Pink sea fan (*Eunicella verrucosa*)

MarLIN – Marine Life Information Network
Marine Evidence–based Sensitivity Assessment (MarESA) Review

John Readman & Dr Keith Hiscock

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Please note. This MarESA report is a dated version of the online review. Please refer to the website for the most up-to-date version [https://www.marlin.ac.uk/species/detail/1121](https://www.marlin.ac.uk/species/detail/1121). All terms and the MarESA methodology are outlined on the website (https://www.marlin.ac.uk)

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Two fans of *Eunicella verrucosa* showing the two morphs, pink and white.

**Photographer:** Keith Hiscock  
**Copyright:** Dr Keith Hiscock

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**Researched by:** John Readman & Dr Keith Hiscock  
**Authority:** (Pallas, 1766)  
**Recorded distribution in Britain and Ireland**

Recorded northwards to north Pembrokeshire and eastwards to Portland Bill in Britain. Common in parts of south Devon and Cornwall, the Isles of Scilly, and at Lundy. Present on the south and west coasts of Ireland but common only in Galway and Donegal Bays.

**Global distribution**

South and west coasts of Britain and Ireland south to north-west Africa and present in the western...
Pink sea fan (*Eunicella verrucosa*) - Marine Life Information Network

Mediterranean (Carpine, 1975; Manuel, 1988).

**Habitat**

Found mainly on upward facing bedrock in areas where water movement (wave action or tidal streams) is moderately strong.

**Depth range**

4->50 m

**Identifying features**

- Profusely branching fan-shaped colonies with close-set polyps on warty protuberences (calyces).
- Sclerites are warty spindles in the inner coenenchyme and balloon-club shaped in the outer.
- Height up to 50 cm.
- Colour varies from white to deep orange-pink.

**Additional information**

May be confused with *Swiftia pallida*, which occurs in Scotland northwards to Scandinavia but is much less branched, has generally thinner branches and may be white or rose coloured.

**Listed by**

W&CPACT UKBAP SPI SPIW REDLIST FOCI

**Further information sources**

Search on:

G G G NBN WoRMS
# Biology review

## Taxonomy

<table>
<thead>
<tr>
<th>Phylum</th>
<th>Cnidaria</th>
<th>Sea anemones, corals, sea firs &amp; jellyfish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class</td>
<td>Anthozoa</td>
<td>Sea anemones, soft &amp; cup corals, sea pens &amp; sea pansies</td>
</tr>
<tr>
<td>Order</td>
<td>Alcyonacea</td>
<td></td>
</tr>
<tr>
<td>Family</td>
<td>Gorgoniidae</td>
<td></td>
</tr>
<tr>
<td>Genus</td>
<td>Eunicella</td>
<td></td>
</tr>
<tr>
<td>Authority</td>
<td>(Pallas, 1766)</td>
<td></td>
</tr>
<tr>
<td>Recent Synonyms</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Biology

<table>
<thead>
<tr>
<th>Typical abundance</th>
<th>Moderate density</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male size range</td>
<td>25-50 cm</td>
</tr>
<tr>
<td>Male size at maturity</td>
<td>25-50 cm</td>
</tr>
<tr>
<td>Female size range</td>
<td>25-50 cm</td>
</tr>
<tr>
<td>Female size at maturity</td>
<td>25-50 cm</td>
</tr>
<tr>
<td>Growth form</td>
<td>Arborescent / Arbuscular</td>
</tr>
<tr>
<td>Growth rate</td>
<td>1 cm/year</td>
</tr>
<tr>
<td>Body flexibility</td>
<td>High (greater than 45 degrees)</td>
</tr>
<tr>
<td>Mobility</td>
<td>Sessile</td>
</tr>
<tr>
<td>Characteristic feeding method</td>
<td>Passive suspension feeder</td>
</tr>
<tr>
<td>Diet/food source</td>
<td>Omnivore</td>
</tr>
<tr>
<td>Typically feeds on</td>
<td>Suspended matter including plankton</td>
</tr>
<tr>
<td>Sociability</td>
<td>Colonial</td>
</tr>
<tr>
<td>Environmental position</td>
<td>Epibenthic, Epilithic</td>
</tr>
<tr>
<td>Dependency</td>
<td>Independent.</td>
</tr>
<tr>
<td>Supports</td>
<td>Substratum</td>
</tr>
<tr>
<td>Is the species harmful?</td>
<td>No</td>
</tr>
</tbody>
</table>

## Biology information

The age of *Eunicella verrucosa* colonies can be determined (destructively) from growth rings in the axis. There is one growth ring per annum as evidenced by studies that measured growth rate in marked fans and then harvested the sea fans to count growth rings (Keith Hiscock, unpublished studies). Growth rate can be highly variable with an increase in branch length of up to 6 cm in some branches in one year and virtually none in others in Lyme Bay populations (C. Munro, pers. comm.) in one year. About 1 cm per annum increase in branch length was recorded in marked colonies at Lundy corresponding to measures of branch length correlated with the number of annual growth rings (Hiscock, unpublished studies).

