Sea fan anemone (*Amphianthus dohrnii*)

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

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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/1120]. All terms and the MarESA methodology are outlined on the website (https://www.marlin.ac.uk)

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Sea fan anemone on *Eunicella verrucosa*.
Photographer: Keith Hiscock
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See online review for distribution map

Distribution data supplied by the Ocean Biogeographic Information System (OBIS). To interrogate UK data visit the NBN Atlas.

Researched by	Dr Heidi Tillin, Dr Angus Jackson & John Readman	**Refereed by**	Admin
Authority	(Koch, 1878)		
Other common names	-	**Synonyms**	-

Summary

Description

A small sea anemone found attached to the stems of gorgonian corals (e.g. sea fans), hydroids and worm tubes. It rarely exceeds 1 cm across the disk but can, exceptionally, reach up to 2.5 cm along the axis of the base. The column is short and the base wraps around the tubular, organic, stems of its host. The colour is pink, buff, orange or red with streaks or splashes of opaque white. Its tentacles are short in length and arranged irregularly in four or five cycles of up to about 80 in number.

Recorded distribution in Britain and Ireland

Recorded from the west coast of Scotland but most frequently recorded "off Plymouth". Also recorded from the Lizard, Lundy and off the south-west and south coasts of Ireland.

Global distribution

Recorded from the Atlantic coast of France and into the western Mediterranean.

Habitat

It occurs attached to the branches of sea fans (*Eunicella verrucosa* and *Swiftia pallida*) and on other 'tubular' organisms such as *Tubularia indivisa*. Always sublittoral, sometimes in very deep water.

Depth range

10 - 1000 m

Identifying features

- Usually found attached to a gorgonian or hydroid.
- Base often elongated along axis of the substratum.
- Cinclides (pores in the column), if present, are few.
- Tentacles short or moderate, arranged irregularly, in 4 or 5 cycles, up to about 80 in number.
- Oral disc usually oval.
- It may secrete a layer of chitin between itself and the substratum

Additional information

No text entered

Listed by

UKBAP SPI[e] SBL

Further information sources

Search on:

G G G NBN WoRMS

Biology review

Taxonomy

Phylum	Cnidaria	Sea anemones, corals, sea firs & jellyfish
Class	Anthozoa	Sea anemones, soft & cup corals, sea pens & sea pansies
Order	Actiniaria	
Family	Amphianthidae	
Genus	Amphianthus	
Authority	(Koch, 1878)	
Recent Synonyms	-	

Biology

Typical abundance	Data deficient
Male size range	<1 cm
Male size at maturity	
Female size range	<1 cm
Female size at maturity	
Growth form	Radial
Growth rate	No information found
Body flexibility	Low (10-45 degrees)
Mobility	Temporary attachment
Characteristic feeding method	Passive suspension feeder, Predator
Diet/food source	Omnivore
Typically feeds on	Plankton and suspended particles.
Sociability	Not relevant
Environmental position	Epizoic
Dependency	Commensal with/on/in. *Eunicella verrucosa*, *Swiftia pallida*, *Tubularia indivisa* and other 'tubular' organisms.
Supports	None
Is the species harmful?	No information

Biology information

Frequent asexual reproduction can cause quite high densities of individuals on a single host.

Habitat preferences

Physiographic preferences	Open coast
Biological zone preferences	Lower circalittoral, Lower infralittoral, Upper circalittoral
Substratum / habitat preferences	Other species (see additional information)
Tidal strength preferences	Moderately Strong 1 to 3 knots (0.5-1.5 m/sec.), Weak < 1 knot (<0.5 m/sec.)

Wave exposure preferences	Exposed, Moderately exposed, Sheltered, Very exposed
Salinity preferences	Full (30-40 psu)
Depth range	10 - 1000 m
Other preferences	No text entered
Migration Pattern	Non-migratory / resident

Habitat Information

Substrata include the host species *Eunicella verrucosa* in England, *Swiftia pallida* in Scotland and other 'tubular' organisms such as *Tubularia indivisa*. Thought to be common in the first half of this century, however, now thought to be considerably less so. Numbers in the Mediterranean also appear to be decreasing.

