Mnemiopsis leidyi 简体中文 正體中文 **System:** Marine

Kingdom	Phylum	Class	Order	Family
Animalia	Ctenophora	Tentaculata	Lobata	Mnemiidae

Common name Rippenqualle (German), sea walnut (English), American comb jelly (English), sea gooseberry (English), Venus' girdle (English), comb jelly (English), warty comb jelly (English), comb jellyfish (English)

Synonym *Mnemiopsis gardeni* , L.Agassiz 1860
Mnemiopsis mccradyi ,, Mayer, 1990

Similar species *Mnemiopsis mccradyi*

Summary The ctenophore, Mnemiopsis ledyi, is a major carnivorous predator of edible zooplankton (including meroplankton), pelagic fish eggs and larvae and is associated with fishery crashes. Commonly called the comb jelly or sea walnut, it is indigenous to temperate, subtropical estuaries along the Atlantic coast of North and South America. In the early 1980s, it was accidentally introduced via the ballast water of ships to the Black Sea, where it had a catastrophic effect on the entire ecosystem. In the last two decades of the twentieth century, it has invaded the Azov, Marmara, Aegean Seas and recently it was introduced into the Caspian Sea via the ballast water of oil tankers.

[view this species on IUCN Red List]

Species Description
Mnemiopsis ledyi is a comb jelly with a length up to 100mm. The body is laterally compressed, with large lobes arising near the stomodeum, generating 4 deep, noticeable furrows that characterize the genus. It has four rows of small, but numerous, cilated combs which are irridescent by day and may glow green by night (NIMPIS, 2002). The colour is usually transparent or slightly milky, translucent (Shiganova 2003).

Notes
Mnemiopsis is probably the most-studied ctenophore genus in the world because of its great abundance in estuaries in heavily populated areas of the United States, and because of its explosive population growth after accidental introduction into the Black Sea in the early 1980s. But after the invasion of a new ctenophore of the genus *Mnemiopsis* into the Black Sea, a question regarding which species was invasive arose. L.N. Seravin (1994) made a revision of the genus *Mnemiopsis* with the conclusion that it includes only one polymorphic species of lobate ctenophore-*Mnemiopsis leidyi*, which this new ctenophore belongs to. Richard Harbison also supports this point of view (personal communication in Dumont and Shiganova).

Lifecycle Stages

Totally planktonic life history; early tentaculate larvae resembling *Cydippida* ctenophores but metamorphoses into the mature lobate form. No current evidence of resting stages (Costello, 2001).
\r\n\r\nThe embryo acquires a double rows of cilia, a well-developed pair of lateral tentacles, and a large, apical sense-organ. The entodermal part of the gastro-vascular system consists of 6 lateral diverticula from a central chamber; 2 of these lateral branches lead into the bases of the tentacles and the other 4 lead outward toward the 4 double rows of cilia. The ectodermal buccal pouch or stomodeum has become a long, laterally compressed tube, with its broad axis 90* from the tentacular axis of the animal. Until this time the animal swims about quite freely within the egg-envelope at this stage its cilia may be observed beating in a normal manner and its tentacles to elongate or contract in response to stimuli. Soon after this the larva breaks through the egg-envelope and escapes into the water. Here it passes the development stages which are very similar to those of the young Pleurobrachia.
\r\n\r\nThe tentacles acquire numerous lateral filaments and elongate greatly, as in Pleurobrachia. When the animal is 5mm long, the oral lobes begin to develop as two simple outgrowths on both sides of the mouth in the sagittal plane of the animal. At the time when the oral lobes begin to develop, the meridional ventral canals and the paragastric tubes begin to elongate downward. The former give rise to the characteristic loops in the oral lobes. Four meridional vessels extend downward and fuse with the circum-oral vessel. The primary tentacle-bulbs migrate downward to lie close by the sides of the mouth. The auricles appear last of all, after the lobes have developed to some extent. When attaining 10mm long the animal becomes ellipsoidal in outline. The appearance of its lobes and auricles resembles to that in the adult of Bolinopsis. Afterward the deep, lateral furrows extend upward to the level of the apical sense-organ and the animal acquires the characteristic of *Mnemiopsis* (Mayer, 1912). The embrional development takes about 20-24 hours in the Black Sea upper water layer by 23 degrees C. The size of hutched larvae is 0.3-0.4mm.

Habitat Description

The native habitat of the ctenophore, *Mnemiopsis*, is in temperate to subtropical estuaries along the Atlantic coast of North and South America (Mayer,1912). *M. leidyi* is tolerant of a wide range of salinity, temperature and water quality conditions over a broad range of inshore habitats. Since its unintentional introduction to the Black Sea, *Mnemiopsis* has spread to adjacent bodies of water, inhabiting waters of salinities ranging from 3% in the Sea of Azov to 39‰ in the eastern Mediterranean, and temperatures ranging from 4oC in winter to 31oC in summer (Dumont and Shiganova).

Reproduction

Mnemiopsis leidyi is a free-spawning, simultaneous hermaphrodite capable of self-fertilization (Costello, 2001). It possesses gonads containing both the ovary and the spermatophore bunches in their gastrodermis. Total numbers of simultaneously forming eggs depends of food availability and on temperature - 2-3000 eggs per day production by adults at high food concentrations is common. The embryo is formed completely within the original egg cover. It has size of about 0.12-0.14mm and acquires its specific form and tentacular structures. When the larva attains mobility the egg cover softens and became flexible. The life span of egg producing individuals may be many months (Costello, 2001).