The sea fan anemone *Amphianthus dohrnii* specifically lives on sea fans. The sea slug *Tritonia nilsohdneri* feeds on sea fans and is camouflaged to look like the sea fan. The 'poached egg shell'
Simnia patula feeds on sea fans and observations at Lundy (K. Hiscock, R. Irving pers. comm.) suggest that their egg laying might cause mortality. Other species colonize damaged or partially dead sea fans where the coenenchyme has been lost, especially barnacles, bryozoans and ascidians.

### Habitat preferences

<table>
<thead>
<tr>
<th>Physiographic preferences</th>
<th>Offshore seabed, Open coast, Strait / sound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biological zone preferences</td>
<td>Lower circalittoral, Upper circalittoral</td>
</tr>
<tr>
<td>Substratum / habitat preferences</td>
<td>Artificial (man-made), Bedrock, Large to very large boulders</td>
</tr>
<tr>
<td>Tidal strength preferences</td>
<td>Moderately Strong 1 to 3 knots (0.5-1.5 m/sec.)</td>
</tr>
<tr>
<td>Wave exposure preferences</td>
<td>Exposed, Moderately exposed, Sheltered, Very exposed</td>
</tr>
<tr>
<td>Salinity preferences</td>
<td>Full (30-40 psu)</td>
</tr>
<tr>
<td>Depth range</td>
<td>4-&gt;50 m</td>
</tr>
<tr>
<td>Other preferences</td>
<td>Found mainly on upward facing rock but occasionally on vertical surfaces.</td>
</tr>
<tr>
<td>Migration Pattern</td>
<td>Non-migratory / resident, Not relevant</td>
</tr>
</tbody>
</table>

#### Habitat Information

Older records suggest that the species occurred in the English Channel almost to the Thames Estuary (Margate). It may occur in south-west Scotland but records needed (Manuel, 1988).

### Life history

#### Adult characteristics

| Reproductive type | No information |
| Reproductive frequency | Annual episodic |
| Fecundity (number of eggs) | No information |
| Generation time | Insufficient information |
| Age at maturity | Insufficient information |
| Season | Insufficient information |
| Life span | 20-100 years |

#### Larval characteristics

| Larval/propagule type | Planula |
| Larval/juvenile development | Lecithotrophic |
| Duration of larval stage | No information |
| Larval dispersal potential | 100 -1000 m |
| Larval settlement period | Insufficient information |

#### Life history information
There is no specific information on reproduction in *Eunicella verrucosa* but observation of the occurrence of small colonies suggests that production and settlement of larvae are successful in occasional years in south-west Britain. The larvae are most likely lecithotrophic and have a short life (Weinberg & Weinberg, 1979). Colonies seem to take some time if ever to colonize wrecks that are distant (>1 km) from existing populations. Wrecks that are in close proximity (<50 m) to existing colonies have been colonized after four years (Hiscock *et al*., 2010). For the morphologically similar *Paramuricea clavata* in the Mediterranean, Coma *et al*. (1995) described reproduction and the cycle of gonadal development with spawning occurring 3-6 days after full or new moon in summer. Spawned eggs adhered to a mucus coating to female colonies: a feature that would be expected to have been readily observed if it occurred in *Eunicella verrucosa*. Maturation of planulae took place among the polyps of the parent colony and, on leaving the colony, planulae immediately settled on surrounding substrata. It seems more likely that planulae of *Eunicella verrucosa* are released immediately from the polyps and are likely to drift.
Sensitivity review

Resilience and recovery rates

*Eunicella verrucosa* forms large colonies which branch profusely, mostly in one plane up to 30 cm tall and 40 cm wide and grows very slowly in British waters, approximately 1 cm per year (Bunker, 1986; Picton & Morrow, 2005). There is no specific information on reproduction in *Eunicella verrucosa* but the larvae of *Eunicella singularis* are most likely lecithotrophic and have a short life (several hours to several days) (Weinberg & Weinberg, 1979).

Recruitment in gorgonians is reported to be sporadic and/or low (Yoshioka 1996; Lasker et al. 1998; Coma et al. 2006). The growth rate can be highly variable. An increase in branch length of up to 6 cm was reported in some branches in one year but virtually none in others in Lyme Bay populations over a year (C. Munro, pers. comm.). In the morphologically similar *Paramuricea clavata* in the Mediterranean, Coma et al. (1995) described reproduction and the cycle of gonad development. Spawning occurred 3-6 days after the full or new moon in summer. Spawned eggs adhered to a mucus coating on female colonies; a feature that would be expected to have been readily observed if it occurred in *Eunicella verrucosa*. Maturation of planulae took place among the polyps of the parent colony and, on leaving the colony, planulae immediately settled on surrounding substrata. It seems more likely that planulae of *Eunicella verrucosa* are released immediately from the polyps and are likely to drift.

