Sabella spallanzanii **System:** Marine

Kingdom	Phylum	Class	Order	Family
Animalia	Annelida	Polychaeta	Canalipalpata	Sabellidae

Common name sabellid fan worm (English), giant fan worm (English), Mediterranean fan worm (English), European fan worm (English)

Synonym *Spirographis spallanzanii*
Spirographis penicillus ,

Similar species

Summary Sabella spallanzanii (the European fan worm) is a filter-feeding tube worm which has the potential to alter native marine ecosystems and compete with native organisms for food and space. It may also inflict economic damage by competing with mussels and oysters in aquaculture farms.

[view this species on IUCN Red List](http://www.iucnredlist.org)

Species Description
The European fan worm (*Sabella spallanzanii*) is one of the largest species in the family Sabellidae with a leathery tube and spiral feeding fan that can reach 10 to 15cm in diameter. The tube can protrude up to 40cm above the sediment and bury as deep as 10cm into the sediment. *Sabella* commonly forms clumps of two or more individuals, creating a canopy of feeding fans that stretches over the sediment (O'Brien Ross and Keough 2006).
This tube-dwelling worm remains inside its tube and extends a fan-like crown of tentacles through the opening of its tube. When the worm is disturbed it withdraws into the tube and closes the end off. The tube is often covered with encrusting or fouling organisms and the fan colour varies from white and pale fawn through to orange and banded red-brown (CSIRO 2001). The crown is composed of two lobes, only one of which is spiralled (NIMPIS 2002).

Notes
The European fan worm (*Sabella spallanzanii*) is known to regenerate damaged body parts both anteriorly and posteriorly, while the worm continues to function. Scallop fishers in Port Phillip Bay may have contributed to the rapid spread of the fan worm through the Bay by throwing back fragments retained on clogged dredges (NIMPIS 2002).

Lifecycle Stages
European fan worm (*Sabella spallanzanii*) larvae begin to settle after about 2 weeks; metamorphosis occurs 10 days after settlement, when mucus is secreted abundantly and an external tube is formed (for details and diagrams please see Giangrande *et al*. 2000).

Uses

The ability of the European fan worm (*Sabella spallanzanii*) to accumulate the microbial pollution indicators suggests this species can be employed as a bioindicator for monitoring water quality. The European fan worm is able to concentrate microbial pollutants by removing them from the surrounding environment allowing the detection of these bacteria even when they are present in the water column at very low concentrations (Stabilia *et al*. 2006). Moreover, the accumulation capability of *S. spallanzanii* for specific micro-organisms provides a potential role in sewage bioremediation (Stabilia *et al*. 2006). As *S. spallanzanii* filters out *Vibrio* species, which are pathogenic for fish and shellfish, it may have a positive environmental application (Stabilia *et al*. 2006). In its native Mediterranean region this European fan worm could be used in the treatment of waste from the aquaculture plants (particularly fish and mussel farming) in coastal areas which are rapidly expanding (Stabilia *et al*. 2006).
Used to feed leatherjackets in aquaria in Australia (Clapin and Evans 1995, in NIMPIS 2002). Used as bait for Sparidae fish in Italy (Gambi *et al*. 1994, in NIMPIS 2002). While suitable for bait in its native range, *S. spallanzanii* is unsuitable for bait in introduced habitats and its use should be discouraged (NIMPIS 2002).

Habitat Description

The European fan worm (*Sabella spallanzanii*) demonstrates a clear preference for growth in sheltered, nutrient-enriched waters (Currie McArthur and Cohen 2000). It is generally found in shallow subtidal areas in depths from 1 to 30m (CSIRO 2001). In shallow waters, worms are solitary and commonly found growing on a wide range of solid surfaces, including artificial materials (rocks, concrete, wood, steel), and benthic organisms (ascidians, mussels, oysters) (Currie McArthur and Cohen 2000). Although *S. Spallanzanii* is a fouling organism of artificial docks and pylons it is not a typical or common fouler of ship hulls (Giangrande *et al*. 2000). However, it has been observed attached to the hulls of moored vessels including car ferries, fishing boats and pleasure craft (Currie Pers. Obs. In Currie McArthur and Cohen 2000). It is also found on wharf piles and facings, channel markers, marina piles and pontoons, and submerged wrecks (CSIRO 2001).

Reproduction

Reproduction of the European fan worm (*Sabella spallanzanii*) was investigated in a population at Port Phillip Bay (Australia) (Currie, McArthur and Cohen 2000) and is described as follows: “The worms are dioecious and attain sexual maturity at 50mm body length. Reproductive periodicity follows a distinct annual cycle, and spawning proceeds through an extended autumn/winter period. Spawning is broadly synchronous between sexes, and coincides with falling seawater temperatures and shorter day-lengths. The females are highly fecund, and >50 000 eggs are shed from large females (>300mm body length) during the annual spawning period. Breeding cycles of *S. spallanzanii* in Port Phillip Bay are 6 months out of phase with endemic populations located at similar latitudes in the northern hemisphere.”

