal and nearly quadrangular. The outside is black-violet coloured; on one side the rim of the shell ends with a pointed and slightly bent umbo while the other side is rounded, although shell shape varies by region. It also tends to grow larger than its cousins, up to 15cm, although typically only 5-8cm.

### Lifecycle Stages

Adult mussels spawn gametes, after which fertilization of an egg occurs. The egg undergoes gametogenesis, forming a larva. The larva forms into a juvenile which settles and attaches itself using byssal threads after 2 to 4 weeks (Matson 2000).

### Uses

*Mytilus galloprovincialis* is widely cultivated in Japan and China (Morton 1996).

### Habitat Description

In its native range, *M. galloprovincialis* can be found from exposed rocky outer coasts to sandy bottoms (Ceccherelli and Rossi 1984). As an invader it typically requires rocky coastlines with a high rate of water flow. In fact, unlike the other 26 Asian and Atlantic molluscs introduced into Pacific regions only one introduced species, the Mediterranean mussel *M. galloprovincialis*, occurs in open coast, high energy environments on the Pacific coast; all remaining species are restricted to bays and estuaries (Carlton 1992).

### Reproduction

Gonochoristic reproduction where males and females spawn simultaneously. *M. galloprovincialis* also has high fecundity and spawns at the time of year with the highest water temperature (Bayne 1976).

## Nutrition

A filter-feeding bivalve that eats a wide range of planktotrophic organisms. This species prefers fast moving water that is free of sediment and thrives in regions where nutrient-rich upwelling occurs.

## General Impacts

The alteration of benthic community dynamics by introduced bivalves on the Pacific coast remains largely uninvestigated including the impact of such invasives as *M. galloprovincialis*, but also *Geukensia demissa*, *Musculista senhousia*, *Mya arenaria*, *Crassostrea virginica*, *Venerupis philippinarum*, and *Gemma gemma*. It is known that *M. galloprovincialis* is able to outcompete and displace native mussels and become the dominant mussel species in certain localities. This is because *M. galloprovincialis* may grow faster than native mussels, be more tolerant to air exposure and have a reproductive output of between 20% and 200% greater than that of indigenous species (Van Erkom Schurink and Griffiths 1993, in Branch and Stephanni 2004). In an experiment to test the tolerance of the three native South African species to aerial exposure (in comparison to *M. galloprovincialis*) mussels were held for 42 weeks at the high-tide level where they experienced up to 7 days of continuous exposure to air. Under these conditions, survivorship of *M. galloprovincialis* was 92%, but 78% for *Perna perna*, 37–46% for *Choromytilus meridionalis* and 0–10% for *Aulacomya ater* (Hockey and van Erkom Schurink 1992, in Branch and Stephanni 2004). In South Africa the indigenous ribbed mussel *A. ater* was progressively displaced from semiexposed and exposed shores as the cover of *M. galloprovincialis* rose there. At sites where *M. galloprovincialis* was experimentally removed, there were no declines of *A. ater* (G.M. Branch Unpub. Data, in Branch and Stephanni 2004). Similarly, in southern California the introduction of *M. galloprovincialis* has been associated with a decline in the closely related native mussel *M. trossulus* (Geller 1999).

Since the 1980s the introduced Mediterranean mussel (*M. galloprovincialis*) has successfully invaded the southern African coastline and has become the dominant species on rocky intertidal shores of the west coast. A comparative study by Robinson and Griffiths (2002) to investigate differences between *M. galloprovincialis* invaded areas and non-invaded areas was conducted in Langebaan Lagoon, South Africa, and highlighted the affect *M. galloprovincialis* has on naturally-occurring communities. Communities in invaded areas differed significantly from non-invaded areas with figures indicating that naturally-occurring sandbank communities were being replaced with communities more typical of rocky shores. To conserve the natural biota of the centre banks, which lie within a national park, the mussel beds should to be removed (Robinson and Griffiths 2002).

## Management Info

Ballast water management could stop the spread of its larvae.

A new technique used in the aquaculture industry is the production of triploid and tetraploid mussels, which are functionally sterile, thereby eliminating the risk of wild populations establishing (McEnulty *et al.* 2001).

