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Marine Macrofauna Genus Trait Handbook

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Marine Ecological Surveys Limited 2007. *Predictive framework for assessment of recoverability of marine benthic communities following cessation of aggregate dredging.* Technical Report to the Centre for Environment, Fisheries and Aquaculture Science (CEFAS) and the Department for Environment, Food and Rural Affairs (Defra). Project No MEPF 04/02. Marine Ecological Surveys Limited, 24a Monmouth Place, BATH, BA1 2AY. pp. 115 + electronic appendices pp. 466.

For any other use of this material please contact the publisher:

Marine Ecological Surveys Limited
24a Monmouth Place
BATH
BA1 2AY

Tel:+44(0)1225442211
Fax:+44(0)1225444411

Email: marine@seasurvey.co.uk

www.seasurvey.co.uk

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Fax:+44(0)1225444411

Email: marine@seasurvey.co.uk

www.seasurvey.co.uk

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PREFACE

All applications for a licence to dredge sand and gravel from the seabed in the waters of England & Wales require an Environmental Impact Assessment (EIA) to be carried out to inform the Consent process. The EIA includes a detailed assessment of the environmental resources in the application area and surrounding deposits, an assessment of the potential impacts of dredging, and of the likely nature and rate of 'recovery' of biological resources following cessation of dredging.

The nature and scale of the effects of aggregate dredging on biological resources on the seabed, both within the comparatively small zones within a Licence Area that are dredged, and in the surrounding deposits are now moderately well-understood. In contrast, the nature of the recovery processes and the rate of recolonisation and restoration of biomass following growth of the colonising individuals, are both site-specific and variable. Studies on selected Licence Areas where dredging has ceased have thus been of limited value in predicting likely processes and rates of recovery at other sites where dredging has yet to take place. Those engaged in preparation of EIA documents, or in reviewing them for advice to Regulators, therefore face real difficulties in making anything other than broad generalisations on which components of seabed communities are likely to recover following cessation of dredging, and the time over which this is likely to occur.

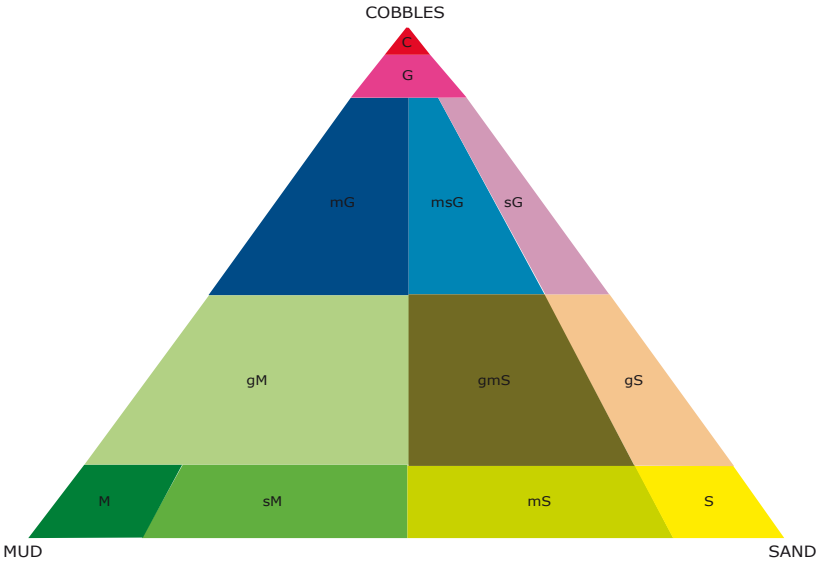
This Handbook is intended to assist in the assessment of the impacts of marine aggregate dredging on living resources of the seabed, as well as in the prediction of the potential that individual genera have to recolonise, and the time that may be required for restoration of the biomass by growth of the colonising individuals.

In order to achieve this, we have identified the characterising benthic organisms from a series of surveys carried out in 2006 in a range of sand and gravel deposits at representative sites in English coastal waters. Ten samples were taken with a 0.1m^2 Hamon grab, supplemented by samples taken with an anchor dredge and with a 2m beam trawl in the un-dredged vicinity of each of twenty aggregate licence sites from the Wash, Thames, East Channel, Wight, Bristol Channel & Liverpool Bay sea areas[1],[2].

Multivariate analysis of the communities at each of the sites allowed definition of the characterising genera for deposits ranging from cobbles and stones through to muddy sands. The results for sediment analysis were summarised in terms of percentage gravel, sand and silt and were subsequently classified using the Folk system (Folk, 1954). This was modified to include a coarse 'cobble' category as shown in Figure 1 to allow a more accurate description of some of the seabed deposits in the survey areas.

[1] Marine Ecological Surveys Ltd 2007. Predictive framework for assessment of recoverability of marine benthic communities following cessation of aggregate extraction. Technical Report to Cefas and the Department for Environment, Food & Rural Affairs (Defra). Project No. MEPF 04/02. Marine Ecological Surveys Ltd., 24A Monmouth Place, Bath BA1 2AY. Pp. 115 + electronic appendices pp. 466.

[2] Newell,R.C., Robinson, J.E., Pearce, B., Seiderer, L.J., Warwick, R.M., Somerfield, P.M., Clarke, K.R., Jenkins, H., Beer, N., Burlinson, F & Stacey, K. 2007. A predictive framework for assessment of recoverability of marine benthic communities following cessation of aggregate dredging. Pp. 158-163 **In:** *Marine Aggregate Extraction: Helping to determine good practice.* Eds. R.C.Newell & D.J.Garner. Marine Aggregate Levy Sustainability Fund (ALSF) Conference Proceedings.



M.....Mud
sM.....Sandy Mud
S.....Sand
mS.....Muddy Sand
gM.....Gravelly Mud
gmS.....Gravelly Muddy Sand
gS.....Gravelly Sand
mG.....Muddy Gravel
msG.....Muddy Sandy Gravel
sG.....Sandy Gravel
G.....Gravel
C.....Cobbles

Figure 1. Folk classification used to classify sediments. The classification C has been applied to cobble habitats. Based loosely on the classification of R.L. Folk, 1954. J.Geol., **62**, pp344-359.

This Biological Traits Handbook summarises the information that is available on the biology and traits that are relevant to assessment of the sensitivity to disturbance, and recoverability for genera of macrofauna that characterise marine sands and gravels in UK coastal waters. It is intended that this will assist in an objective assessment of the nature and scale of impacts of aggregate dredging on the characterising genera of marine benthos in marine sands and gravels, and of the likely time that individual genera may take to recolonise and grow to maturity following cessation of dredging.

INTRODUCTION

1. IMPACTS OF AGGREGATE DREDGING ON MARINE BENTHOS

Direct Effects of Dredging.

Dredging is generally carried out by a suction-trailer dredger that is capable of operating in up to 50m water depth, although most near-shore Licence Areas are in water depths of about 30m. The dredger can operate from a fixed position or, more usually, whilst steaming parallel with the tidal stream at about 3knots, during which time aggregates are removed with a centrifugal pump in a draghead on the seabed and pumped up into the hold of the vessel.

Since very few benthic organisms are capable of avoiding entrainment into the draghead if it passes over the deposits in which they live, it follows that most marine benthos is 'vulnerable' to the direct impacts of aggregate dredging. The extent of impact on the benthic fauna as a whole depends on the intensity of dredging over a Licence Area. Where the dredging intensity is high, then losses of 80-90% of the population density and biomass of marine benthos have been reported. In other sites where the dredging intensity is lower and over a broader area, the overall losses are reported to be 20-30%.[3]

Many recent Licence Areas have an active 'zoning' plan incorporated into the management of an aggregate area. This involves intensive dredging over a relatively small part of the Licence Area and movement to a different zone once resources are depleted. This minimises the area that is dredged at any one time and allows a maximal time for recovery at those zones where dredging has ceased.

It follows from this that some impacts of dredging on marine benthos within the small zones that are actively dredged are likely to be unavoidable. The main factors that need to be taken into account are therefore those that control the recolonisation and subsequent 'recovery' of the marine benthos once dredging has ceased.

Indirect Effects of Dredging:

The aggregates that are dredged from the seabed may be immediately suitable for end-use as beach-feed, and for aggregate supply for a range of purposes. In this case the material can be shipped to the wharfs ashore as an 'all-in' cargo for further processing to meet market requirements.

In many cases, however, the gravel:sand ratio of the cargo needs to be adjusted to meet customer requirements. Where the proportion of sand in seabed deposits is higher than required ashore, the gravel:sand ratio of the cargo is adjusted by passing the dredged material through screening towers so that an appropriate ratio is achieved in the cargo.

[3] Newell, R.C., Seiderer, L.J. & Hitchcock, D.R. 1998. The impact of dredging works in coastal waters: a review of the sensitivity to disturbance and subsequent recovery of biological resources on the seabed. *Oceanography and Marine Biology: an Annual Review*, **36**, 809-818.

The sand that is mobilised by the dredging process settles rapidly to the seabed near to the dredge site. Most studies show that coarse material settles almost immediately below the dredger and that even sand-sized particles settle within 300-500 metres of the point of discharge. This means that most deposition is confined to the immediate vicinity of the actively-dredged zone, and within the boundaries of the Licence Area. There is, however, some evidence that fine sand deposited from the screening process may be mobilised by seabed currents and dispersed as a thin surface veneer for distances of up to 2-3km in areas where seabed currents are strong[4].

Summary of Potential Effects:

The 'footprint' of aggregate extraction thus comprises several components:-

- impacts directly under the path of the draghead in the actively-dredged zones.
- the effects of deposition of sediment on the seabed immediately adjacent to the path of the dredger. This could potentially lead to smothering of organisms that are unable to resurface.
- the effects of increased quantities of suspended sediment on the respiratory and feeding systems of resident organisms, many of which are filter-feeders.
- The effects of an alteration of the surface deposits from gravels and sandy gravels to fine sand. This may prevent recolonisation by organisms that originally occurred in the deposits and which require solid substrata for settlement.

It should be emphasised that it is a requirement of most recent licences that after cessation of dredging the seabed shall remain in a similar composition to that which occurred prior to dredging. With that in mind, most dredging licences require surface deposits of at least 1 metre depth to be retained at the cessation of dredging, to allow as far as possible recolonisation by a similar range of organisms that comprised the original benthos.