Life history

Adult characteristics

Reproductive type	Fission
Reproductive frequency	No information
Fecundity (number of eggs)	Not relevant
Generation time	Insufficient information
Age at maturity	Insufficient information
Season	Insufficient information
Life span	20-100 years

Larval characteristics

Larval/propagule type	No information
Larval/juvenile development	No information
Duration of larval stage	Not relevant
Larval dispersal potential	No information
Larval settlement period	Not relevant

Life history information

Asexual reproduction is via a form of fission called basal laceration where the anemone creeps along a rock leaving fragments of its base behind which develop into miniature new anemones. As a result, the *Amphianthus dohrnii* may form dense aggregations on its host. Therefore dispersal may be limited as because asexual reproduction produces no planktonic larval phase. Nevertheless, while sexual reproduction and larval stages have not been recorded they may occur as the distribution of this species is widespread.

Sensitivity review

Resilience and recovery rates

The sea fan anemone *Amphianthus dohrnii* typically occurs on sea fans although it has also been recorded on other species such as hydroids but this is a rare occurrence (Sharrock, 2012). As the sea fans provide a biogenic habitat for the anemone the sensitivity and recovery of these (where impacted) is considered in the sensitivity assessments.

If the host species is removed from a location then it is unlikely that a substitute substratum could be found. Very little is known about the larval and reproductive biology of this species. It is probably long-lived. Asexual reproduction by basal laceration allows population persistence in suitable locations. A cluster of *Amphianthus dohrnii* was recorded on the same sea fan in Devon for 6 years (Sharrock, 2012). The number of individual anemones varied over time and it is not clear what happened to individuals, whether they died or drifted off or were predated (Sharrock, 2012).

Since *Amphianthus dohrnii* lives on sea fans which themselves have a limited lifespan, some pelagic dispersal and colonization must occur and the presence of single *Amphianthus dohrnii* on sea fans at a number of sites suggests that some pelagic dispersal occurs (Sharrock, 2012), supporting population spread and recovery. However, sexual reproduction has not been recorded. The deep sea congener *Amphianthus inornata* reproduces seasonally and genetic analysis indicates that sexual reproduction is more important than asexual reproduction (Bronsdon *et al.*, 1997). Successful recruitment events may be episodic. An alternative to larval dispersal is rafting by adults on flotsam. The species is mobile in a limited fashion and may be able to climb back onto suitable host species if displaced.

Recruitment in gorgonians is reported to be sporadic and/or low (Yoshioka 1996; Lasker *et al.* 1998; Coma *et al.* 2006). *Eunicella verrucosa* has been known to colonize wrecks at least several hundred metres from other hard substrata but is thought to have larvae that generally settle near the parent (Hiscock pers. comm.). 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.

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 1.5cm high in August 2007 compared with 4-5 cm high by mid-December 2007) (Hiscock *et al.*, 2010). Although not recovered, Sheehan *et al.* (2013) noted that within three years of closing an area in Lyme Bay, UK to fishing, some recovery of *Eunicella verrucosa* had occurred, with a marked increase compared to areas that were still fished.

Resilience assessment. Where there is no impact (resistance is 'High') the recovery of *Amphianthus dohrnii* is assessed as 'High', by default. If a proportion of a cluster of anemones are removed from a sea fan, recovery is likely through asexual reproduction of surviving anemones and resilience would be assessed as 'High' within two years. Where part of a population is removed from a location (resistance is 'Low' or 'Medium') but the habitat remains suitable recovery may occur through drifting or settlement of pelagic larvae produced by nearby adults and resilience is assessed as 'Medium' (within 2-10 years). If a whole population is removed from an area (resistance is 'None'), recolonization may depend on successful recruitment. As pelagic larvae may be short-lived and dispersal may be low, resilience is assessed as 'Low- Very low'. These recovery rates are also applicable to the sea fan *Eunicella verrucosa* (Readman & Hiscock, 2017).