## Pathway

Shipping is held to be the most probable original mode of introduction of *M. galloprovincialis* to South Africa (Grant *et al.* 1984, in Branch and Stephanni 2004) and to Mexico (Carlton 1992). Late twentieth century distribution of *M. galloprovincialis* was probably enhanced by ballast water transport as well as ship fouling (Carlton 1992). *M. galloprovincialis* is sometimes transferred through mariculture as a food source and because it is confused with other *Mytilus* species

**Principal source:** Branch, G.M. and Steffani, C.N. 2004. Can we predict the effects of alien species? A case-history of the invasion of South Africa by *Mytilus galloprovincialis* (Lamarck). *Journal of Experimental Marine Biology and Ecology*. 300:189-215.

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

## Review:

**Publication date:** 2006-05-09

## ALIEN RANGE

[1] AFRICA	[1] AUSTRALIA
[1] CANADA	[1] HONG KONG
[1] IRELAND	[1] JAPAN
[1] KOREA, DEMOCRATIC PEOPLE'S REPUBLIC OF	[1] KOREA, REPUBLIC OF
[1] MEDITERRANEAN & BLACK SEA	[1] MEXICO
[1] NAMIBIA	[1] NETHERLANDS
[1] NORTH AMERICA	[5] SOUTH AFRICA
[2] UNITED KINGDOM	[6] UNITED STATES

## BIBLIOGRAPHY

37 references found for *Mytilus galloprovincialis*

### Management information

[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](http://www.cefes.co.uk/media/118009/fisk_guide_v2.pdf) is available from [http://www.cefes.co.uk/media/118009/fisk\\_guide\\_v2.pdf](http://www.cefes.co.uk/media/118009/fisk_guide_v2.pdf) [Accessed 13 January 2009].

Griffiths, Charles and Jennifer, Day. 2004. Aquatic invasive species in South Africa- Environmental impacts and management responses. In Abstracts: 13th International Conference on Aquatic Invasive Species, September 20-24, 2004. Lynch West County Hotel, Ennis, County Clare, Ireland.

**Summary:** Report into presence and location of aquatic invasive species and management plans used for control in South Africa.

[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]

Jenner, Henk A. and Janssen-Mommen Jake 2004. Exotic cooling water fouling organisms in the Netherlands with emphasis on heat treatment of the Japanese oyster *Crassostera gigas*. In Abstracts: 13th International Conference on Aquatic Invasive Species, September 20-24, 2004. Lynch West County Hotel, Ennis, County Clare, Ireland.

**Summary:** Report on the effectiveness of heat treatment on *Crassostera gigas* in the Netherlands.

McEnnulty, F.R., Bax, N.J., Schaffelke, B. and Campbell, M.L. 2001. A review of rapid response options for the control of ABWMAC listed introduced marine pest species and related taxa in Australian waters. Centre for research on introduced marine pests, Technical Report 23. June 2001. CSIRO Marine Research.

**Summary:** Outlines management techniques and response options to invasions by marine organisms in Australian waters.

### General information

Anderson, A.S., Bilodeau, A.L., Gilg, M.R., and Hilbish, T.J. 2002. Routes of introduction of the Mediterranean mussel (*Mytilus galloprovincialis*) to Puget Sound and Hood Canal. *Journal of Shellfish Research*. 21 (1): 75-79.

**Summary:** Reports on alternate routes of introduction in Puget Sound as well as where the Mediterranean mussel has so far established.

Apte, S., Holland, B.S., Godwin, L.S., Gardner, J.P. 2000. Jumping ships: a stepping stone event mediating transfer of a non-indigenous species via a potentially unsuitable environment. *Biological Invasions*. 2: 75-79.

**Summary:** A good article that deals with ballast water organisms from one ship being passed onto another and further transported to other areas.

Bayne, B.L. 1976. Marine mussels: their ecology and physiology. Cambridge University Press: New York.

**Summary:** Book on ecology, development, life cycles, and physiology of all marine mussels.

Bishop Museum. 2002. Records of the Hawaii Biological Survey for 2000. Bishop Museum Occasional Papers: No. 68.

**Summary:** Gives details of the Hawaii Biological Survey for 2000, which included an incidence of *M. galloprovincialis*.