2. TRAITS RELEVANT TO PREDICTION OF RECOVERABILITY

Our knowledge of the biology and life-history of even the common invertebrates that characterise marine sands and gravels is surprisingly sparse. We have carried out a comprehensive search of the literature and have added information based on cohort analysis, growth ring data and estimated life-spans and body size data of the genera collected in our surveys. This has provided information on key traits that we consider to be important in controlling vulnerability to disturbance and subsequent recoverability of key characterising genera of marine sands and gravels in UK waters.

Out of a possible 25 traits, we have acceptable data for 6 traits which were selected as probably the most significant ones in predicting recoverability and for which a reasonable amount of data from both published sources and our own analyses were available. These were:-

- Size
- Life-span
- Age at reproductive maturity
- Fecundity
- Larval mode
- Mobility of adults

These traits were assigned a 'score' that allows an estimate of the relative vulnerability to disturbance and recoverability of the genera likely to be encountered as characterising taxa in marine sands and gravels.

This information can then be used to estimate the likely time for restoration of BIODIVERSITY by recolonisation, and for subsequent restoration of BIOMASS following the growth of colonising individuals during the life-span of the particular genera encountered in the deposits.

[4] Newell, R.C., Seiderer, L.J., Robinson, J.E., Simpson, N.M., Pearce, B & Reeds, K.A. 2004. Impacts of overboard screening on seabed and associated benthic biological community structure in relation to marine aggregate extraction. Technical Report to the Office of the Deputy Prime Minister (ODPM) and Minerals Industry Research Organisation (MIRO). 152 pp. Project No SAMP.1.022. Marine Ecological Surveys Ltd.

Basically, small organisms with a high fecundity and a short life-span are likely to have a higher recoverability compared with larger organisms with a long life-span and slower growth rate. Organisms with a long planktonic phase are likely to colonise rapidly from sources outside of a disturbed area compared with those with a short planktonic phase or which have no planktonic larval phase. Again, genera with mobile adults are likely to be able to accommodate sediment deposited by the dredging process, and may also have the potential for recolonisation by adults as well as juveniles.

HOW TO USE THIS TRAIT HANDBOOK

Identification of Characterising Genera:

Our surveys suggest that 'biodiversity' based on the number of characterising taxa in marine deposits is related in a complex way to sediment type with mixed sands and gravels supporting a higher biodiversity of benthic infauna than muddy sand and cobbles.

Once the characterising taxa have been defined for a particular deposit type or survey area, the vulnerability and recoverability of each of the characterising genera can then be identified from the information given for each of the characterising genera on the following pages. Provided that the substrate remains suitable for recolonisation following cessation of dredging, the rate of recolonisation and growth for a suite of genera can then be assembled for the characterising community identified in a particular survey site.

Some short-lived and fast growing components of the community that may have a long larval phase are likely to recolonise and grow to adult size in a short time, but other components including some of the larger molluscs may take several years to achieve successful settlement and several (or many) years before the biomass is restored by growth of the colonising individuals. The predicted restoration of biodiversity by recolonisation and of community structure by growth of the colonising organisms is thus likely to be sequential and heavily dependent on the nature of the deposits and resident community that occurs prior to dredging.

Traits Information:

Traits information for each of the genera is entered on a separate page in alphabetical order. The entry contains a brief description of the features of the life-history and reproductive biology that are relevant to assessment of the impacts of aggregate dredging and subsequent recolonisation and growth. These features are summarised in tabular form into a 'Traits Diagram' using symbols for the six key traits listed above.

An example of the trait template that we have used to summarise the information for the genera is shown in Figure 2.

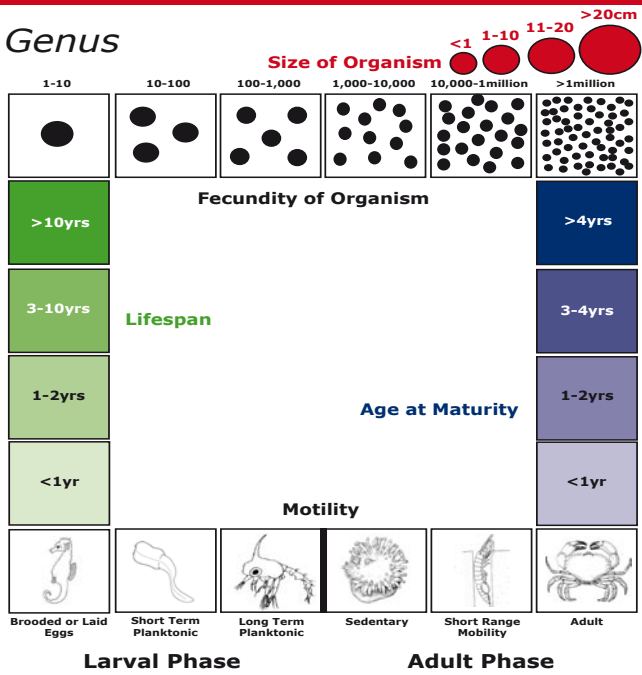


Figure 2. Legend to the trait template which was used to summarise the genera presented in this handbook.

Bottom Row: Symbols used for three different larval modes:- brooded larvae or laid eggs, a short-term larval phase and a long larval phase. Also shown are symbols for the mobility of the adults from sedentary to short-range mobility and to mobile adults.

Left Axis: This shows the life-span categories into which each of the genera have been grouped. These range from <1 year, 1-2 years, 3-10 years and >10 years.

Right Axis: This shows the age at reproductive maturity for each genus. It ranges from <1 year, 1-2 years, 3-4 years and > 4 years.

Top Axis: This shows both the fecundity and the size of the particular genus. The fecundity values range from 1-10 eggs, 10-100, 100-1000, 1000-10,000, 10,000-1 million and >1 million eggs. The body size of the genus ranges from <1cm, 1-10cm, 11-20cm and >20cm.

Each page also shows a colour code for the type of deposit in which the genus is found, based on the Folk classification diagram shown in Figure 1.

Where there is insufficient information to assess a particular relevant trait, we have estimated the value from information for related genera. These values are shown in grey in the traits diagrams to indicate an uncertainty in the value shown for a particular genus.

GLOSSARY

Note that the glossary is more comprehensive than the Marine Macrofauna Genus Trait Handbook might require. It does however cover a number of terms which appear in associated documents.

REFERENCES

An abbreviated reference list is included in this handbook. A full reference list is included in the interactive electronic version of this report. Where there is insufficient information to include a separate page for a particular genus, we have included the relevant references both in the abbreviated reference list and in the full reference list.

INTERACTIVE ELECTRONIC CD

An interactive electronic copy of this handbook has been included for your convenience.

Marine Ecological Surveys Limited
February 2008

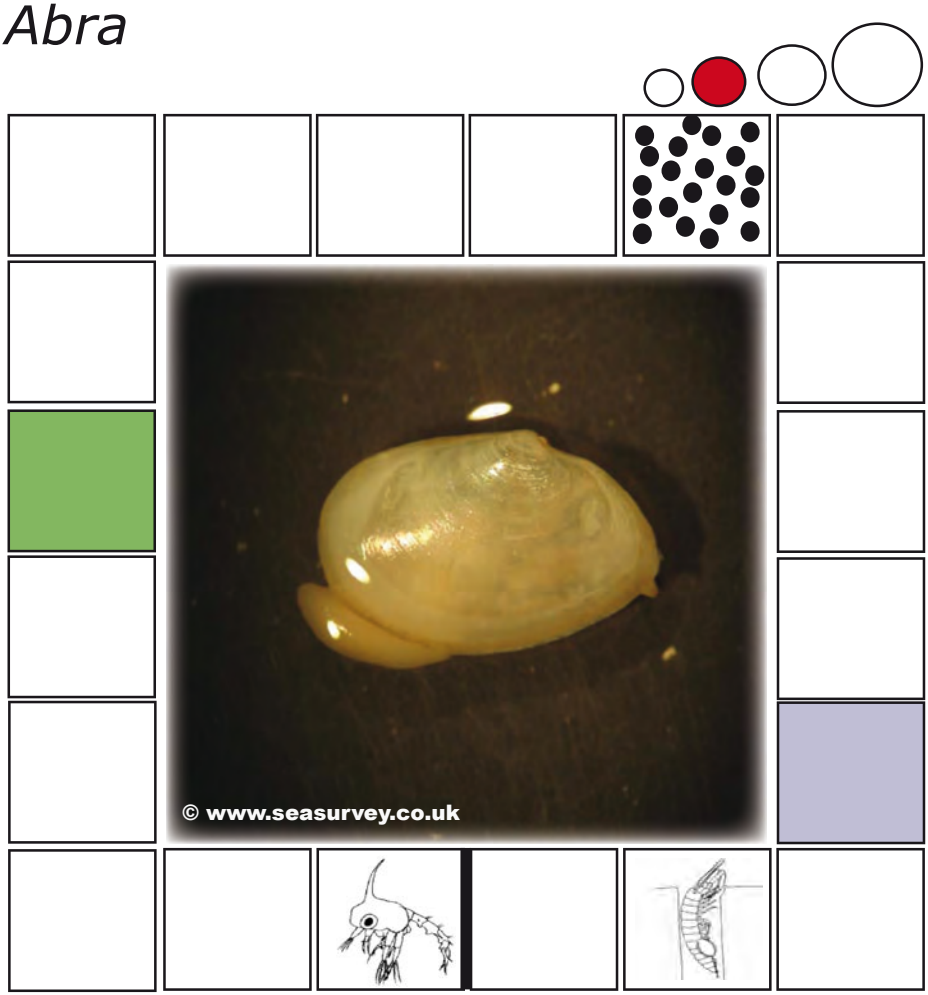
Abietinaria

VULNERABLE

Vulnerability: *Abietinaria* is an erect Hydroid which grows to a height of 10-30cm & is attached to gravel, stones & shell fragments. Like all hydroids this genus is sedentary & is therefore unable to evade either the direct impacts of dredging or the deposition of sediment mobilised by the dredging process.

