GLOBAL INVASIVE SPECIES DATABASE

FULL ACCOUNT FOR: ***Crassostrea gigas***

Crassostrea gigas 正體中文 **System:** Marine

Kingdom	Phylum	Class	Order	Family
Animalia	Mollusca	Bivalvia	Ostreida	Ostreidae

Common name giant Pacific oyster (English), immigrant oyster (English), giant oyster (English), Japanese oyster (English), Miyagi oyster (English), Pacific oyster (English)

Synonym *Ostrea gigas* , Thunberg, 1793
Ostrea laperousi , Schrenk, 1861
Ostrea talienwhanensis , Crosse, 1862

Similar species *Ostrea edulis, Ostrea lurida, Crassostrea virginica*

Summary The bivalve Crassostrea gigas is a filter feeder. It has been introduced from Asia across the globe. In North America and the Australasia-Pacific regions C. gigas is known to settle into dense aggregations, and exclude native intertidal species. It has been documented destroying habitat and causing eutrophication of the water bodies it invades.

view this species on IUCN Red List

Species Description
C. gigas is a bivalve, epifaunal, suspension/filter feeder that cements itself to rocks and other hard substrata and feeds primarily on phytoplankton and protists (CIESM, 2000; NIMPIS, 2002). CIESM (2000) states that \"*C. gigas*'s shell is extremely variable in shape depending on the substrate. It will have a rounded shape with extensive fluting on hard substrata, an ovate and smooth shell on soft substrata, and a solid shape with irregular margins on mini-reefs. The upper valve (rv) is flattened with a low round umbo. The lower valve (lv) is larger, more convex, and has a more well developed umbo that is much higher than on rv. *C. gigas*'s anterior margin is longer than the posterior margin.\" NIMPIS (2002) reports that, \"*C. gigas* has a white elongated shell, with an average size of 150-200mm. The two valves are solid, but unequal in size and shape. The left valve is slightly convex and the right valve is quite deep and cup shaped. One valve is usually entirely cemented to the substrata. The shells are sculpted with large, irregular, rounded, radial folds.\" Reise *et al.* (2005) reports that, \"The largest specimen found in the European Wadden Sea was of the gigantic size of 310mm.\" CIESM (2000) states that, \"exceptional specimens can attain 400mm.\"

Notes
Mitchell *et al.* (2000) report that, \"The majority of introductions of *C. gigas* have been undertaken as a replacement/alternative for collapsed fisheries of native species.\"\r\nThe Portuguese oyster '*Crassostrea angulata*' (Lamarck, 1819) was deliberately introduced from Portugal and France several times into coastal waters of Northern Europe, but did not establish itself (Wolff & Reise, 2002). Boudry *et al.* (1998) consider '*C. angulata*' to be identical to *C. gigas*. However, O'Foighil *et al.* (1998) consider '*C. angulata*' to be closely related, but not identical to Japanese*C. gigas*.

Lifecycle Stages
The Port Stephens Fisheries Centre (2003) states that, \"*C. gigas* change sex during their life, usually spawning first as a male and subsequently as a female. Spawning is temperature dependent and occurs in the summer months. *C. gigas* females can produce between 30 to 40 million eggs per spawning, often giving the surrounding water a milky appearance. Fertilization takes place in the water column. The larvae are planktonic and free swimming, developing for three to four weeks before finding a suitable clean hard surface to settle on. Although they usually attach to rocks, they can also settle in muddy or sandy areas (where they attach to small stones, shell fragments or other debris) or on top of other adult oysters. A very small percentage of oysters survive this phase; those that do are called \"spat\". Pacific oysters have very high growth rates (they can grow to over 75mm in their first 18 months) and high rates of reproduction. *C. gigas* can live up to 10 years and reach an average size of 150-200mm.\" The Prince William Sound Regional Citizens' Advisory Council (2004) states that, \"The Pacific Oyster is extremely fertile. During the breeding season the reproductive organs may form 50% of the body's volume. Pacific oysters typically produce between 50-100 million eggs which are released over several spawning bursts. The female discharges her eggs up to 12 inches from its body in the form of white clouds. The male oyster also discharges its sperm. Fertilization must occur within 10-15 hours after spawning.\"