Bortolus, Alejandro., 2008. Error Cascades in the Biological Sciences: The Unwanted Consequences of Using Bad Taxonomy in Ecology. *Ambio* Vol. 37, No. 2, March 2008

[Braby, C.E. and Somero, G.N. 2001. Stress physiology of invasions: Comparison of Mytilus Bay Mussels in the central California hybrid zone. In Abstracts: Second International Conference on Marine Bioinvasions, March 9-11, 2001. New Orleans, LA](#)

**Summary:** Investigation into how the environment dictates the success or failure of a *Mytilus* invasion.

Available from: <http://massbay.mit.edu/resources/pdf/MarinePDF/2001/MBI2001abs1.pdf> [Accessed September 20 2005]

[Branch, G.M. and Steffani, C.N. 2004. Can we predict the effects of alien species? A case-history of the invasion of South Africa by \*Mytilus galloprovincialis\* \(Lamarck\). \*Journal of Experimental Marine Biology and Ecology\*. 300: 189-215.](#)

**Summary:** This article gives a great case history of the invasion in South Africa.

[Caceres-Martinez, J. and Figueras, A. 1998. Distribution and abundance of mussel \(\*Mytilus galloprovincialis\* Lmk\) larvae and post-larvae in the Ria de Vigo \(NW Spain\). \*Journal of Experimental Marine Biology and Ecology\*. 229: 277-287.](#)

**Summary:** This article discusses the decline of native mussel species in North America, and the possible association with the introduction of

[Carlton, J.T. 1992. Introduced marine and estuarine mollusks of North America: an end-of-the-20th-century perspective. \*Journal of Shellfish Research\*. 11 \(2\): 489-505.](#)

**Summary:** A summary of the invasive species in the North American marine environment.

[Carlton, J.T. 1992. Introduced Marine and Estuarine Mollusks of North America: An End-of-the-20th-century Perspective, \*Journal of Shellfish Research\* 11\(2\): 489-505.](#)

[Carlton, J.T. 2003. Community assembly and historical biogeography in the North Atlantic Ocean: the potential role of human-mediated dispersal vectors. \*Hydrobiologia\*. 503: 1-8.](#)

**Summary:** This article discusses the historical and current occurrence of biological invasions in the North Atlantic Ocean, and outlines possible means of human-assisted dispersal.

[Ceccherelli, V.U. and Rossi, R. 1984. Settlement, growth and production of the mussel \*Mytilus galloprovincialis\*. \*Marine Ecology Progress Series\*. 16: 173-184.](#)

[Frolenko, L.N. and Studenikina, E.I. 2002. Bioecological characteristics of benthic species - inhabitants of the Sea of Azov, \*Izvestiya Vysshikh Uchebnykh Zavedenii Severo-Kavkazskii Region Estestvennye Nauki\* 4: 81-86.](#)

[Geller, J.B. 1999. Decline of a native mussel masked by sibling species invasion. \*Conservation Biology\*. 13 \(3\): 661-664.](#)

**Summary:** This article discusses the decline of native mussel species in North America, and the possible association with the introduction of *M. galloprovincialis* to North American waters.

[Godwin, L.S. 2003. Hull fouling of maritime vessels as a pathway for marine species invasions to the Hawaiian islands. \*Biofouling\*. 19: Supplement 1. 123-131.](#)

**Summary:** This paper outlines the introduction of invasive species to the marine environment in Hawaii by means of ship fouling.

[Griffiths, C.L. and Robinson, T.B. 2003. Status and impacts of marine alien species in South Africa. In Abstracts: Third International Conference on Marine Bioinvasions, March 16-19, 2003. Scripps Institution of Oceanography La Jolla, California](#)

**Summary:** Discussion into the effects and impacts of alien marine invertebrates in South Africa.

Available from: <http://massbay.mit.edu/resources/pdf/MarinePDF/2003/MBI2003abs4.pdf> [Accessed September 20 2005]

[Hammond, W. and Griffiths, C.L. 2004. Influence of wave exposure on South African mussel beds and their associated infaunal communities. \*Marine Biology\*. 144: 547-552.](#)

**Summary:** This study examined the infaunal communities associated with mussel beds in South Africa.

[Hanekom, N. and Nel, P. 2002. Invasion of sandflats in Langebaan Lagoon, South Africa, by the alien mussel \*Mytilus galloprovincialis\*: Size, composition and decline of the populations, \*African Zoology\* 37\(2\): 197-208.](#)

[Hockey, P.A. and van Erkom Schurink, C. 1992. The invasive biology of the mussel \*Mytilus galloprovincialis\* on the Southern African coast. \*Transactions of the Royal Society of South Africa\*. 48 \(1\):123-139.](#)

**Summary:** This article provides a case study of the invasion into South Africa and the rate of spread.

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

**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:

[\[Matson, S.E. 2000. Hybridization of the mussels \\*Mytilus trossulus\\* and \\*Mytilus galloprovincialis\\*: larval growth, survival and early development. Masters Thesis - University of Washington.\]\(#\)](http://www.cbif.gc.ca/pls/itisca/taxastep?king=every&p_action=containing&taxa=Mytilus+galloprovincialis&p_format=&p_ifx=plgltp_lang = [Accessed March 2005]</a></p>
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**Summary:** This thesis gives details about the introduction of *Mytilus galloprovincialis* and its hybridization with *M. trossulus*.