Recoverability: *Abietinaria* is a large (colonial) animal with a lifespan of 1-10yrs, reaching sexual maturity after 2yrs. There is relatively little information on the reproduction & life history of *Abietinaria.* After fertilisation the eggs are brooded then released as (planula) larvae giving at least some dispersal potential. There is a potential for colonisation to occur relatively quickly but recovery of biomass following growth of the colonising individuals is likely to take many years.

Abra

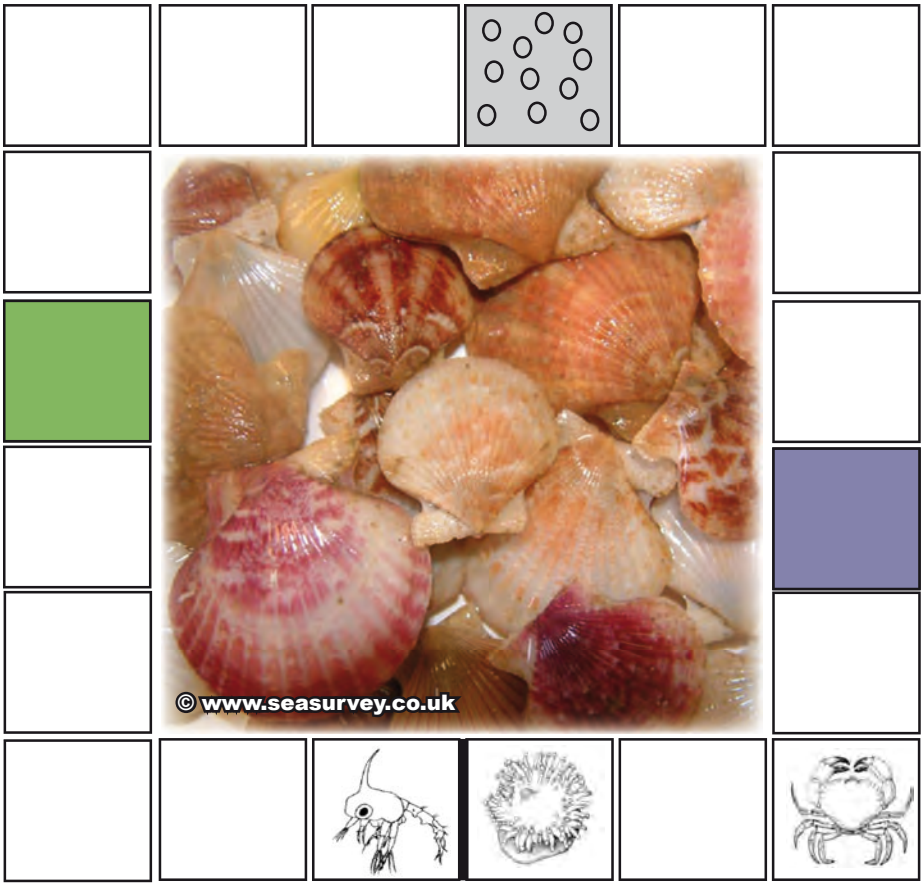


ROBUST

Vulnerability: *Abra* is a small bivalve mollusc belonging to the Family Scrobiculariidae. It reaches a shell length of only 1-2cm & lives in shallow burrows in sands & muddy sands where it filters particulate matter from the water column. It has limited mobility & is vulnerable to the physical disturbances associated with aggregate extraction. It is likely to be able to resurface through relatively thin deposits of sediment mobilised by the dredging process.

Recoverability: *Abra* is well-adapted for recovery & colonisation. It has a relatively short life-span of about 3yrs & reaches sexual maturity in <1yr. It also has high fecundity (15-17,000) & a high larval/juvenile dispersal potential (>10km). The eggs are fertilised externally & then develop into free swimming veliger larvae that spend about 30 days in the plankton. The juveniles of *Abra alba,* have also been observed as having a second migratory phase facilitated by "byssus drifting". The relatively short life-span, high fecundity & larval dispersal suggest that this genus has a high recoverability. Biomass is likely to be restored within 3yrs after initial colonisation.

Aequipecten

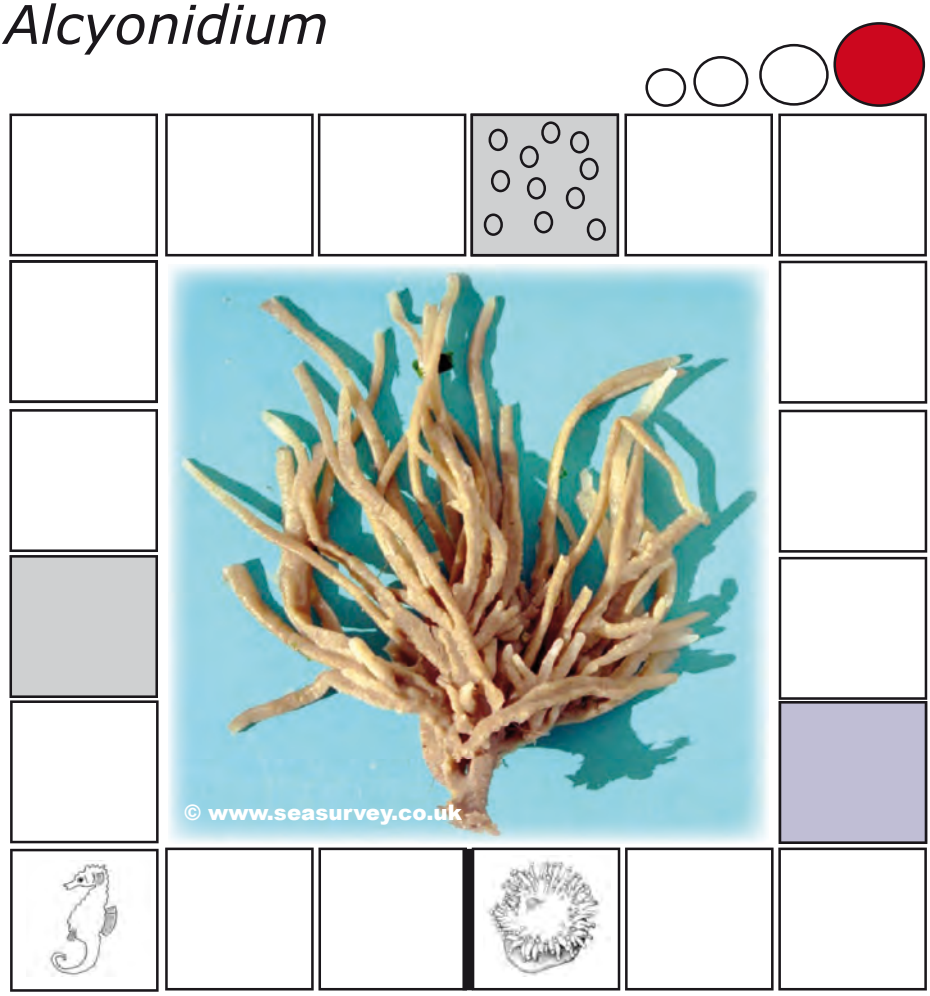


INTERMEDIATE

Vulnerability: *Aequipecten* is a very robust bivalve mollusc which lives on sandy gravel substrates. Juveniles start their lives attached to the substrata with byssus, threads which later detach when the shell length approaches 6cm leaving the adult to swim freely. Adult *Aequipecten* may therefore be able to avoid direct impact from the dredging activities as well as any associated sediment deposition. The sessile juveniles are more vulnerable to these impacts.

Recoverability: *Aequipecten* is a relatively long-lived bivalve with a life-span of approximately 6yrs. Insufficient information exists on the fecundity of this bivalve. The larvae are planktotrophic giving it a good dispersal potential & the high mobility of adults allows the potential for adult colonisation. *Aequipecten* reaches sexual maturity after only one year implying that the initial stages of recovery can occur rapidly. However the long life-span of this genus means that recovery of adult biomass could take a further 6yrs.

Alcyonidium

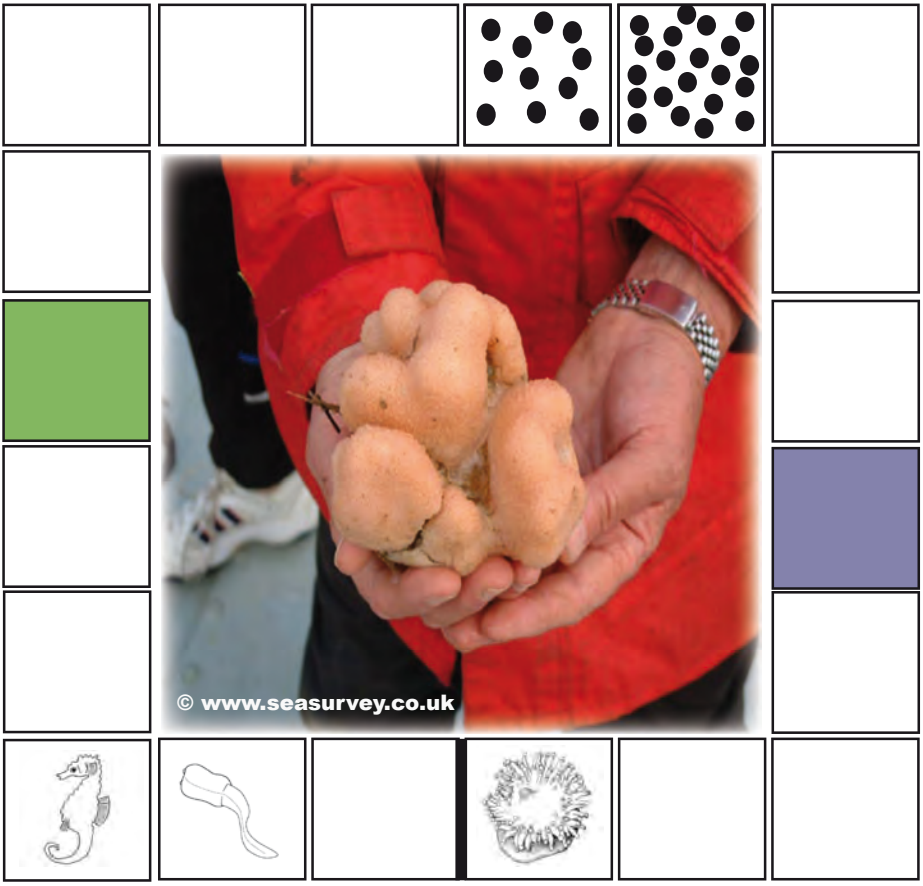


VULNERABLE

Vulnerability: *Alcyonidium* is an erect bryozoan which grows attached to hard substrates including stones, boulders & shells. Like all bryozoans this genus is sedentary & is therefore unable to evade the direct effects of dredging or deposition of sediment mobilised by the dredging process.