Hydrological Pressures

	Resistance	Resilience	Sensitivity
Temperature increase (local)	Low Q: Low A: NR C: NR	Medium Q: Low A: NR C: NR	Medium Q: Low A: NR C: NR

Amphianthus dohrnii occurs in waters around the UK, south-western Europe and the Mediterranean. Over its range it experiences warmer air and sea temperatures than in the UK. Its range suggests that it is likely to be tolerant of warmer temperatures but it should be noted that local populations are likely to have adapted to local temperature regimes and assessments based on the range should be interpreted with caution. General observations on sea anemones show mortalities at raised temperatures. A short-term increase of 5°C is likely to kill some individuals of a population. A decrease in temperature may inhibit growth or reproduction.

Eunicella verrucosa has been recorded in the Western Mediterranean and off north-west Africa (Wells *et al.*, 1983 cited in Koomen & Helsdingen, 1996), 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' (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 40m depth (Perez *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, a certain 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).The seafan host, E*unicella verrucosa*, may, therefore, not be impacted by this pressure.

Sensitivity assessment. No direct evidence was found to assess the sensitivity of *Amphianthus dohrnii* to this pressure. This species occurs in the subtidal and compared with species from habitats which experience more variable temperatures such as the intertidal and estuaries is probably less tolerant of varying temperatures. A chronic increase at the pressure benchmark is likely to fall within natural variation experienced by this species and as it occurs within warmer waters over its range is likely to be tolerated. An acute increase at the pressure benchmark (5°C for a month) may exceed physiological tolerances, particularly if these occur when, or where, the anemones are acclimated to lower temperatures. As a precaution, resistance is assessed as 'Low' and resilience as 'Medium' so that sensitivity is assessed as 'Medium'.

	Resistance	Resilience	Sensitivity
Temperature decrease (local)	Low Q: Low A: NR C: NR	Medium Q: Low A: NR C: NR	Medium Q: Low A: NR C: NR

No direct evidence was found to assess this pressure. *Amphianthus dohrnii* occurs in waters around the UK, south-western Europe and the Mediterranean. The UK represents the most northern part of its range and it is likely to be sensitive to a decrease in temperature.

The host species, *Eunicella verrucosa* may also be impacted by decreased temperatures. *Eunicella verrucosa* is a southern species, 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.).

Sensitivity assessment. No direct evidence was found to assess the sensitivity of *Amphianthus dohrnii* to this pressure. This species occurs in the subtidal and compared with species from habitats which experience more variable temperatures such as the intertidal and estuaries is probably less tolerant of varying temperatures. A chronic decrease at the pressure benchmark is likely to fall within natural variation experienced by this specie and as it occurs within warmer waters over its range is likely to be tolerated. An acute decrease at the pressure benchmark (5°C for a month) may exceed physiological tolerances, particularly if these occur when, or where, the anemones are acclimated to lower temperatures. As a precaution, resistance is assessed as 'Low' and resilience as 'Medium' so that sensitivity is assessed as 'Medium'. Readman & Hiscock (2017) assessed the sensitivity of *Eunicella verrucosa* to this pressure as 'Medium', suggesting that a proportion of seafans is likely to remain following decreased temperatures to support recruitment.

Salinity increase (local)	Low Q: High A: Low C: NR	Medium Q: Low A: NR C: NR	Medium Q: Low A: Low C: NR

No direct evidence was found to assess the sensitivity of *Amphianthus dohrnii* to this pressure. This species only lives in fully saline habitats. An increase in salinity to hyposaline conditions (>40 ppt) may impact both the anemone and its host seafan. Whilst no evidence for *Eunicella verrucosa* sensitivity was found, there is evidence of gorgonian mortality due to hypersaline effluent. Chesher (1975) monitored the species surrounding a desalination outfall with brine effluent at 52‰ salinity, together with variable concentrations of copper and nickel. As a group gorgonians were noted to survive brief exposure to 4-5% effluent, however, long-term survival decreased in relation to proximity to the outfall.

Sensitivity assessment. An increase in salinity to hyposaline conditions may affect both *Amphianthus dohrnii* and its seafan hosts. Resistance is therefore probably 'Low', resilience 'Medium' and sensitivity is 'Medium'.