Although not recovered, Sheehan et al. (2013) noted that within three years of closing an area in Lyme Bay, the UK to fishing, some recovery of *Eunicella verrucosa* had occurred, with a marked increase compared to areas that were still fished. *Eunicella verrucosa* was first recorded on the Scylla artificial reef four years after sinking. Colonies occurred on the bedrock reefs within 50 m of the wreck. Initial growth was reported as rapid (colonies were 1.5 cm high in August 2007 compared with 4-5 cm high by mid-December 2007) (Hiscock et al., 2010).

**Resilience assessment.** *Eunicella verrucosa* has been described as slow growing in the British Isles (Picton & Morrow, 2005), with short-lived larvae (Weinberg & Weinberg, 1975) and recovery is likely to be slow following population collapses. Following the creation of a no take zone in Lyme Bay, Sheehan et al. (2013) reported some recovery occurring within the first few years and Hiscock et al. (2010) recorded recruitment of *Eunicella verrucosa* on an artificial reef after four years. Therefore, where the species population is severely impacted (i.e. resistance is ‘None’) then resilience is assessed as ‘Low’ (recovery within 10-25 years). However, where resistance is ‘Low’ or ‘Medium’, resilience is assessed as ‘Medium’ (recovery within 2-10 years).

**Hydrological Pressures**

<table>
<thead>
<tr>
<th>Temperature increase (local)</th>
<th>Resistance</th>
<th>Resilience</th>
<th>Sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q: Low A: NR C: NR</td>
<td>High</td>
<td>High</td>
<td>Not sensitive</td>
</tr>
</tbody>
</table>

*Eunicella verrucosa* has been recorded in the western Mediterranean and off north-west Africa (Wells, 1983), and increase in temperature is not likely to negatively affect the species. However, during the last decades, mass mortality events related to high seawater temperature anomalies have been reported within the western Mediterranean basin. A mass mortality event in 1999 affected many gorgonians, although *Eunicella verrucosa* near Gallinaria Island was ‘little affected’.
Pink sea fan (*Eunicella verrucosa*) - Marine Life Information Network

(Cerrano *et al.* 2000). ‘Occasional’ mortality was observed in the shallowest populations along the Provence coast (at 37-38 m) during a high temperature event in 1999 where sea temperature was 23-24 °C throughout the water column to 40 m depth (Pérez *et al.* 2000). In 2003, the pink sea fan populations were affected in the Gulf of Genoa but not along the Provence coast (Garrabou *et al.* 2009). Although total mortality was not explicitly reported for this species, reduction in population size could be suspected, due to delayed mortality of colonies affected by high levels of injury, as observed in some other Mediterranean gorgonians (e.g. Linares *et al.*., 2005; Coma *et al.*, 2006).

**Sensitivity assessment.** Records of *Eunicella verrucosa* are concentrated in the south-west of the UK, with distribution as far south as North Africa and the Mediterranean. In UK waters, an increase in temperature at the benchmark level is unlikely to impact the species. Resistance is, therefore, assessed as ‘**High**’, resilience as ‘**High**’ and the species recorded as ‘**Not sensitive**’ at the benchmark level.

<table>
<thead>
<tr>
<th>Temperature decrease (local)</th>
<th>Medium</th>
<th>Medium</th>
<th>Medium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q: Low</td>
<td>A: NR</td>
<td>C: NR</td>
<td>Q: Medium</td>
</tr>
</tbody>
</table>

*Eunicella verrucosa* is a southern species, and its distribution is generally limited to the south-west of the British Isles (Hayward & Ryland, 1990; NBN, 2015). A decrease in temperature is likely to result in mortality. However, a live specimen collected from shallow depths off North Devon in 1973 exhibited growth rings that demonstrated that the colony had survived the 1962/63 cold winter (Hiscock, pers comm.). Also, large colonies were collected from Lundy in the late 1960’s suggesting no significant loss in 1962/63 (Hiscock, pers. comm.). Assuming that temperature decrease reduces recruitment, the population size might decline for a year but recovery would occur following successful recruitment.

**Sensitivity assessment.** *Eunicella verrucosa*, already close to its northern distribution limit, would likely suffer mortality in the event of a decrease in temperature, however, it appears to have survived the 1962/3 winter and may have some resistance to temporary changed. Resistance is, therefore, assessed as ‘**Medium**’, resilience as ‘**Medium**’ and sensitivity as ‘**Medium**’.