Recoverability: There is little information on the reproduction & life history of *Alcyonidium.* Some species of the genus are known to brood their larvae which, once released, settle within a matter of hours. The dispersal potential is therefore limited & is reliant on an adjacent colony. Recovery of adult biomass is difficult to assess, but since this colonial organism reaches sexual maturity after only 2 months local recolonisation my be achieved relatively rapidly if the substratum remains suitable for settlement.

Alcyonium

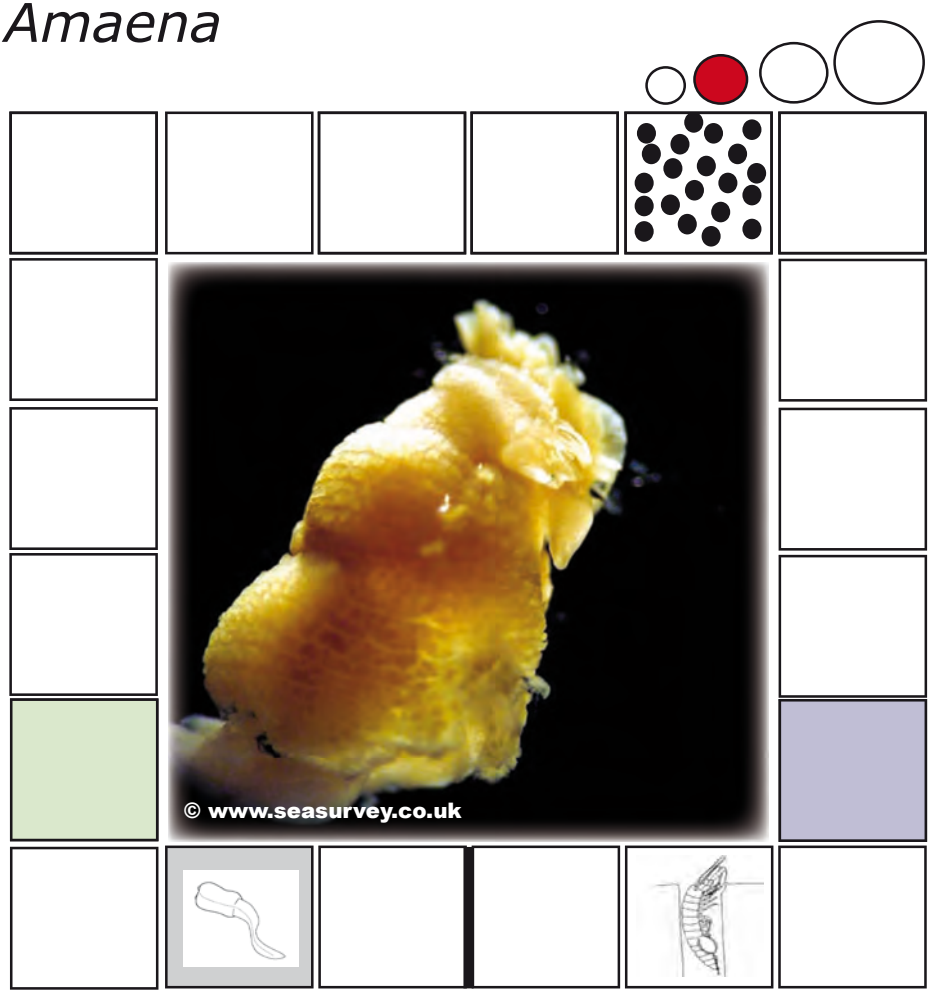


VULNERABLE

Vulnerability: *Alcyonium* or "dead man's fingers" is a 10-20cm high octocoral which typically grows attached to wrecks, cobbles & other hard surfaces where the water currents are strong. As with any sedentary animal it is highly vulnerable to physical disturbance & also to sedimentation.

Recoverability: There is little information on the life-span & recoverability of this genus. The colonies probably have a relatively long life-span of 5-10yrs possibly exceeding 28yrs & reach sexual maturity at 1-2yrs. They also have a high fecundity (1,000–100,000) & a high larval/juvenile dispersal potential (>10km). Young colonies form a thin encrustation after settlement of larvae & subsequently have a relatively slow growth-rate. This genus has a slow growth rate. Recovery to adult biomass is therefore likely to take many years.

Amaena

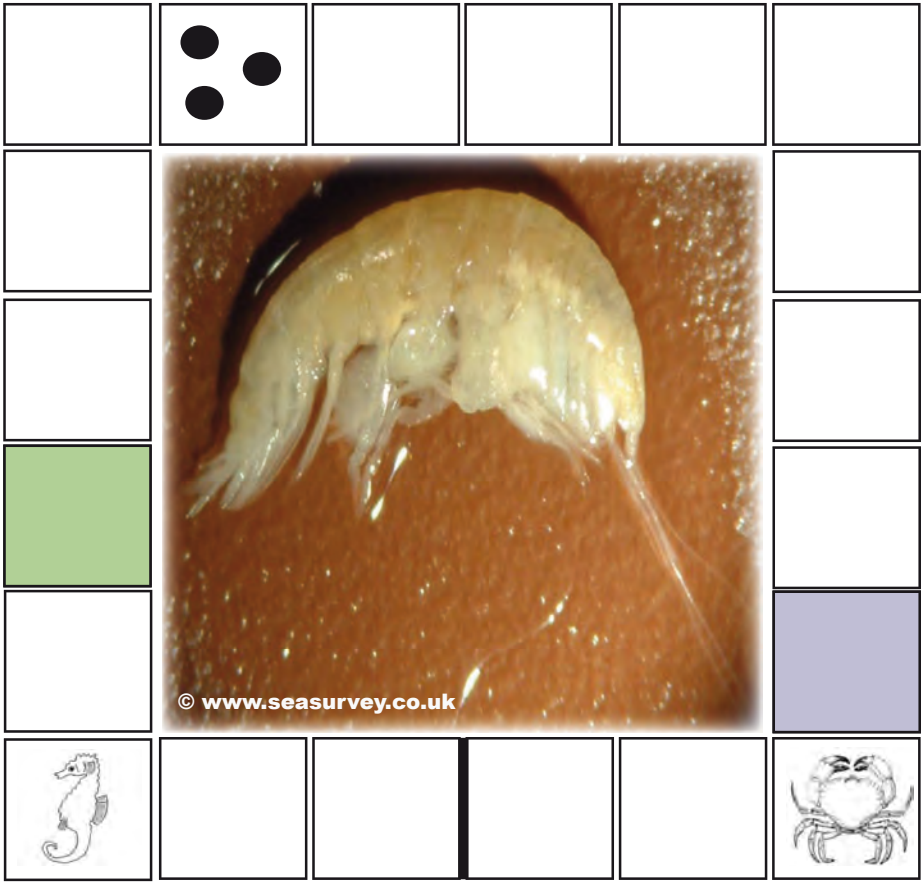


ROBUST

Vulnerability: *Amaena* is a small burrowing Terebellid polychaete that occurs in mixed sands & gravel deposits. The body size is 3-10cm. Rather little is known about its general biology, except that in common with other terebellids, it is likely to feed on small particulate matter within, or on the surface of the deposits, using the tentacles. It has very limited mobility & is therefore likely to be vulnerable to disturbance by dredging & to deposition of sediment mobilised during the dredging process.

Recoverability: The genus is relatively short-lived, with a life span of about a year, & producing a large number of as many as 20,000 eggs per individual. The eggs measure about 0.21mm in diameter & are fertilised externally in the water column. Little is known of the duration of the larval phase before settlement takes place. The small size & short generation time, together with the high fecundity & planktonic larval dispersal phase suggests that this genus has a high recoverability.

Ampelisca

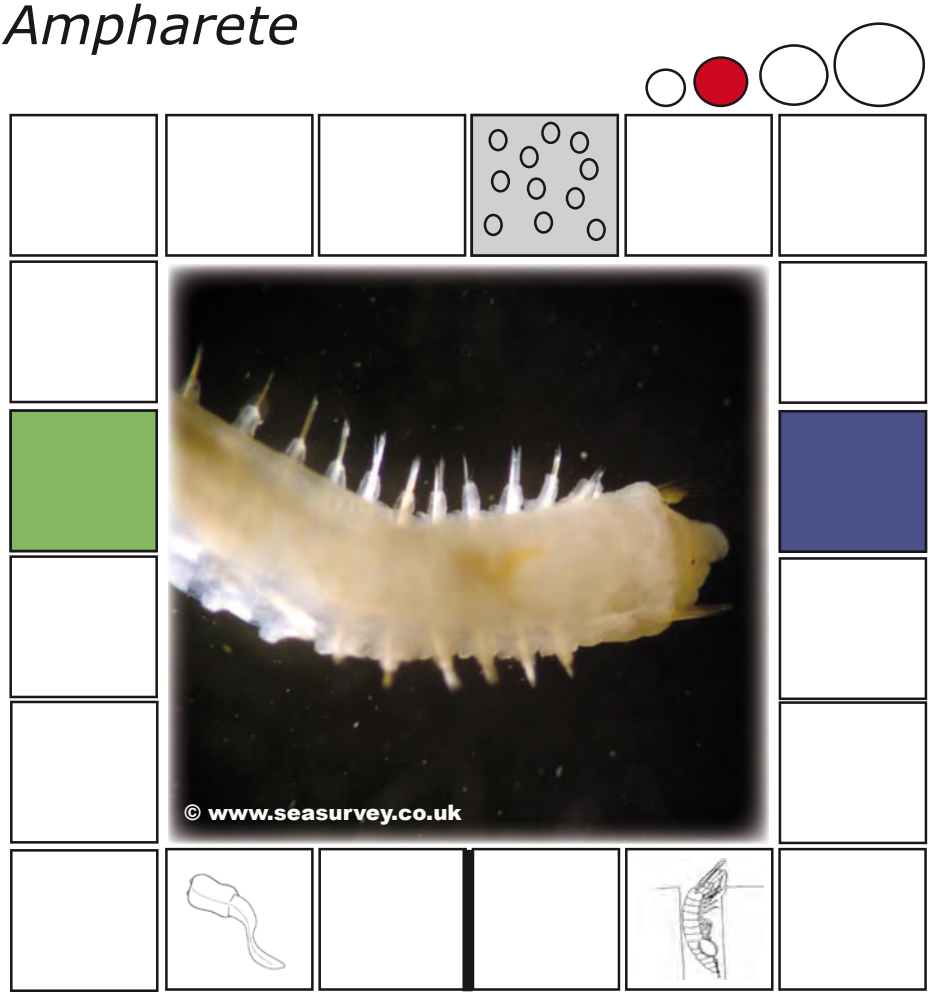


ROBUST

Vulnerability: *Ampelisca* is a small tube-dwelling amphipod of about 1cm body length. It is characteristic of fine sand & muddy sediments. Its tubes are not permanent & this genera remains essentially mobile. However, its small body size means that it may not be able to avoid the direct physical disturbance associated with dredging, although it is likely to withstand moderate sedimentation.