Nutrition

The European fan worm (*Sabella spallanzanii*) feeds on suspended particulate matter, organic matter, bacteria, phytoplankton and zooplankton (NIMPIS 2002). While the consumption of larvae by sabellids cannot be ruled out, it is likely that particles in the size range containing most invertebrate larvae (100 to 2000 µm) does not constitute an important part of their diet (Holloway and Keough 2002). *Sabella starte magnifica* consumes particles 6 to 8 µm in size, and uses larger particles only for tube building (Fitzsimons 1965, in Holloway and Keough 2002). The large sabellid *Eudistillia vancouveri* is most effective in removing particles in the 3 to 6 µm range in situ and *Sabella penicillus* consumes 6 µm particles with 100% efficiency (Merz 1984, Mayer 1994, in Holloway and Keough 2002).

General Impacts

The European fan worm (*Sabella spallanzanii*) has the potential to compete with native filter-feeding organisms for food and space, and in high densities is likely to impact commercially important species (mussels, oysters, scallops, etc.) (Currie McArthur and Cohen 2000). Worms readily settle on mussel grow-out lines and may reduce mussel growth by altering water flow around the lines and competing with mussels for suspended food (CSIRO 2001). There are also indications that some less robust species of seagrass are adversely affected by the settlement of worms on their fronds (CSIRO 2001).

The European fan worm is considered a major threat to benthic assemblages in both hard and soft sediment habitats and is of particular concern in Port Phillip Bay (Victoria, Australia) as a result of its potential effect on nutrient cycling processes in soft sediments (Murray and Parslow 1999, in O'Brien Ross and Keough 2006). Lemmens and collegues (1996) and Clapin (1996) estimated that *S. spallanzanii* had a mean filtering capacity of about 12 m^3 per day per m^2 of habitat (in Stabilia *et al*. 2006).

Several studies have shown that planktonic bacteria are important components of estuaries and coastal waters, reaching high population densities and accounting for a large fraction of the production of particulate matter in those systems (Azam 1998, Fuhrman and Azam 1980, in Stabilia *et al*. 2006). Filter feeders such as *Sabella* remove from the water not only phytoplankton but also free-living bacteria Stabilia *et al*. 2006). Consequently, the impact on bacterial community structure through the removal by filter-feeding invertebrates is of considerable interest when looking at the ecological changes brought about by *Sabella* colonies.

Colonies of *S. spallanzanii* may alter water flow and velocity, altering sediment stability and altering concentrations of oxygen or organic matter (Merz 1984, Woodin 1983, Thistle *et al*. 1984, in O'Brien Ross and Keough 2006). The physical structure of the fan worm's body may deter other fauna. O'Brien Ross and Keough (2006) found that the sediment underlying clumps of *Sabella* had significantly lower abundances of cumaceans, ostracods and harpacticoid copepods (all taxa of small (<1mm) crustaceans that live on or in the sediment) (Jones 1963, in O'Brien Ross and Keough 2006).

Sessile and mobile epifauna (amphipods, barnacles and serpulid polychaetes) colonise *Sabella* tubes and their combined filter feeding capacity is much greater than the filter feeding capacity of communities associated with both seagrass beds and bare sediments (Lemmens *et al*. 1996, in O'Brien Ross and Keough 2006). This may result in a reduction of the amount of organic material in the water column, as well as reducing the amount of food available for detrivores (including cumaceans, harpacticoid copepods and some ostracods) in the underlying sediment (Jones 1963; Kornicker 1993, Dussart and Defaye 1995, in O'Brien Ross and Keough 2006).

High levels of relatively toxic forms of arsenic and its compounds can accumulate in polychates; *Sabella* has particularly high concentrations in the branchial crown and it is suggested to be an anti-predatory strategy (Fattorini *et al*. 2004, in NIMPIS 2002).

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. *Sabella spallanzanii* 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 *S. spallanzanii* 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.
Physical: Physical removal is being used to eradicate annually small numbers of *S. spallanzanii* from Australian ports, where re-introduction routinely occurs from nearby source populations (Thresher and Kuris 2004). Because of this spread there appears to be a high risk of future range-expansions of the European fan worm by ship movement in Australia (Currie McArthur and Cohen 2000).
Manual: Manual removal *via* diver collection is generally only useful for new incursions and before the fan worm has begun to reproduce. Regular monitoring and physical removal by scuba divers is being used in Eden Harbour (New South Wales, Australia) by NSW Fisheries to prevent *S. spallanzanii* from becoming established. The appearance of new individuals between removals is attributed to the reintroduction of the fan worm by vessels travelling from Port Phillip Bay to Eden (C. Hewitt Pers. Comm., in NIMPIS 2002). Care and diver education is of primary importance in this program because of the presence of similar-looking native fan worms species in Australia (NIMPIS 2002).
Recent work by mussel growers in Port Phillip Bay indicates that 24 hour air exposure of mussel ropes kills small native seastars and many epiphytic biota (such as *Sabella spallanzanii*). However there is always the likelihood of some individuals surviving in amongst the denser clusters of mussels (Garnham 1998, in NIMPIS 2002).

Pathway

The sabellid fan worm probably introduced in Australia with live bait from Europe (DOF Western Australia 2000, Bernstein and Olson 2001, in Lee and Gordon 2006).All populations of the European fan worm in Australia are believed to have been introduced by commercial shipping activities as fouling organisms on the hulls of vessels or as larvae in ships' ballast water (Currie McArthur and Cohen 2000). However, the introduction by larval pools is the more probable mechanism, because even if *S. spallanzanii* is a fouling organism of artificial docks and pylons, it is not a typical or common fouler of ship hulls (Giangrande *et al*. 2000).

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ALIEN RANGE

[16] AUSTRALIA

[1] NEW ZEALAND

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