Salinity decrease (local)	Low Q: Low A: NR C: NR	Medium Q: Low A: NR C: NR	Medium Q: Low A: NR C: NR

Amphianthus dohrnii and its seafan hosts occur in full salinity (30-35 ppt), at the pressure benchmark, a change from full to variable salinity (18-30 ppt) is assessed. No direct evidence was found to assess this pressure but as no records from brackish or estuarine habitats were found for either the anemone or seafans, it is probable that *Amphianthus dohrnii* would be affected adversely by a decrease in salinity.

Sensitivity assessment. Whilst there is no specific evidence for sea fan anemone or seafans in low salinity conditions, it is probable that these species, which are 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'.

Water flow (tidal current) changes (local)	Medium Q: Low A: NR C: NR	Medium Q: Low A: NR C: NR	Medium Q: Low A: Low C: Low

Based on diving records *Amphianthus dohrnii* is absent in shallower sites around Plymouth with healthy sea fan populations that are exposed to greater levels of current and swell than preferred sites (Sharrock, 2012). Seafans are less sensitive and occur at shallower sites and those that are more exposed (Sharrock, 2012).

Sensitivity assessment. An increase in water flow at the pressure benchmark may result in less settlement of larvae but may enhance food supply to adult *Amphianthus dohrnii*. Resistance is assessed as 'Medium' and resilience as 'Medium' so that sensitivity is assessed as 'Medium'.

Emergence regime changes	Not relevant (NR) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR

This pressure is considered relevant only to species that inhabit the intertidal and sublittoral fringe and is, therefore, not relevant to *Amphianthus dohrnii* as it is found exclusively in subtidal habitats.

Wave exposure changes (local)	High Q: Low A: NR C: NR	High Q: High A: High C: High	Not sensitive Q: Low A: Low C: Low

Amphianthus dohrnii prefer deeper habitats that are less exposed and are more senstive to wave action than its seafan hosts which occur at shallower and more wave exposed sites (Sharrock, 2012). At the pressure benchmark a change in wave height is unlikely to impact seafan anemones.

Chemical Pressures

	Resistance	Resilience	Sensitivity
Transition elements & organo-metal contamination	Not Assessed (NA) Q: NR A: NR C: NR	Not assessed (NA) Q: NR A: NR C: NR	Not assessed (NA) Q: NR A: NR C: NR

This pressure is **Not assessed.**

Hydrocarbon & PAH contamination	Not Assessed (NA) Q: NR A: NR C: NR	Not assessed (NA) Q: NR A: NR C: NR	Not assessed (NA) Q: NR A: NR C: NR

This pressure is **Not assessed.**

Synthetic compound contamination	Not Assessed (NA) Q: NR A: NR C: NR	Not assessed (NA) Q: NR A: NR C: NR	Not assessed (NA) Q: NR A: NR C: NR

This pressure is **Not assessed.**

Radionuclide contamination	No evidence (NEv) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR	No evidence (NEv) Q: NR A: NR C: NR

No evidence.

Introduction of other substances	Not Assessed (NA) Q: NR A: NR C: NR	Not assessed (NA) Q: NR A: NR C: NR	Not assessed (NA) Q: NR A: NR C: NR

This pressure is **Not assessed.**

De-oxygenation	No evidence (NEv) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR	No evidence (NEv) Q: NR A: NR C: NR

No evidence was found to assess sensitivity.

Nutrient enrichment	High Q: Low A: NR C: NR	High Q: High A: High C: High	Not sensitive Q: Low A: Low C: Low

This pressure relates to increased levels of nitrogen, phosphorus and silicon in the marine environment compared to background concentrations. The pressure benchmark is set at compliance with Water Framework Directive (WFD) criteria for good status, based on nitrogen concentration (UKTAG, 2014). A change in nutrient enrichment to comply with 'good' status is unlikely to lead to impacts on *Amphianthus dohrnii* or its sea fan hosts. Resistance and resilience are assessed as 'High' and the sea fan anemone is considered 'Not sensitive' at the benchmark level.

Organic enrichment	High Q: Low A: NR C: NR	High Q: High A: High C: High	Not sensitive Q: Low A: Low C: Low

No evidence was found on the diet of *Amphianthus dohrnii* but it may be able to consume organic matter. As *Amphianthus dohrnii* on sea fans may accumulate silt (Sharrock, 2012), the anemone is not considered sensitive to the deposition of organic matter at the pressure benchmark. Cocito *et al.* (2013) demonstrated the ability of *Eunicella verrucosa* and other gorgonians to feed on both suspended organic matter and zooplankton.