Recoverability: *Ampelisca* does not produce large numbers of offspring in its lifetime (about 20-60) but reproduces regularly. The larvae are brooded giving them a higher chance of survival than free-living larvae. *Ampelisca* has a short lifespan & reaches sexual maturity in a matter of months allowing a population to recover abundance & biomass in a very short period of time.

Ampharete

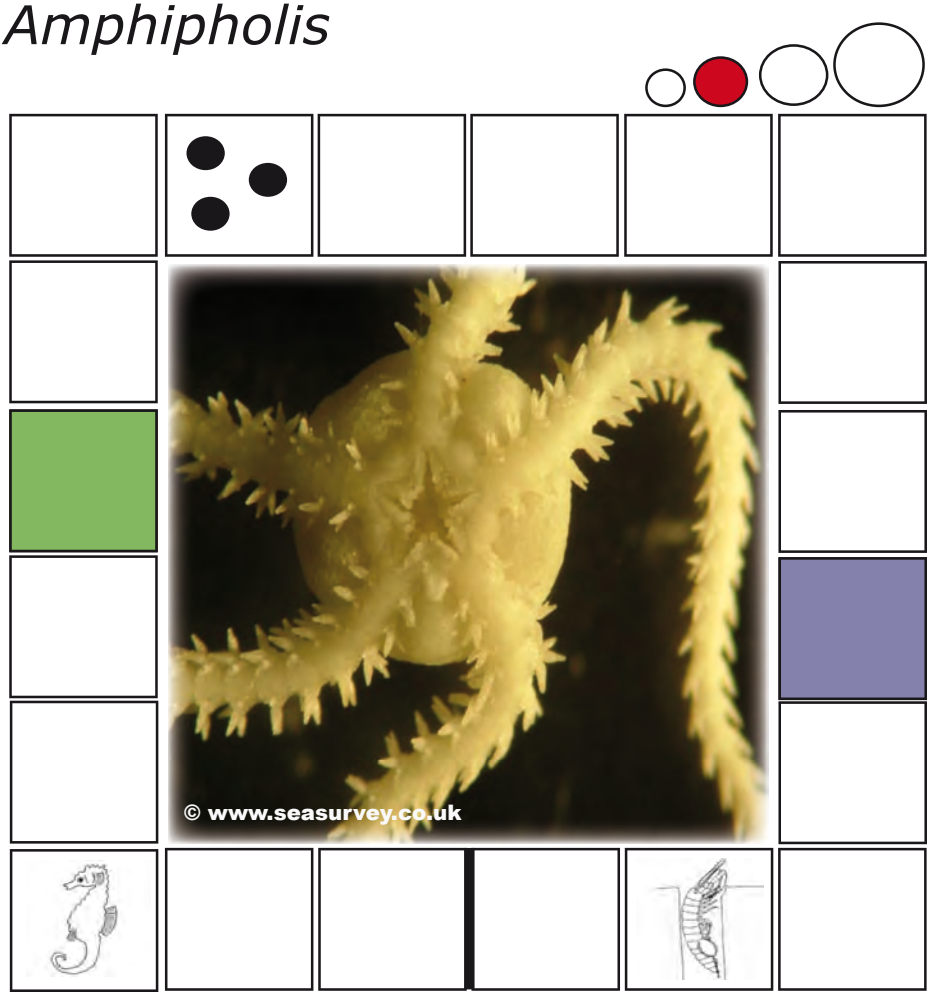


VULNERABLE

Vulnerability: *Ampharete* is a polychaete worm belonging to the Family Ampharetidae. It is a large family with more than 30 species. Most species live in fragile tubes in deposits of fine sand or mud. The adult worm is 1-3cm in length & has limited mobility. It is likely to be vulnerable to dredging & to deposition of sediment mobilised by the dredging process.

Recoverability: Insufficient information is available on the fecundity of *Ampharete* but it is known to take 3yrs to reach sexual maturity indicating a low reproductive potential. The slow growth to reproductive maturity suggests that restoration of the biomass may take several years after initial colonisation of disturbed sediments. This coupled with the low dispersion & mobility of the genus suggests that the genus has a low recoverability.

Amphipholis

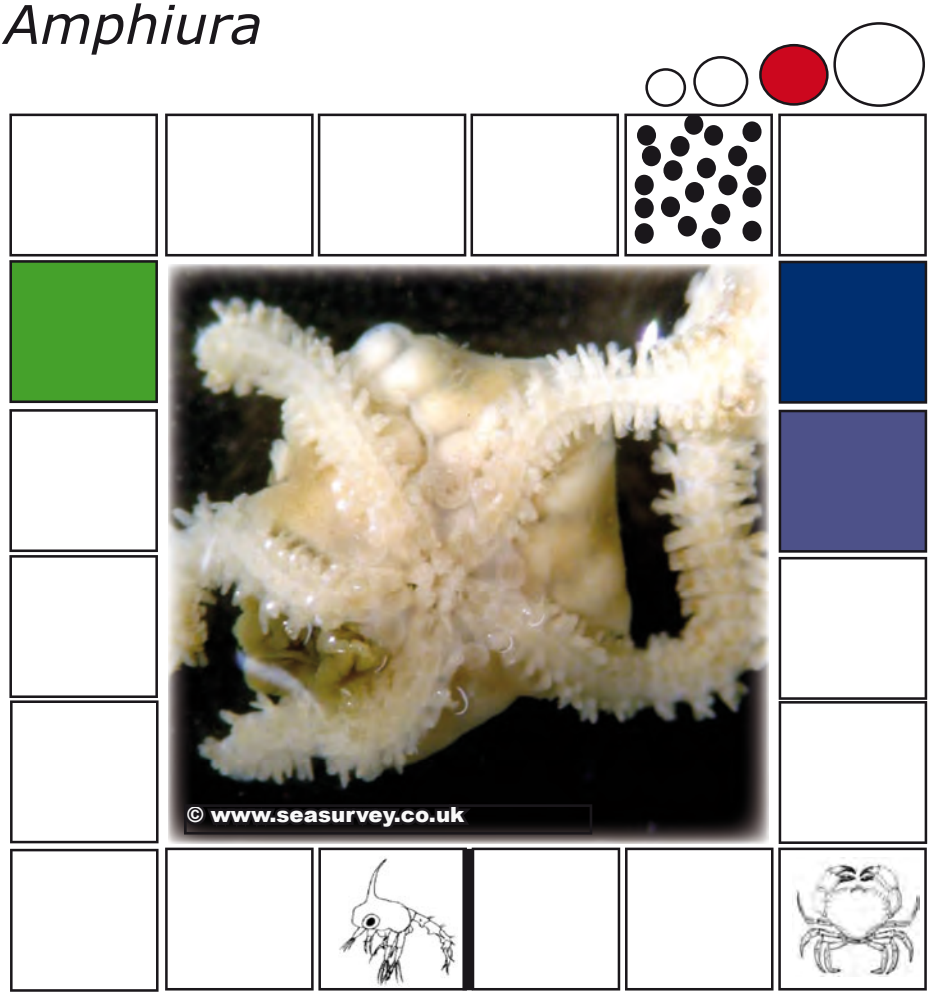


VULNERABLE

Vulnerability: *Amphipholis* is a small brittle star belonging to the Family Amphiuridae. The size is about 6cm with a very small disc width of about 5mm. It lives on the surface of stones & gravels, & occasionally on sands where it feeds on surface detritus. It is moderately mobile in the search for food. *Amphipholis* is fragile & whilst it does have the ability to regenerate arms, it is likely to be vulnerable to dredging. It may have some capacity to resurface from small quantities of sediment deposited by the dredging process, but is unlikely to be able to tolerate a significant overburden of mobile sand..

Recoverability: *Amphipholis* can be hermaphroditic. They reach sexual maturity after 1yr but produce only a small number of offspring (up to 100) which they brood. The dispersal potential for this brittle star is therefore low. They also have a long lifespan so restoration of the biomass by growth of colonising individuals is likely to take several years. The low fecundity & dispersal potential & the slow growth rate suggest that this genus has a low recoverability.