Uses
Hopkins (2001) states that, \"The Pacific oyster (*C. gigas*) has been introduced into Europe as a commercial species of importance for aquaculture in countries such as the UK and France.\"

Habitat Description
NIMPIS (2002) states that, \"*C. gigas* will attach to almost any hard surface in sheltered waters. Whilst they usually attach to rocks, the oysters can also be found in muddy or sandy areas. Oysters will also settle on adult oysters of the same or other species. They prefer sheltered waters in estuaries where they are found in the intertidal and shallow subtidal zones, to a depth of about three metres.\" Reise (1998) reports that, \"After larval settlement, the lower valve of *Crassostrea gigas* becomes partially or almost completely cemented to a hard substrate. At Sylt [in the German Wadden Sea], 85% were found to be attached to [the native blue mussel] *Mytilus edulis*, i.e. to living individuals (47%) as well as to empty shells. Other bivalves (8%) were of minor importance as substrates. There were two instances with juvenile oysters being attached to living adults of *C.gigas*.\"

Reproduction
NIMPIS (2002) reports that, \"*C. gigas* begins life as a male oyster and after a year functions as a female. Spawning is temperature dependant and throughout their range, *C. gigas* are summer breeders. Fertilization occurs externally and larvae are planktonic, spending about three weeks in this free-swimming phase. When settling, the larvae group together and crawl around the sea floor, searching for a suitable hard substratum to which they can cement their lower shell valves. The oyster grows at around 25mm per year.\"

Nutrition
C. gigas is a filter feeder. It will ingest bacteria, protozoa, a wide variety of diatoms, larval forms of other invertebrate animals, and detritus (PWSRCAC, 2004).

General Impacts
The AMCS Bulletin 1998 reports that, \"*C. gigas* is well known for its tendency to colonize areas of coastline many kilometres away from its parent organisms. Spat have been documented spreading up to 1,300 km on ocean currents. Once established, they have the potential to smother other marine life, such as scallops, destroying habitat and causing eutrophication that affects water quality. They pose a direct threat to human safety because of their propensity to cut feet and shoes with their sharp shells.\"
Eno *et al.* (1997) report that, \"In North America, *C. gigas* can settle in dense aggregations, and exclude other intertidal species\". This could result in limitations of food and space availability for other intertidal species (NIMPIS, 2002). The Port Stephens Fisheries Centre (2003) states that, \"*C. gigas* ability to change the species balance with its introduction also has the potential to impact on non-oyster species, through a modification of their habitat.\" Hopkins (2001) states that, \"There is great concern that the indigenous European oyster (*Ostrea edulis*) has, as a result in part from *C. gigas* introductions, become a threatened species.\"
In the area of the European Wadden Sea, however, the last living reef of the European oyster was found in 1940. After that *O. edulis* was declared to be extinct in the region (Nehring 2001). There has been some debate about the actual cause of the decline but more recent accounts on the subject seem to prove that overexploitation by oyster fishery since the 18th century exterminated these populations (Nehring 2003). Since 1964, the Pacific oyster *C. gigas* has been imported for cultivation to several places in Northern Europe, including the Wadden Sea. These oysters reproduced successfully and since the 1980's first individuals were found outside the culture plots in the Wadden Sea (Nehring 2003). While no viable population of the native *O. edulis* is left in the Wadden Sea, the Pacific *C. gigas* is now firmly established. Ecologically these oysters are very different. *O.edulis* occurred in the Wadden Sea subtidally and has a narrower tolerance range for temperature and salinity than *C.gigas* which lives primarily in the intertidal. An interference between the two oyster species in the Wadden Sea is not to be expected (Reise 1998). Nehring (2003) states that, \"The recently expanding occurrence of *C. gigas* in the Wadden Sea makes it likely that oyster reefs, together with their associated community of organisms, will 're-establish', at least in the intertidal zone. If these irreversible changes in the biota of the North Sea can be classified as a positive example of population 'enrichment' is still under discussion. Due to the higher growth rate and the larger size of oysters, blue mussels are eventually overgrown and killed.\" Reise et al. (2005) reports that, \"Many oyster beds are now rapidly developing into solid reefs at several sites in the region. Thus *C. gigas* is expected to take over in the Wadden Sea, both as an ecosystem engineer generating solid reefs and as a competitive suspension feeder.\"