Sensitivity assessment. The input of organic matter at the pressure benchmark may provide food for the anemone and its sea fan hosts. Resistance was assessed as 'High', resilience as 'High' and sensitivity as 'Not sensitive'.

Physical Pressures

	Resistance	Resilience	Sensitivity
Physical loss (to land or freshwater habitat)	None Q: High A: High C: High	Very Low Q: High A: High C: High	High Q: High A: High C: High

All marine habitats and benthic species are considered to have a resistance of 'None' to this pressure and to be unable to recover from a permanent loss of habitat (resilience is 'Very Low'). Sensitivity within the direct spatial footprint of this pressure is, therefore 'High'. Although no specific evidence is described, confidence in this assessment is 'High' due to the incontrovertible nature of this pressure.

Physical change (to another seabed type)	None Q: High A: High C: High	Very Low Q: High A: High C: High	High Q: High A: High C: High

Sea fans and thus sea anemones may colonize artificial hard substratum such as wrecks. A change to an artificial hard substratum does not, therefore, automatically result in loss of the population from a location. Recovery would depend on the colonization rate of sea fans. 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.

A change to sediments would result in the loss of suitable substratum for the sea fan hosts and in turn lead to the loss of the *Amphianthus dohrnii* population. Based on the loss of suitable host species following a change to a sedimentary habitat, resistance to this pressure is assessed as 'None'. Resilience is assessed as 'Very low' as the pressure benchmark refers to a permanent change. Sensitivity is, therefore 'High'. This assessment is recorded with high confidence based on the clear habitat requirements of the sea fan hosts.

Physical change (to another sediment type)	Not relevant (NR) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR

Not relevant to rock habitats.

Habitat structure changes - removal of substratum (extraction)	Not relevant (NR) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR

The sea fan hosts are epifaunal, occurring 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'. (N.B. extraction of sea fans is assessed under the removal of target and non-target species pressures).

Abrasion/disturbance of the surface of the substratum or seabed	Low Q: Low A: NR C: NR	Medium Q: Low A: NR C: NR	Medium Q: Low A: NR C: NR

No specific evidence was found to assess the sensitivity of *Amphianthus dohrnii* to abrasion. *Amphianthus dohrnii* is epifaunal, soft bodied and highly likely to be killed by physical disturbance, however, where abrasion damages individuals they may recover through regrowth and the effect may be to produce more anemones via regrowth of fragments.

The host species sea fans are also likely to be intolerant of abrasion. *Eunicella verrucosa* has some resistance to some forms of abrasion. Eno *et al*. (2001) conducted experimental potting on areas containing fragile epifaunal species in Lyme Bay, south west England. Divers observed that pink sea fan 'flexed and bent before returning to an upright position under the weight of pots'. Although relatively resistant to a single event it was not clear whether repeated exposure could cause further damage or whether injuries had been inflicted that could lead to deterioration (Eno *et al*., 2001). Observation of pots suggested that they were dragged along the bottom when wind and tidal streams were strong, however, little damage to epifauna was observed. *Eunicella verrucosa* were patchily distributed in areas subject to potting damage, but the study could not determine whether this was due to damage from potting (Eno *et al*., 2001). A further four year study on potting in the Lundy Marine Protected Area detected no significant differences in *Eunicella verrucosa* between areas subject to commercial potting and those where this activity was excluded. Tinsley (2006) observed flattened sea fan that had continued growing, with new growth being aligned perpendicular to the current, so even colonies of *Eunicella verrucosa* that are damaged can survive. Healthy *Eunicella verrucosa* were able to recover from minor damage and scratches to the coenenchyme (Tinsley, 2006), and the coenenchyme covering the axial skeleton would re-grow 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. No evidence was found to assess the sensitivity of *Amphianthus dohrnii*, as it is dependent on its seafan host the sensitivity assessment is based on the seafan *Eunicella verrucosa*. *Eunicella verrucosa* is likely to be severely damaged 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) 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 as 'Medium'. Confidence is assessed as low as the evidence refers to the host seafan rather than *Amphianthus dohrnii*.

