**Mytilus galloprovincialis**

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

**Synonym**: Mytilus, Mytilus edulis, Mytilus trossulus

**Similar species**: 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).

**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 larvae. 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 planktrophic 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 (McEnnulty 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.

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ALIEN RANGE

1) AFRICA
1) CANADA
1) IRELAND
1) KOREA, DEMOCRATIC PEOPLE'S REPUBLIC OF
1) MEDITERRANEAN & BLACK SEA
1) NAMIBIA
1) NORTH AMERICA
2) UNITED KINGDOM
2) UNITED STATES

BIBLIOGRAPHY

37 references found for Mytilus galloprovincialis

Management information

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


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


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]


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

General information

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

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

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


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

Summary: This article compares samples of larvae from offshore and nearshore along Spain.

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


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.


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.


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


Summary: This article discusses the relationships between Mytilus galloprovincialis and Mytilus trossulus, the main species of dark and blue mussels, in Korea. This study was conducted in order to determine the presence of Mytilus trossulus on the western coast of Korea and to clarify the relationship between Mytilus galloprovincialis and Mytilus trossulus on the western coast of Korea. Mytilus galloprovincialis was found to be the dominant species in the area and Mytilus trossulus was found to be a minor species. Mytilus galloprovincialis is a successful invasive species in Korea. Mytilus trossulus is a rare species in Korea.

Summary: This article provides a case study of the invasion into South Africa and the rate of spread. This article gives an in-depth look into the introduction of Mytilus galloprovincialis in the Northern and Southern Hemispheres. This article also discusses hybridization of native and non-native species. Mytilus galloprovincialis is a successful invasive species in South Africa.

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