<table>
<thead>
<tr>
<th>Salinity increase (local)</th>
<th>No evidence (NEv)</th>
<th>Not relevant (NR)</th>
<th>No evidence (NEv)</th>
</tr>
</thead>
</table>

*Eunicella verrucosa* occurs in the circalittoral and an increase at the benchmark would result in a change from full to hypersaline conditions. No records of *Eunicella verrucosa* in hypersaline conditions was found. Chesher (1975) monitored the species surrounding a desalination outfall with brine effluent at 52‰ salinity, together with variable concentrations of copper and nickel. A group of ‘gorgonians’ were noted to survive brief exposure to 4-5% effluent, however, long-term survival decreased in relation to proximity to the outfall. ‘No evidence’ on the effects of hypersaline conditions on *Eunicella verrucosa* was found.

<table>
<thead>
<tr>
<th>Salinity decrease (local)</th>
<th>Low</th>
<th>Medium</th>
<th>Medium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q: Low</td>
<td>A: NR</td>
<td>C: NR</td>
<td>Q: Medium</td>
</tr>
</tbody>
</table>

*Eunicella verrucosa* typically occurs in the circalittoral and has only been recorded in 'Full salinity' biotopes (Connor *et al.*, 2004). No evidence for *Eunicella verrucosa* in low salinity conditions was found.

**Sensitivity assessment.** Whilst there is no specific evidence for *Eunicella verrucosa* in low salinity conditions, the species is known to occur in full salinity biotopes and has been recorded in hypersaline conditions. Resistance is, therefore, assessed as ‘**Low**’ and resilience as ‘**Medium**’. Sensitivity is assessed as ‘**Low**’.
conditions, it is probable that this species, which is typically found in circalittoral open water, would be affected adversely by a decrease in salinity at the benchmark level. Resistance is assessed as ‘Low’ (with low confidence), resilience as ‘Medium’ and sensitivity as ‘Medium’.

<table>
<thead>
<tr>
<th>Water flow (tidal current) changes (local)</th>
<th>Q: Medium A: Low C: Medium</th>
<th>Q: High A: High C: High</th>
<th>Q: Medium A: Low C: Medium</th>
</tr>
</thead>
</table>

Sea fans are found in strong tidal streams but most likely retract their polyps when current velocity gets too high for the polyps to retain food. Tidal streams exert a steady pull on the colonies and are, therefore, likely to detach only very weakly attached colonies. Colonies rely on water flow rates to bring food and to remove silt. Bunker (1986) reported that *Eunicella verrucosa* was present in areas subject to at least moderate tidal stream, but was most abundant in strong tidal streams. There is a tendency for *Eunicella verrucosa* to align across the direction of the prevailing current (Bunker, 1986). A substantial decrease in water flow will probably result in impaired growth due to a reduction in food availability, and an increased risk of siltation.

**Sensitivity assessment.** Whilst a significant decrease could result in less favourable conditions for *Eunicella verrucosa*, a change at the benchmark level (0.1-0.2 m/s) is unlikely to adversely affect the species, which has been recorded in a range of water flow conditions. Resistance is, therefore, assessed as ‘High’, resilience as ‘High’ and the species is recorded as ‘Not Sensitive’ at the benchmark level.

<table>
<thead>
<tr>
<th>Emergence regime changes</th>
<th>Not relevant (NR)</th>
<th>Not relevant (NR)</th>
<th>Not relevant (NR)</th>
</tr>
</thead>
</table>

Changes in emergence are Not Relevant to this species, which is restricted to fully subtidal conditions. The pressure benchmark is relevant only to species found in the littoral and shallow sublittoral fringe.

<table>
<thead>
<tr>
<th>Wave exposure changes (local)</th>
<th>High</th>
<th>High</th>
<th>Not sensitive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q: Low A: Low C: Low</td>
<td>Q: High A: High C: High</td>
<td>Q: Low A: Low C: Low</td>
<td></td>
</tr>
</tbody>
</table>

*Eunicella verrucosa* occurs in biotopes that are moderately to extremely wave exposed (Connor et al., 2004). Bunker (1986) reported that *Eunicella verrucosa* was most abundant in moderately exposed locations. However, dead sea fans have been recorded washed up along Chesil Beach (UK) following winter storms (Hatcher & Trehwella, 2006, cited in Wood, 2015b).

**Sensitivity assessment.** A significant decrease in wave exposure, e.g. due to artificial barriers, may be detrimental as *Eunicella verrucosa* is dependent on water flow for nutrition. Whilst storms may cause mortality, a 3-5% change in significant wave height is unlikely to result in impact. Therefore, resistance is assessed as ‘High’, resilience as ‘High’ and the species is recorded as ‘Not Sensitive’ at the benchmark level.