Management Info
Preventative measures: A two year study was undertaken for the Department of Environment and Heritage (Australia) by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) to identify and rank introduced marine species found within Australian waters and those not found within Australian waters.
All of the non-native potential target species identified in this report are ranked as high, medium and low priority, based on their invasion potential and impact potential. *Crassostrea gigas* is identified as one of ten most damaging potential domestic target species, based on overall impact potential (economic and environmental). A hazard ranking of potential domestic target species based on invasion potential from infected to uninfected bioregions identifies *C. gigas* as a 'medium priority species' - these species have a reasonably high impact/or invasion potential.
For more details, please see Hayes *et al.* 2005.
The rankings determined in Hayes *et al.* 2005 will be used by the National Introduced Marine Pest Coordinating Group in Australia to assist in the development of national control plans which could include options for control, eradication and/or long term management.\r\n
Physical: Reise *et a.l* (2005) states that, \"No control is feasible which would not also harm other components of the Wadden Sea ecosystem.\"
Biological: To prevent the further spread of *C. gigas*, the Mariculture Committee (2003) reports that, \"Sterile triploid *C. gigas* can be produced. There are two methods to produce triploid animals. One is via chemical induction and the other is crossing of tetraploids with diploid broodstock. The dangers in the former technique are that less than 100% of the animals produced are triploid while the dangers of the latter technique would be the unintentional release of tetraploids into the marine environment, which could potentially interact with natural diploids producing sterile triploids.\" Humphry (1995) states that, \"*Mytilicola* sp. are copepod parasites of the intestinal tract of marine molluscs and have caused catastrophic mortalities in infected hosts (Sparks 1985, Bauer 1991). *Mytilicola orientalis* was introduced in seed oysters *C. gigas* transplanted from Japan to the USA and France in an attempt to control the species. A turbellarian parasite *Pseudostylochus* sp. was associated with high mortalities in *C. gigas* imported from Japan into Vanuatu for experimental aquaculture. The mudworm *Polydora* sp. caused severe shell damage in imported oysters *C. gigas* in Vanuatu and French Polynesia (Eldredge 1993, Hallier 1977). The sponge *Cliona* sp. resulted in severe shell damage to imported Japanese oysters, *C. gigas* in Vanuatu (Hallier 1977). Shell damage associated with uncharacterized epiphytic sponges is also reported in cultured giant clams (Anon 1991).\" Reise *et al.* (2005) states that, \"The trematode parasite *Renicola roscovita* which takes periwinkles as first, cockles and mussels as second intermediate host and gulls and eider ducks as final host, is also infesting *C. gigas* but at lower intensity.\"

Pathway
Its introduction from France to Britain is thought to have been on ships' hulls (Fletcher & Manfredi 1995) (Eno *et al.* 1997).

Principal source: NIMPIS, 2002. *Crassostrea gigas* species summary. National Introduced Marine Pest Information System (Eds: Hewitt C.L., Martin R.B., Sliwa C., McEnnulty, F.R., Murphy, N.E., Jones T. & Cooper, S.)

Compiler: National Biological Information Infrastructure (NBII) & IUCN/SSC Invasive Species Specialist Group (ISSG)

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ALIEN RANGE

[5] ATLANTIC - NORTHEAST
[1] BELGIUM
[1] CHILE
[5] AUSTRALIA
[2] CANADA
[1] CHINA

[1] CYPRUS
[1] FRANCE
[1] GERMANY
[1] JERSEY
[1] MALTA
[2] NETHERLANDS
[1] NORWAY
[1] SOUTH AFRICA
[1] SPAIN
[10] UNITED KINGDOM
[1] VANUATU

[1] DENMARK
[1] FRENCH POLYNESIA
[1] GREECE
[1] KOREA, REPUBLIC OF
[1] MOROCCO
[1] NEW ZEALAND
[1] PORTUGAL
[1] SOUTH AMERICA
[1] TUNISIA
[6] UNITED STATES

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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).
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La lista de especies del Sistema de informaci�n sobre especies invasoras de m�xico cuenta actualmente con informaci�n aceca 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 novedades, para conocer los cambios.
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