Amphiura

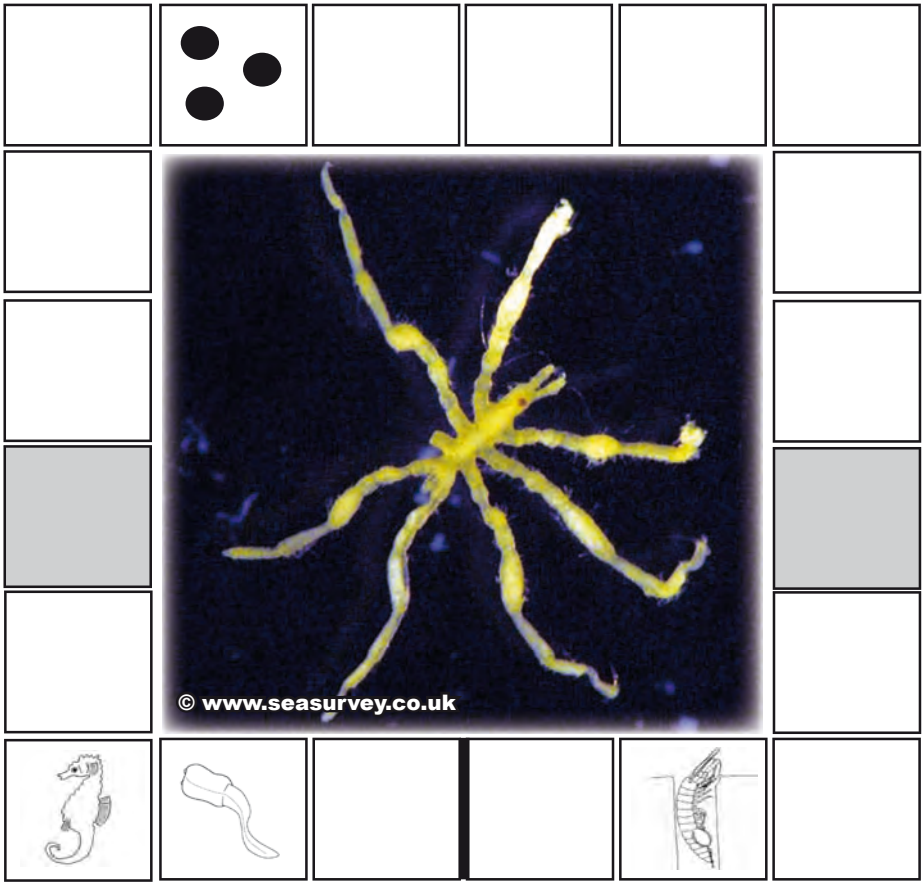


ROBUST

Vulnerability: *Amphiura* is one of the larger brittle stars reaching up to 20cm in size. The larger size gives it a greater ability to avoid physical disturbance & greater burrowing capabilities. The adults may therefore be able to survive deposition of sediment mobilised by the dredging process. Both adults & the smaller juveniles are, however, relatively fragile organisms that are likely to be vulnerable to the direct impacts of dredging.

Recoverability: *Amphiura* is a relatively long-lived & slow-growing brittlestar with a life-span of 10-20yrs. Sexual maturity is reached after 3-5yrs. Spawning takes place in spring & eggs are released into the water column where they are fertilised externally. *Amphiura* produces approximately 50,000 gametes in its lifetime so that the potential for initial colonisation is high. The ophiopluteus larvae are common in the early summer plankton & remain in the water column for a protracted period giving the animal potential for dispersal over significant distances. However, the growth rate is relatively slow so recovery of the biomass is likely to take as much as 10yrs after initial recolonisation of the seabed has taken place.

Anoplodactylus

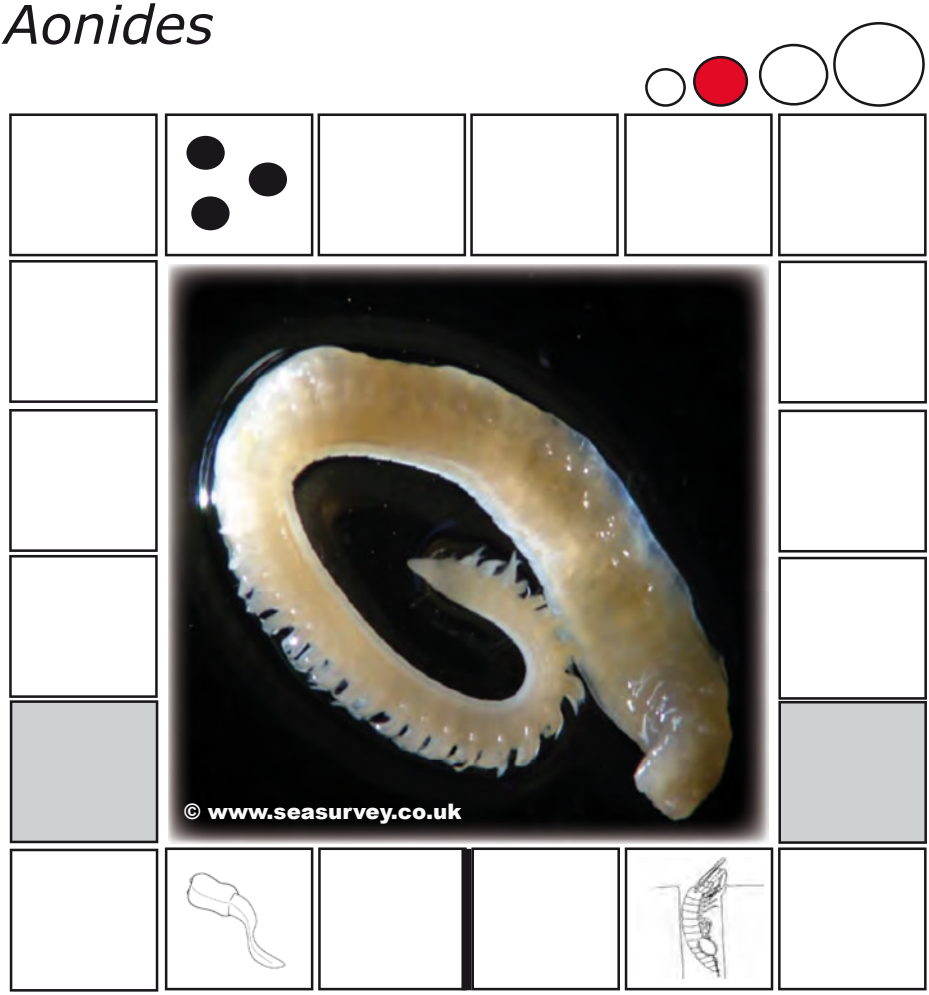


VULNERABLE

Vulnerability: *Anoplodactylus* is a genus of small sea spider (Pycnogonida) of 0.1cm body length. Little information is available on its general biology, although its small size, fragility & limited motility suggests that it is likely to be vulnerable to disturbance by dredging & to deposition of sediment mobilised during the dredging process.

Recoverability: Very little is known of the life-span or the age at which individuals mature. The eggs are about 0.12mm in diameter & are produced annually between spring & summer. Each female produces 30-40 eggs & these are transferred to the male as mature eggs at which point they are fertilised. The duration of the larval phase is 11-30 days during which time the larvae may occur as a parasitic phase within *Lobelia* hydroids. The larval phase is unlikely to lead to widespread dispersal, perhaps as little as 10-100m from the site of release. The small number of eggs & limited dispersal suggests that this genus has a low recoverability.

Aonides

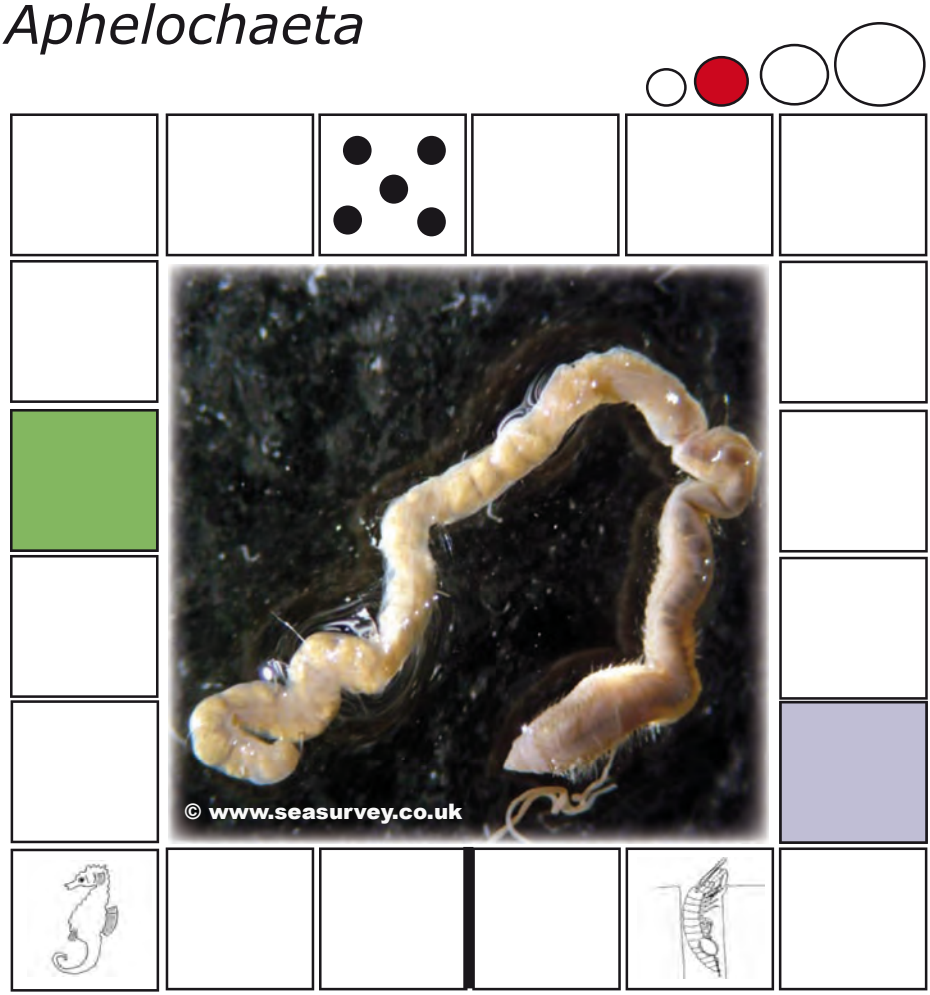


INTERMEDIATE

Vulnerability: *Aonides* is a small deposit feeding polychaete worm of 3-10cm. It has limited mobility & lives in a loosely constructed tube or is free-living. Little is known about the life history but its size & morphology suggest that it is likely to be vulnerable to physical disturbance. It may have some capability to survive sedimentation events but this is likely also to be limited.