**Chemical Pressures**

<table>
<thead>
<tr>
<th>Transition elements &amp; organo-metal contamination</th>
<th>Resistance</th>
<th>Resilience</th>
<th>Sensitivity</th>
</tr>
</thead>
</table>

https://www.marlin.ac.uk/habitats/detail/1121
This pressure is **Not assessed** but evidence is presented where available. No evidence for *Eunicella verrucosa* was found. However, Chan *et al.* (2012) studied the response of the gorgonian *Subergorgia suberosa* to heavy metal-contaminated seawater from a former coastal mining site in Taiwan. Cu, Zn, and Cd each showed characteristic bioaccumulation. Metallic Zn accumulated but rapidly dissipated. In contrast, Cu easily accumulated but was slow to dissipate, and Cd was only slowly absorbed and dissipated. Associated polyp necrosis, mucus secretion, tissue expansion, and increased mortality were reported in *Subergorgia suberosa* exposed to water polluted with heavy metals.

**Hydrocarbon & PAH contamination**

This pressure is **Not assessed** but evidence is presented where available.

Oil pollution is mainly a surface phenomenon its impact upon *Eunicella verrucosa*, which occurs in the circalittoral, may be limited. However, as in the case of the *Prestige* oil spill off the coast of France, high swell and winds can cause oil pollutants to mix with the seawater and potentially negatively affect sublittoral habitats (*Castège et al.*, 2014).

Filter feeders are highly sensitive to oil pollution, particularly those inhabiting the tidal zones and bottom-dwelling organisms in areas where oil components are deposited by sedimentation (*Zahn et al.*, 1981). No evidence for *Eunicella verrucosa* was found, although White *et al.* (2012) reported on deep-water gorgonian communities, including *Swiftia pallida* six months after the *Deep Water Horizon* oil spill. Stress in the gorgonians was observed including excessive mucous production, retracted polyps and smothering by brown flocculent material (floc).

**Synthetic compound contamination**

This pressure is **Not assessed**.

**Radionuclide contamination**

No evidence was found.

**Introduction of other substances**

This pressure is **Not assessed**.

**De-oxygenation**

In general, respiration in most marine invertebrates does not appear to be significantly affected until extremely low concentrations are reached. For many benthic invertebrates this concentration is about 2 ml/l (ca 2.66 mg/l) (*Herreid, 1980; Rosenberg et al., 1991; Diaz & Rosenberg, 1995*). Cole *et al.* (1999) suggest possible adverse effects on marine species below 4 mg/l and probable adverse effects below 2 mg/l. No evidence was found concerning the effects of hypoxia for *Eunicella verrucosa*. However, as a species that lives in fully oxygenated waters in...
conditions of flowing waters, it is expected that it would be intolerant of decreased oxygen levels. Therefore, resistance is assessed as 'Low' (albeit with 'Low' confidence), resilience as 'Medium' and sensitivity assessed as 'Medium'.

Nutrient enrichment

<table>
<thead>
<tr>
<th></th>
<th>Resistance</th>
<th>Resilience</th>
<th>Sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not relevant (NR)</td>
<td>Not relevant (NR)</td>
<td>Not sensitive</td>
<td></td>
</tr>
</tbody>
</table>

Whilst *Eunicella verrucosa* could be at risk of competition from algae in shallow waters due to nutrient enrichment, the species is typically found in the circalittoral. Hiscock (2003) noted significant mortality of *Eunicella verrucosa* in Lundy, with parallels to a 1999 event in the north-west Mediterranean (Perez *et al.*, 2000) and an event described off Plymouth in 1924 (Marine Biological Association, 1957). Hiscock (2003) suggested that a warming event in combination with nutrient enrichment could trigger disease, resulting in mortality of the sea fans.

However, *Eunicella verrucosa* is considered to be 'Not sensitive' at the pressure benchmark that assumes compliance with good status as defined by the WFD.

Organic enrichment

<table>
<thead>
<tr>
<th></th>
<th>Resistance</th>
<th>Resilience</th>
<th>Sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>No evidence (NEv)</td>
<td>Not relevant (NR)</td>
<td>No evidence (NEv)</td>
<td></td>
</tr>
</tbody>
</table>

Organic enrichment leads to organisms no longer being limited by the availability of organic carbon. The consequent changes in ecosystem function can lead to the progression of eutrophic symptoms (Bricker *et al.*, 2008), changes in species diversity and evenness (Johnston & Roberts, 2009) and decreases in dissolved oxygen and uncharacteristic microalgal blooms (Bricker *et al.*, 1999, 2008). Indirect adverse effects associated with organic enrichment include increased turbidity, increased suspended sediment and the increased risk of deoxygenation.

Whilst *Eunicella verrucosa* could be at risk of competition from algae in shallow waters, the species is typically found in the circalittoral and feeds on both suspended organic matter and plankton (Cocito *et al.*, 2013). Hiscock (2003) noted significant mortality of *Eunicella verrucosa* in Lundy, with parallels to a 1999 event in the north-west Mediterranean (Perez *et al.*, 2000) and an event described off Plymouth in 1924 (Marine Biological Association, 1957). Hiscock (2003) suggested that a warming event in combination with nutrient enrichment could trigger disease, resulting in mortality of the sea fans.