Nutrition

A wide range of zooplanktonic prey; varies with ctenophore development. Early cydippid stages utilize protozoa and microzooplankton, lobate forms feed primarily on crustaceans (often copepods, cladocera) mollusc larvae, eggs, and young fish larvae (Costello, 2001).

General Impacts

Mnemiopsis ledyi is a major zooplankton predator and is associated with fishery crashes (Costello, 2001). A carnivorous predator on edible zooplankton (including meroplankton), pelagic fish eggs and larvae, *M. leidyi* causes negative impacts right through the foodchain of the areas it has invaded. In the Black Sea and the Sea of Azov, the zooplankton, ichthyoplankton and zooplanktivorous fish stocks all underwent profound changes.
The pelagic ecosystem of the Black Sea was degraded, manifesting as sharply decreased biodiversity, abundance, and biomass of the main components of the pelagic ecosystem-zooplankton (Dumont and Shiganova). Fish stocks in the Black Sea and Sea of Azov have suffered due to predation on eggs and larval stages of food supplies (Shiganova 2003). Effects on the ecosystem in the Caspian Sea were faster and stronger than in the Black Sea. In 2001, repercussions were felt at all trophic levels, including that of the top predator, the Caspian seal (Dumont and Shiganova).
A cascading effect occurred at the higher trophic levels, from a decrease in zooplankton stock and collapsing planktivorous fish, to vanishing predatory fish and dolphins. Similar effects occured at lower trophic levels: from a decrease in zooplankton stock to an increase in phytoplankton, which was released from zooplankton grazing pressure. The majority of these effects were top-down, but a few were also bottom-up. Similar effects, but less pronounced, were recorded in the Sea of Marmara. Effects on Mediterranean food webs have, so far, remained insignificant. Salinity is probably supraoptimal there, and several predators prevent *M.leidyi* from reaching outbreak levels.

Management Info

<u>Biological</u>: Eradication may be impossible in practice. A variety of predators (including medusae and fish) consume *M. leidyi* in its native regions. Reduction of *M. leidyi* populations in the Black Sea occurred after one of its predators, the ctenophore *Beroe ovata*, was introduced to the region (Costello, 2001).
\r\nOne of the factors that provoked high level of population development of *M. leidyi* in the Black Sea but was not observed within its natural range-estuarial waters of North America was the absence of a predator feeding on *M. leidyi* and controlling its population size (Purcell *et al*., 2001). In 1997, another invader, the ctenophore *Beroe ovata* Mayer 1912, was found in the northeastern Black Sea. It is a predator feeding on planktivorous comb jellies - especially *M. leidyi* (Konsulov and Kamburskaya, 1998). As with its predecessor, *B. ovata* arrived with ballast waters from the same coastal waters of North America (Seravin et al., 2002). Development of *B. ovata* considerably decreased the population of *M. leidyi* that had deformed the Black Sea ecosystem for over a decade. The reduction of the *M. leidyi* population limited its influence on the ecosystem and consequently we observed a recovery of the main components of the Black Sea pelagic ecosystem – zooplankton (including meroplankton), phytoplankton, dolphins and fish as well as their eggs and larvae (Shiganova et al.,2000a,b; 2001 c).
\r\nConscious of this, and bearing in mind the devastating impact of *M. leidyi* on the fisheries in the Black and Azov Seas in the 1990s, we began a number of initiatives in 2001 with a view to take stock of the situation, review and assess remedial measures and take concrete actions. After deliberation, we proposed the introduction of a potential predator of *M. leidyi* as the only truly viable option. As shown by the example of the Black Sea, the best – and so far only - candidate for this is another ctenophore species, *Beroe ovata*. After the accidental introduction of *Beroe ovata* to the Black Sea, the abundance of *M. leidyi* here immediately dropped to levels so low that no further damage was inflicted. In fact, the ecosystem almost immediately began to recover. It is anticipated that the results of a *Beroe ovata* introduction in the Caspian will be similar. Summer 2003 is now the target date for the implementation of this plan (Dumont and Shiganova, unpublished).

Pathway

In the early 1980s, *Mnemiopsis leidyi* was accidentally introduced via the ballast water of ships to the Black Sea where it had a catastrophic effect on the entire ecosystem. It was also introduced into the Caspian Sea via the ballast water of oil tankers.

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ALIEN RANGE

[1] AZERBAIJAN
[1] BULGARIA
[1] CASPIAN SEA
[1] GEORGIA
[1] GREECE
[1] IRAN, ISLAMIC REPUBLIC OF
[1] KAZAKHSTAN
[4] MEDITERRANEAN & BLACK SEA
[1] ROMANIA
[2] RUSSIAN FEDERATION
[1] SYRIAN ARAB REPUBLIC
[2] TURKEY
[1] TURKMENISTAN
[1] UKRAINE

Red List assessed species 1: EN = 1;

Pusa caspica **EN**

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Managment information

Caspian Environmental program
Summary: Details about an April 2001 workshop convened to combat the threat of a comb jellyfish invasion of the Caspian Sea.
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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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The guidance document is available from http://www.cefas.co.uk/media/118009/fisk_guide_v2.pdf [Accessed 13 January 2009].
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Available from:
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