Recoverability: There is little information on the reproductive biology of this genus. However, as a short-lived animal with small body size, it is likely to recover adult biomass relatively quickly following colonisation by juveniles. The fecundity & dispersal potential of this genus is low (larval duration 2-10 days) so recolonisation from sources outside a disturbed area is likely to be slow.

Aphelochaeta

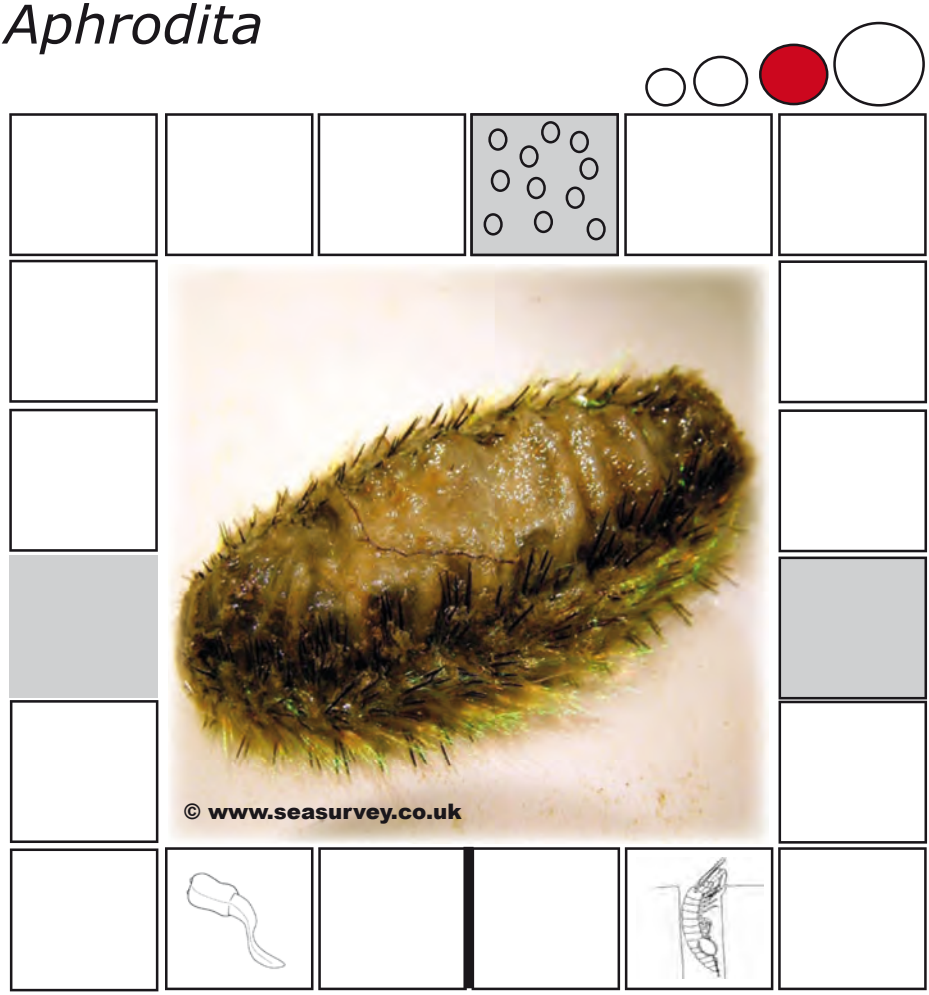


INTERMEDIATE

Vulnerability: *Aphelochaeta* (recent synonym *Tharyx*) is a Cirratulid polychaete worm that is able to swim but only does so when disturbed. It is a surface deposit feeder living in fine to muddy sand. The normal mode of movement is burrowing. It is vulnerable to dredging but may be able to resurface following deposition of small quantities of sediment associated with the dredging process.

Recoverability: *Aphelochaeta* appears to fertilise its eggs externally after laying between 20 & 500 on the sediment. This relatively high number of offspring means that pre-dredge population densities can potentially be restored very quickly. It has a moderate life-span of 3-5yrs & maturity is reached within 1yr. Biomass may therefore be restored be restored relatively quickly after recolonisation of a disturbed area. However without a planktonic larval stage the dispersal & colonisation potential of the genus from sources outside a disturbed area are low.

Aphrodita



VULNERABLE

Vulnerability: *Aphrodita* more commonly referred to as the "sea mouse", is a relatively large free-living polychaete worm. It lives on the surface or in shallow subsurface deposits of sands, muddy sands & gravels where it is an active predator feeding typically on polychaete worms. The body reaches 10-20cm in length & 3-7cm in width. It is vulnerable to dredging but is moderately mobile & may be able to resurface through sediments deposited during the dredging process.

Recoverability: Very little information is available on the reproduction, dispersal & growth of *Aphrodita*. However, it is known to be gonochoristic, releasing gametes into the water column where they are fertilised externally. Little is known about the growth rate & longevity of *Aphrodita*, but its large body size suggests that it has a relatively long lifespan. It is likely that this genus has a low recoverability.

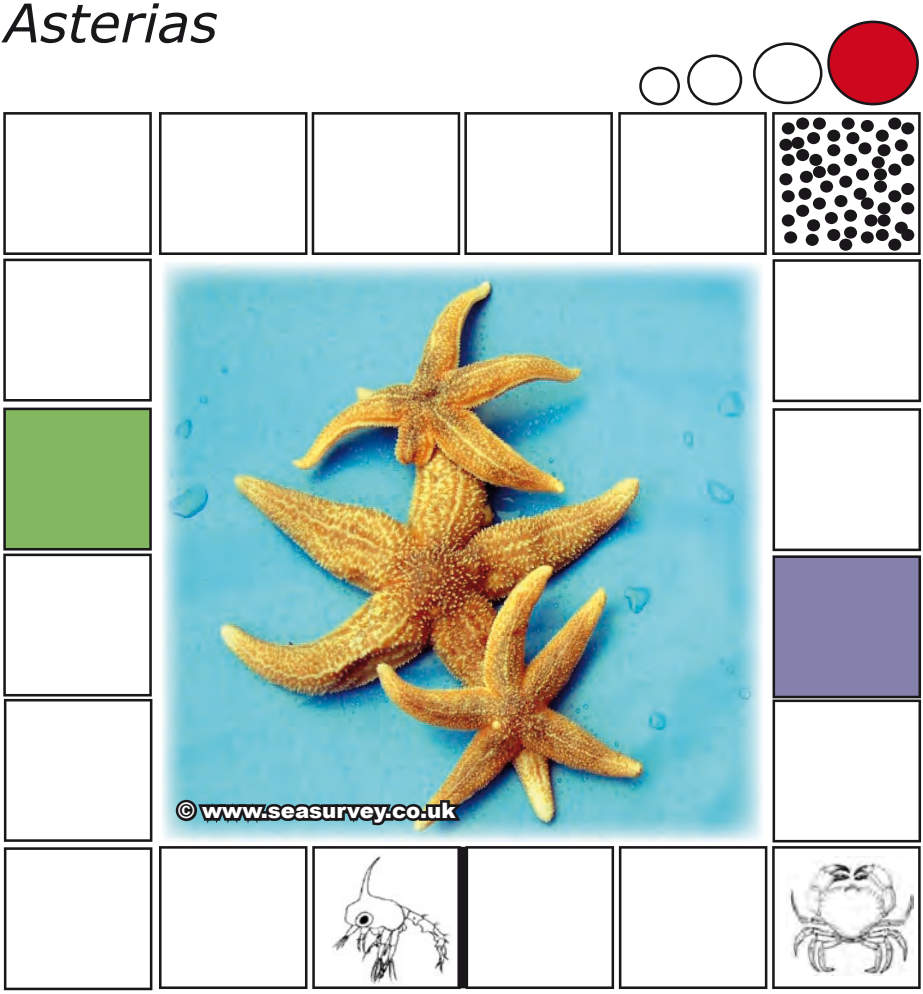
Ascidia

INTERMEDIATE

Vulnerability: *Ascidia* is a genus of solitary sessile sea squirts (Ascidiacea) of about 3-15cm height. In common with other ascidians, the genus feeds by filtering fine particulate material from the water column through a complex gill filtration system. This is vulnerable to clogging by excessive quantities of suspended material & the organism is also unable to reattach itself if the substrate is disturbed. It is likely to be vulnerable to disturbance by dredging & to deposition of sediment mobilised during the dredging process.

Recoverability: *Ascidia* has a life-span of 1-2yrs & produces relatively few yolk-filled eggs (typically 6-8 per adult) at annual breeding times that reach peaks in mid-summer. Fertilisation is external & after a short phase of 2-10 days in the plankton, the tadpole larvae select a suitable substratum for settlement & metamorphosis. Metamorphosis can be delayed during this site-selection phase until a suitable substratum is located, but rarely exceeds 10 days during which time the larvae can be dispersed by seabed currents for up to 10km. The relatively long life-span of 1-2yrs & the small number of larvae produced by this genus suggest that its recoverability is low, although the relatively widespread dispersion allows colonisation from outside the area of disturbance. This genus should probably be regarded as of intermediate recoverability.