Sensitivity assessment. Little empirical evidence was found to support an assessment of this species at this benchmark. The lack of direct evidence for *Eunicella verrucosa* has resulted in this pressure being assessed as 'No evidence'.

Physical Pressures

<table>
<thead>
<tr>
<th>Physical loss (to land or freshwater habitat)</th>
<th>Resistance</th>
<th>Resilience</th>
<th>Sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>Very Low</td>
<td>High</td>
<td></td>
</tr>
</tbody>
</table>

All marine habitats and benthic species are considered to have 'No resistance' to this pressure and to be unable to recover from a permanent loss of habitat. Sensitivity within the direct spatial footprint of this pressure is, therefore 'High'. Although no specific evidence is described confidence in the resistance assessment is 'High', due to the incontrovertible nature of this pressure.
Seafans may colonize artificial hard substratum such as wrecks. A change to an artificial hard substratum does not, therefore, automatically result in loss of suitable habitat for *Eunicella verrucosa*. Artificial substratum may differ in character from natural habitats and may be associated with other pressures such as the presence of oil leaking from fuel tanks or the discharge of other chemicals from cargo or the presence of antifoulant. However, a change to sedimentary substrata would result in the loss of suitable substratum for *Eunicella verrucosa*. Based on the loss of suitable habitat for the species, resistance to this pressure is assessed as ‘None’. Resilience is, therefore, assessed as ‘High’.

<table>
<thead>
<tr>
<th>Physical change (to another seabed type)</th>
<th>None</th>
<th>Very Low</th>
<th>High</th>
</tr>
</thead>
</table>

Habitat structure changes - removal of substratum (extraction)

E*unicella verrucosa* is epifaunal, occurs on rock, and would be sensitive to the removal of the habitat. However, extraction of rock substratum is considered unlikely and this pressure is considered to be ‘Not relevant’.

<table>
<thead>
<tr>
<th>Abrasion/disturbance of the surface of the substratum or seabed</th>
<th>Low</th>
<th>Medium</th>
<th>Medium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q: Medium A: Medium C: Low</td>
<td>Q: Medium A: Medium C: Medium</td>
<td>Q: Medium A: Medium C: Low</td>
<td></td>
</tr>
</tbody>
</table>
2006), and the coenenchyme covering the axial skeleton re-grew over scrapes on one side of the skeleton in about one week (Hiscock, pers. comm.). Hinz et al. (2011) reported that *Eunicella verrucosa* did not show a significant negative response (abundance or average body size) to scallop dredging intensity.

**Sensitivity assessment.** *Eunicella verrucosa* is sessile epifauna and is likely to be severely damaged by heavy gears, such as scallop dredging (MacDonald et al., 1996). However, some studies suggest that the species may be more resistant, particularly to low intensity lighter abrasion pressures, such as pots and associated anchor damage (Eno et al. 2001). Taking all the evidence into account, a resistance of ‘Low’ is recorded, albeit with a low confidence value owing to the lack of consensus in the literature. Resilience is assessed as ‘Medium’ and sensitivity assessed as ‘Medium’.

### Penetration or disturbance of the substratum subsurface

*Eunicella verrucosa* is epifaunal and occurs on rock, which is resistant to subsurface penetration. This pressure is ‘Not Relevant’ to species that occur on rock. However, the effects of ‘surface abrasion’ are discussed above.

<table>
<thead>
<tr>
<th>Changes in suspended solids (water clarity)</th>
<th>High</th>
<th>High</th>
<th>Not sensitive</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Q: Medium A: Medium C: Medium</td>
<td>Q: High A: High C: High</td>
<td>Q: Medium A: Medium C: Medium</td>
</tr>
</tbody>
</table>

While siltation may inhibit feeding, colonies of the sea fan *Eunicella verrucosa* produce mucus to clear themselves of silt (Hiscock, pers. comm.) and it is probably tolerant of increases in suspended sediment (Hiscock et al., 2004). Bunker (1986) reported that *Eunicella verrucosa* were mostly observed on bedrock or boulders but occurred at sites described as ‘moderately silted’. Williamson et al. (2011) recorded responses in the gorgonian *Leptogorgia virgulata* over 14 days to sedimentation treatments up to 20,000 mg /l. The gorgonians maintained healthy tissue and polyp feeding activity and did not show any symptoms or significant differences in tissue loss. A decrease in inorganic suspended solids is unlikely to impact *Eunicella verrucosa*, however, the species feeds on plankton and suspended organic matter (Cocito et al., 2013) and a reduction in suspended organic material could result in loss of nutrition. However, the species occurs in areas of moderate water movement and also feeds on plankton.

**Sensitivity assessment.** *Eunicella verrucosa* would probably resist some siltation and a change at the benchmark level is unlikely to cause mortality. Resistance is recorded as ‘High’, resilience as ‘High’ and the species is recorded as ‘Not sensitive’ at the benchmark level.