Penetration or disturbance of the substratum subsurface	Not relevant (NR) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR

The species characterizing this biotope group are epifauna or epiflora occurring on rock which is resistant to subsurface penetration. The assessment for abrasion at the surface only is therefore considered to equally represent sensitivity to this pressure. This pressure is considered 'Not Relevant' to hard rock species and habitats.

Changes in suspended solids (water clarity)	High Q: Low A: NR C: NR	High Q: High A: High C: High	Not sensitive Q: Low A: Low C: Low

Amphianthus dohrnii attached to sea fans often collect silts and some may be heavily silted (Sharrock, 2012), suggesting that they are tolerant of increases in siltation associated with increased sediments in the water column. While siltation may inhibit feeding, colonies of the sea fan *Eunicella verrucosa* produce mucus to clear themselves of silt (Hiscock, pers. comm.) and 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.

Sensitivity assessment. *Amphianthus dohrnii* and its sea fan hosts would probably tolerate an increase in suspended sediments and some siltation and a change at the benchmark level is unlikely to cause mortality although there may be some sub-lethal effects on feeding and hence growth and possibly reproduction. Resistance is recorded as 'High', resilience as 'High' and the species is 'Not sensitive' at the benchmark level. A decrease in suspended inorganic solids is unlikely to lead to negative effects on the anemones or seafan hosts but a reduction in suspended organic matter may reduce food supply to anemones and sea fans may reduce food supply but this could be mitigated by enhanced phytoplankton productivity.

Smothering and siltation rate changes (light)	High Q: Low A: NR C: NR	High Q: High A: High C: High	Not sensitive Q: Low A: Low C: Low

Amphianthus dohrnii attached to sea fans often collect silts and some may be heavily silted (Sharrock, 2012), suggesting that they are tolerant of increases in siltation associated with sediment deposition. At the pressure benchmark (deposition of 5cm of fine sediment) the anemone is unlikely to be directly smothered as it tends to occur on the top of sea fans (Sharrock, 2012) and will, therefore, be too high above the substratum to be covered.

While high levels of suspended sediment may inhibit feeding, colonies of the sea fan *Eunicella verrucosa* produce mucus to clear themselves of silt (Hiscock, pers comm.). Bunker (1986) reported that *Eunicella verrucosa* were mostly observed on bedrock or boulders but occurred at sites up to 'moderately silted'.

Sensitivity assessment. *Amphianthus dohrnii* tends to occur on the top of sea fans (Sharrock, 2012) and is therefore unlikely to be affected at the benchmark level. Resistance is therefore assessed as 'High', resilience as 'High' and the species is 'Not sensitive'.

Smothering and siltation rate changes (heavy)	Low Q: Low A: NR C: NR	Medium Q: Low A: NR C: NR	Medium Q: Low A: Low C: Low

Smothering by 30 cm of sediment would likely bury the majority of sea fans and the associated *Amphianthus dohrnii*, with only those individuals on larger boulders and vertical surfaces escaping burial. *Amphianthus dohrnii* appears to prefer sites without strong wave action and currents (Sharrock, 2012) and removal of sediments by water may require some time. The damage to the anemones and sea fans would depend on the time taken for the deposited sediment to be removed. Resistance is assessed as 'Low' as there may be mortality of substantial numbers of sea fans and anemones, resilience is probably 'Medium' and sensitivity is assessed as 'Medium'.

Litter	Not Assessed (NA) Q: NR A: NR C: NR	Not assessed (NA) Q: NR A: NR C: NR	Not assessed (NA) Q: NR A: NR C: NR

Not assessed.

Electromagnetic changes	No evidence (NEv) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR	No evidence (NEv) Q: NR A: NR C: NR

No evidence.

Underwater noise changes	Not relevant (NR) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR

Neither *Amphianthus dohrnii* nor its host species are likely to react to noise vibrations and this pressure is considered to be 'Not relevant'.