[McDonald, J.H., Koehn, R.H., Balakirev, E.S., Manchenco, G.P., Pudovkin, A.I., Sergiyevskii, S.O. and Krutovskii, K.V. 1990. Species identity of the common mussel inhabiting the Asiatic coasts of the Pacific Ocean. \*Biologi i Morfologia\*. 1: 13-22.](#)

**Summary:** This gives details of the presence of *M. galloprovincialis* in Korea.

[McDonald, J.H., Seed, R. and Koehn, R.H. 1991. Allozyme and morphometric characters of three species of \*Mytilus\* in the Northern and Southern Hemispheres. \*Marine Biology\*. 111: 323-335.](#)

**Summary:** This paper gives a global perspective of *Mytilus* in different regions of both its native and introduced range.

[Morton, B. 1996. The Aquatic Nuisance Species Problem: A Global Perspective and Review, University of Hong Kong](#)

**Summary:** A summary of aquatic invasive species worldwide, with examples and definitions.

[New South Wales \(NSW\) Department of Primary Industries, Fisheries., 2006. Aquaculture prospects for the Blue Mussel.](#)

**Summary:** Available from: [http://www.fisheries.nsw.gov.au/aquaculture/saltwater2/aquaculture\\_prospects\\_for\\_the\\_blue\\_mussel](http://www.fisheries.nsw.gov.au/aquaculture/saltwater2/aquaculture_prospects_for_the_blue_mussel) [Accessed 9 May 2006]

[Picton, B.E. & Morrow, C.C., 2005. \[In\] Encyclopedia of Marine Life of Britain and Ireland: \*Mytilus galloprovincialis\* \(Lamarck, 1819\)](#)

**Summary:** This photographic guide covers a selection of the larger animals which live round the coasts of Britain and Ireland. It is intended for divers and marine biologists who need to be able to recognise species in situ and is not an exhaustive identification guide.

Available from: <http://www.habitas.org.uk/marinelife/species.asp?item=W16510> [Accessed November 2007]

Ramirez, S.C. and Caceros-Martinez, J. 1999. Settlement of the blue mussel *Mytilus galloprovincialis* Lamark on artificial substrates in Bahia de Todos Santos, BC, Mexico. *Journal of Shellfish Research*. 18: 33-39.

**Summary:** This article deals with *M. galloprovincialis* settlement on artificial structures in Mexican waters.

Robinson, T.B. and Griffiths, C.L. 2002. Invasion of Langebaan Lagoon, South Africa, by *Mytilus galloprovincialis*: Effects on natural communities. *African Zoology* 37(2): 151-158.

Sebastian, C.R., Steffani, C.N. and Branch, G.M. 2002. Homing and movement patterns of a South African limpet *Scutellastra argenvillei* in an area invaded by an alien mussel *Mytilus galloprovincialis*, *Marine Ecology-Progress Series* 243: 111-122.

Vario, S.L., Koehn, R.K. and Vainola, R. 1988. Evolutionary genetics of the *Mytilus edulis* complex in the North Atlantic region. *Marine Biology*. 98: 51-60.

**Summary:** This article discusses the relationships between *Mytilus* spp. It also discusses hybridization of native and non-native species.

Wilkins, N.P., Fujino, K., and Gosling, E.M. 1983. The Mediterranean mussel *Mytilus galloprovincialis* Lmk. in Japan. *Biological Journal of the Linnean Society*. 20:365-374.

**Summary:** This article gives an in depth look into the introduction of *M. galloprovincialis* in Japan.

Wonham, M.J. 1999. Predicting the spread of an invasive mussel.: The changing roles of competition and predation. In [Abstracts: First National Conference on Marine Bioinvasions, January 24 -27, 1999, Massachusetts Institute of Technology, Cambridge, MA](#)

**Summary:** Investigation into the factors limiting the success of an invasion at two sites in Washington by *Mytilus galloprovincialis*.

Available from: <http://massbay.mit.edu/resources/pdf/MarinePDF/1999/MarineAbs12.pdf> [Accessed September 20 2005]