<table>
<thead>
<tr>
<th>Smothering and siltation rate changes (light)</th>
<th>High</th>
<th>High</th>
<th>Not sensitive</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Q: Medium A: Medium C: Medium</td>
<td>Q: High A: High C: High</td>
<td>Q: Medium A: Medium C: Medium</td>
</tr>
</tbody>
</table>

While siltation may inhibit feeding, colonies of the sea fan *Eunicella verrucosa* produce mucus to clear themselves of silt (Hiscock, pers. comm.). It is, however, thought that smothering causes mortality (Hiscock et al., 2004). Bunker (1986) reported that *Eunicella verrucosa* was mostly observed on bedrock or boulders but occurred at sites up to ‘moderately silted’. Sharrock (2012) described most colonies of *Eunicella verrucosa* around the wreck of the *Rosehill* as having a degree of silt around them. *Eunicella verrucosa* forms large colonies which branch profusely up to 50 cm in height but are more often up to 25 cm tall (Picton & Morrow, 2005, Sartoretto & Francour, 2012, Hiscock, pers.comm.).
**Sensitivity assessment.** Smothering by 5 cm would cover small *Eunicella verrucosa*, however, the species occurs in moderate water flow and the sediment would likely be removed rapidly. Therefore, resistance is assessed as 'High', resilience as 'High' and sensitivity is recorded as 'Not sensitive' at the benchmark level.

**Sensitivity assessment.** Smothering by 30 cm of sediment would likely bury *Eunicella verrucosa*. The species tends to occur in moderate to high energy environments and it is likely that the sediment would be removed. However, the damage to the resident community would depend on the time taken for the deposited sediment to be removed. Therefore, resistance is assessed as 'Low' as the worst-case scenario. Hence, resilience is probably 'Medium' and sensitivity is assessed as 'Medium'.

**Litter**

Not assessed. Ghost fishing by discarded fishing gear, lines and pots may cause some damage, discarded lines may get caught on *Eunicella verrucosa* and increase drag, especially in stormy weather. Fishing lines can cause lesions to the gorgonian coenenchyme, leading to greater aggregates of epibionts that can eventually cause the branch to rupture (Bo et al., 2014).

**Electromagnetic changes**

No evidence was found

**Underwater noise changes**

Not relevant

**Introduction of light or shading**

Not relevant

**Barrier to species movement**

Not relevant. This pressure is considered applicable to mobile species, e.g. fish and marine mammals rather than seabed habitats. *Eunicella verrucosa* colonies are sessile. Whilst barriers that
interfere with larval transport could reduce recruitment or entrain larvae depending on local conditions, dispersal is not considered under the pressure definition and benchmark.

**Death or injury by collision**
- Not relevant (NR)
  - Q: NR A: NR C: NR
  - Q: NR A: NR C: NR
  - Q: NR A: NR C: NR

*Not relevant* to species occurring on the seabed. NB. Collision by grounding vessels is addressed under ‘surface abrasion’.

**Visual disturbance**
- Not relevant (NR)
  - Q: NR A: NR C: NR
  - Q: NR A: NR C: NR
  - Q: NR A: NR C: NR

**Biological Pressures**

**Genetic modification & translocation of indigenous species**
- No evidence (NEv)
  - Q: NR A: NR C: NR
  - Q: NR A: NR C: NR
  - Q: NR A: NR C: NR

No evidence was found to suggest that *Eunicella verrucosa* was subject to translocation, hybridization, or genetic modification.

**Introduction or spread of invasive non-indigenous species**
- Medium
  - Q: Medium A: Low C: Medium
  - Q: Medium A: Medium C: Medium
  - Q: Medium A: Low C: Medium

*Solidobalanus fallax* is an invasive southern species barnacle only recently recorded in south west England (Southward *et al.*, 2004) and, along with hydroids and bryozoans, have been observed fouling (primarily damaged or diseased) gorgonians (Hall-Spencer *et al.*, 2007). Fouling smothers the sea fan polyps and the membrane that covers the skeleton thus killing the live tissue of the sea fan. Eventually this can weaken the fan structure to the extent that fragmentation occurs. This can be accentuated by the weight of fouling turf and attracted silt (Sharrock, 2012). Therefore, resistance is assessed as ‘Medium’, resilience as ‘Medium’ and sensitivity as ‘Medium’. Due to the constant risk of new invasive species, the literature for this pressure should be revisited.