Introduction of light or shading	Not relevant (NR) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR

Not relevant, neither *Amphianthus dohrnii* or *Eunicella verrucosa* are likely to be directly impacted by changes in light levels.

Barrier to species movement	Not relevant (NR) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR

Not relevant: barriers and changes in tidal excursion are not relevant to species restricted to open waters.

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

'Not relevant' to seabed habitats and associated species. NB. Collision by interaction with bottom towed fishing gears and moorings are addressed under 'surface abrasion'.

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

Neither *Amphianthus dohrnii* nor its host species are likely to react to visual disturbance and this pressure is considered to be 'Not relevant'.

Biological Pressures

	Resistance	Resilience	Sensitivity
Genetic modification & translocation of indigenous species	Not relevant (NR) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR

Amphianthus dohrnii and the sea fans they grow on are not cultivated or translocated. This pressure is therefore considered 'Not relevant' to this species.

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

No direct evidence was found for impacts of invasive non-indigenous species (INIS) on *Amphianthus dohrnii*. Non-indigenous species may have indirect effects on the sea fan anemone where they lead to mortality or changes in distribution of the seafan hosts.

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 associated with *Amphianthus dohrnii* (Sharrock, 2012). The barnacle may impact *Amphianthus dohrnii* either thorugh space pre-emption on seafans or through damage and loss of seafans.

Sensitivity assessment. Resistance is assessed as 'Medium', resilience as 'Medium' and sensitivity as 'Medium'.

Introduction of microbial pathogens	Medium Q: Low A: NR C: NR	Medium Q: Low A: NR C: NR	Medium Q: Low A: Low C: Low

No evidence was found to assess the sensitivity of *Amphianthus dohrnii* to microbial pathogens.

A number of diseases may affect the seafan hosts. 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. 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*, resistance is assessed as 'Medium', resilience as 'Medium' sensitivity as 'Medium'. Confidence is low as the impacts of diseases on seafan host habitat provision to *Amphianthus dohrnii* is not clear.

Removal of target species	Not relevant (NR) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR	Not relevant (NR) Q: NR A: NR C: NR

Amphianthus dohrnii is not targeted by commercial or recreational fishers or harvesters. This pressure is therefore considered 'Not relevant'.

Removal of non-target species	None Q: Low A: NR C: NR	Low Q: Low A: NR C: NR	High Q: Low A: Low C: Low

Amphianthus dohrnii may be indirectly impacted by commercial or recreational collecting or fishing activities that affect the sea fans that it occurs on leading to habitat loss. *Amphianthus dohrnii* is likely to be removed if the sea fan it is associated with is removed.

Eunicella verrucosa has historically been harvested as a curio by divers and was collected in the British Isles (Bunker, 1986; Wells *et al*., 1983 cited in Koomen & Helsdingen, 1996), however it is now protected under schedule 5 of the Wildlife and Countryside Act 1981 and harvesting is illegal.

Sensitivity assessment. The biogenic habitat provided by *Eunicella verrucosa* or *Swiftia pallida* would have no resistance to harvesting. Resistance has been assessed as ‘None’, resilience as ‘Low’ and sensitivity is therefore ‘High’.

Importance review

Policy/legislation

UK Biodiversity Action Plan Priority	☑
Species of principal importance (England)	☑
Scottish Biodiversity List	☑

Status

National (GB) importance	Nationally rare	**Global red list (IUCN) category**	-

Non-native

Native	Native		
Origin	-	**Date Arrived**	-

Importance information

Formerly common in the English Channel and around southern Ireland. Recently, however, this anemone appears to have become rare (Manuel, 1988). Stephenson (1935) noted that "numerous specimens taken off Plymouth, where it is not uncommon (e.g. on the Mewstone ledge, etc.)" but it is now very rarely seen at the Mewstone (Hiscock *et al*., 2011). Numbers in theMediterranean also appear to be decreasing (Manuel, 1988). Abundance declined significantly on a wreck in Bigbury Bay since the 1980's but may have increased on another wreck in Whitsand Bay (Hiscock *et al*., 2011). The species may have variable recruitment at different locations. Hiscock *et al*. (2011) estimated that this species had experienced at least a 50% decrease over the last 75 years.

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