**Introduction of microbial pathogens**
- Medium
  - Q: High A: Medium C: Medium
  - Q: Medium A: Medium C: Medium
  - Q: Medium A: Medium C: Medium

The first recorded incidence of cold-water coral disease was noted in *Eunicella verrucosa*, in south west England in 2002 (Hall-Spencer *et al.*, 2007). Video surveys in south west England from 2003 to 2006 of 634 separate colonies at 13 sites revealed that disease outbreaks were widespread and 9% of colonies had tissue necrosis. The coenenchyme became necrotic in diseased specimens, leading to tissue sloughing and exposing skeletal gorgonin to settlement by fouling organisms. Sites where necrosis was found had significantly higher incidences of fouling. No fungi were isolated from diseased or healthy tissue, but significantly higher concentrations of bacteria occurred in diseased specimens. *Vibrio* isolated from *Eunicella verrucosa* did not induce disease at
15°C, but, at 20°C, controls remained healthy and test gorgonians became diseased, regardless of whether Vibrio were isolated from diseased or healthy colonies. Bacteria associated with diseased tissue produced proteolytic and cytolytic enzymes that damaged Eunicella verrucosa tissue and may be responsible for the necrosis observed. Monitoring at the site where the disease was first noted showed new gorgonian recruitment from 2003 to 2006; 5 of the 18 necrotic colonies videoed in 2003 had died and become completely overgrown, whereas others had continued to grow around a dead central area. (Hall-Spencer et al., 2007)

**Sensitivity assessment.** Based on evidence of mortality linked to disease in Eunicella verrucosa (9% of colonies exhibited necrosis, but 13 of the 18 diseased colonies survived throughout the 3 years of monitoring. Resistance is, therefore, assessed as ‘Medium’, resilience as ‘Medium’ and sensitivity as ‘Medium’.

**Removal of target species**

<table>
<thead>
<tr>
<th>None</th>
<th>Low</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q: Low A: NR C: NR</td>
<td>Q: Medium A: Medium C: Medium</td>
<td>Q: Low A: Low C: Low</td>
</tr>
</tbody>
</table>

Eunicella verrucosa has historically been harvested as a curio by divers and was collected in the British Isles (Wells et al., 1983; Bunker, 1986). However, it is now protected under schedule 5 of the Wildlife and Countryside Act 1981 and harvesting is illegal. Eunicella verrucosa is sessile, epifaunal and would have no resistance to harvesting. Resistance has been assessed as ‘None’ and resilience as ‘Low’ so that sensitivity is assessed as ‘High’.

**Removal of non-target species**

<table>
<thead>
<tr>
<th>Low</th>
<th>Medium</th>
<th>Medium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q: Low A: NR C: NR</td>
<td>Q: Medium A: Medium C: Medium</td>
<td>Q: Low A: Low C: Low</td>
</tr>
</tbody>
</table>

Eunicella verrucosa is sessile epifauna and is likely to be severely damaged or removed by heavy gears, such as scallop dredging (MacDonald et al., 1996). However, some studies suggests that the species may be more resistant, particularly to low intensity lighter abrasion pressures, such as pots and associated anchor damage (Eno et al. 1996; Sheehan, 2013). Therefore, a resistance of ‘Low’ is recorded, albeit with a low confidence value owing to the lack of consensus in the literature. Resilience is assessed as ‘Medium’ and sensitivity is ‘Medium’.
Importance review

Policy/legislation

- Wildlife & Countryside Act: Schedule 5, section 9
- UK Biodiversity Action Plan Priority
- Species of principal importance (England)
- Species of principal importance (Wales)
- IUCN Red List: Vulnerable (VU)
- Features of Conservation Importance (England & Wales)

Status

- National (GB) importance: Not rare/scarce
- Global red list (IUCN) category: Vulnerable (VU)

Non-native

- Native
- Origin: Date Arrived: Not relevant

Importance information

*Eunicella verrucosa* provides an important habitat for two associated species: the sea slug *Tritonia nilsohdneri* and the sea fan anemone *Amphianthus dohrnii*. The 'poached egg shell' *Simnia patula* also occurs on *Eunicella* but *Alcyonium* spp. are a more favoured habitat. The pink sea fan is a charismatic species and one that illustrates slow growth and poor recovery potential if lost. Whilst listed as nationally scarce (Sanderson, 1996), the species is most likely more widespread than recorded. Also, there may be very large populations in some areas; for instance a population of half a million colonies is suggested for Lyme Bay (Anonymous, 2001)
Bibliography


Bunker, F., 1986. Survey of the Broad sea fan Eunicella verrucosa around Skomer Marine Reserve in 1985 and a review of its importance (together with notes on some other species of interest and data concerning previously unsurveyed or poorly documented areas). Volume I. Report to the NCC by the Field Studies Council.


www.jncc.gov.uk/MarineHabitatClassification.


Main, K., 1982. The early development of two oval snails, Simnia aequalis and Simnia barbarensis. The Veliger, 24, 252-258.


Theodor, J., 1967. Contribution a l’S&amp;#233;tude des gorgones (VI): la d&amp;#233;nu&amp;#233;ation des branches de gornones par dees mollusques pr&amp;#233;ur.&amp;#233; Vie et Milieu, 18, 73-78.


**Datasets**