Asterias

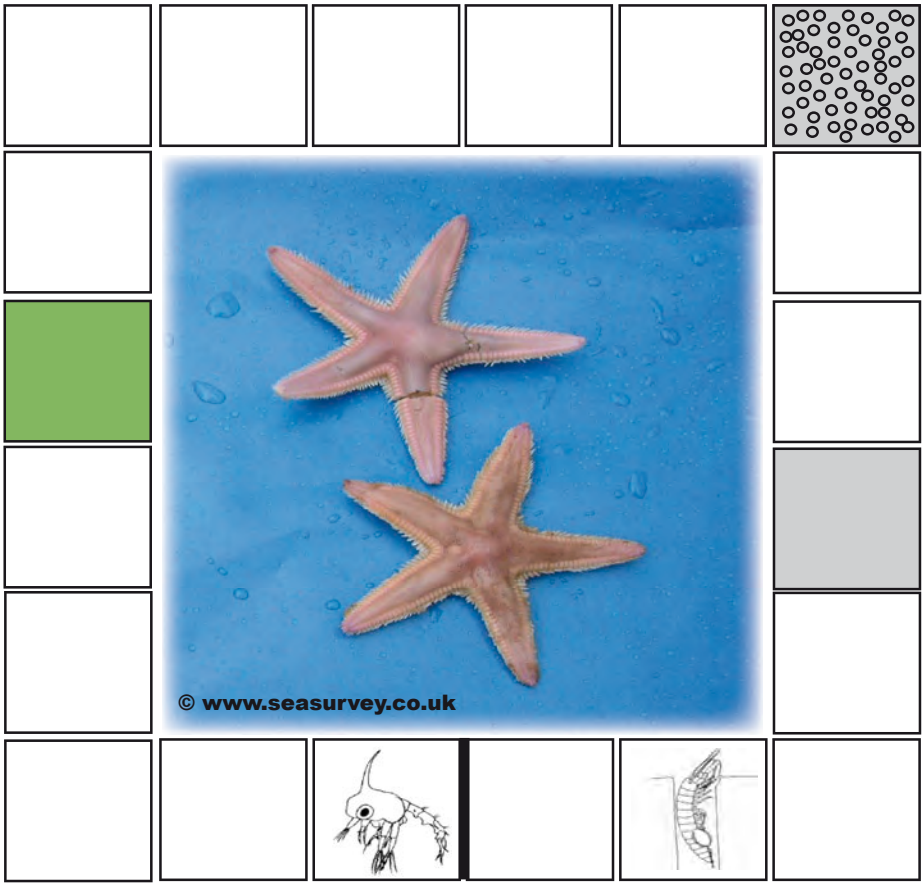


ROBUST

Vulnerability: *Asterias,* the common starfish, is a mobile species with a high regeneration potential. It reaches a diameter of 50cm & scavenges material on the surface of the deposits & also preys on burrowing bivalves at depths of several cm in sands & muddy sands. It is vulnerable to dredging, but is likely to be able to resurface through significant quantities of sediment deposited during the dredging process.

Recoverability*:* *Asterias* is a large long-lived genus & reaches sexual maturity after 1yr. It has a high fecundity & spawns over 2 million eggs in the spawning season which extends from May-September. The bipinnaria larvae are planktotrophic & remain in the plankton for up to 100 days during which time they develop into a brachiolaria larva before metamorphosis & settlement. The dispersal potential, recolonisation rate & subsequent restoration of biomass by growth of the juveniles is high. The genus has a high recoverability.

Astropecten

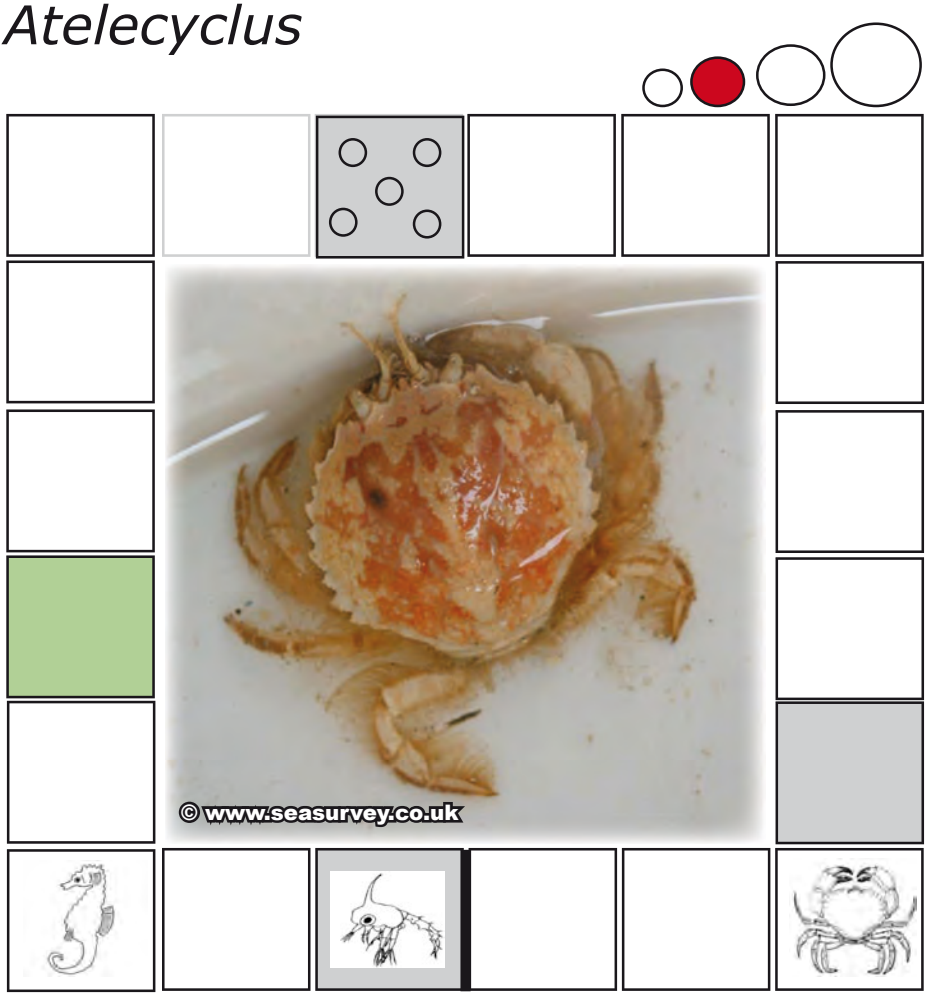


INTERMEDIATE

Vulnerability: *Astropecten* is a genus of starfish (Astropectinidae) that typically occurs on substrates of sand & sandy gravel. It a free-living genus that is generally 10cm in diameter but can reach up to 20cm. It lives partially buried under the surface of sandy substrata where it feeds on carrion & invertebrates. It is mobile over relatively short distances but is likely to be vulnerable to dredging within an actively-dredged site. It probably has a capacity to migrate up through sand mobilised by the dredging process, since mobile sand is a feature of the deposits in which this genus lives. Overall, this genus is of intermediate vulnerability to disturbance by dredging.

Recoverability: *Astropecten* has a relatively long life-span of 3-5yrs. There is little information on brood size or age at maturity for this genus. Fertilisation is external following an annual episodic breeding cycle during which eggs of 0.1-0.2mm are released into the water column. The duration of the larval phase is very variable but is commonly 11-30 days during which dispersal is relatively widespread. The relatively long-life span, & probable low fecundity of species that have yolk-filled (lecithotrophic) eggs, suggests that some members of the genus have a low recoverability. Others with larvae that feed in the plankton (planktotrophic species) may have a greater capacity for recolonisation from sources outside the zone of disturbance.

Atelecyclus

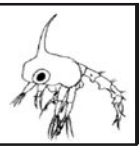


INTERMEDIATE

Vulnerability: *Atelecyclus* is a small but mobile crab that lives on sandy & gravel substrates. The carapace is 3-4cm in length & the crab is able to burrow into sediments. It is vulnerable to dredging but is well-adapted to resurface from sediments deposited during the dredging.

Recoverability: There is little information on the life-span & reproductive biology of *Atelecyclus*. The sexes are separate & fertiliisation is internal. The planktotrophic zoea larvae are released into the water column after a short period of incubation by the female but there is insufficient information to assess the fecundity & dispersal potential for this genus. It is likely to grow to adult size in <3yrs & to have a moderate dispersal potential in the plankton.

Autolytus



ROBUST

Vulnerability: *Autolytus* is small free-living polychaete worm belonging to the Family Syllidae. There are many species, most with a body length of 1-2cm. They live in epigrowths, amongst shells & stones on the seabed. Many have an ability to form chains of stolons that are budded asexually. The worms have limited mobility. Little is known about its life history but its size & morphology suggest that it is likely to be vulnerable to physical disturbance. It may have some capability to survive sedimentation but is vulnerable to damage to the epigrowths upon which it depends as a habitat.

Recoverability: *Autolytus* is a short-lived genus able to reproduce sexually & also through budding. The stolons may be male & female, with the latter carrying egg sacs with many hundreds of eggs. The eggs are fertilised externally after release & develop into planktotrophic larvae that spend up to 8 weeks in the plankton. The fecundity & dispersal potential of this genus is therefore high. The small size & fast growth rate suggests that following disturbance the biomass is likely to be restored rapidly by growth of the colonising individuals.

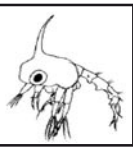
Axius

VULNERABLE

Vulnerability: *Axius* is a relatively uncommon genus of burrowing shrimp of about 7cm length that belongs to the class Eumalacostraca. It is found mainly in relatively stable deposits of mud & sand. Water is drawn through the burrow for irrigation & the shrimp gathers food from the surface of the substratum before retreating into the burrow for protection from predators. It has limited mobility outside of the burrow & is likely to be vulnerable to disturbance both by dredging & from sediments mobilised by the dredging process.

Recoverability: There is hardly any information on the life span, the age at maturity or the fecundity of this genus. The larva is an easily-recognisable member of the plankton but is rarely common. It is likely to be widely dispersed from the site of spawning. The overall recoverability is probably intermediate based on the dispersal & recolonisation of other genera of crustaceans with planktotrophic larvae.

Balanus



ROBUST

Vulnerability: *Balanus* is a barnacle which grows attached to hard surfaces such as boulders, shells & stones. The adults are <1cm in width & feed by capture of zooplankton with modified thoracic limbs. Barnacles are vulnerable to dredging & to deposition of large quantities of sediment mobilised by the dredging process. They are also susceptible to sedimentation that prevents location of suitable substrata for settlement by the larvae.

Recoverability: *Balanus* has a life-span of 3-4yrs & is hermaphroditic. Fertilisation is internal by an adjacent barnacle & large numbers of fertilised eggs are released as planktotrophic nauplius larvae into the plankton. The larvae are about 0.5mm in length & go through several stages of development before metamorphosing into a cypris larva. This is an active site-selection phase when the cypris is able to delay metamorphosis until a suitable substrate such as a rock or stone is located. This genus has a high dispersal & colonisation potential. Growth rates observed in this genus are fast, reaching sexual maturity in months & full adult biomass within a year. Full recovery of both population density & biomass is therefore achieved rapidly.

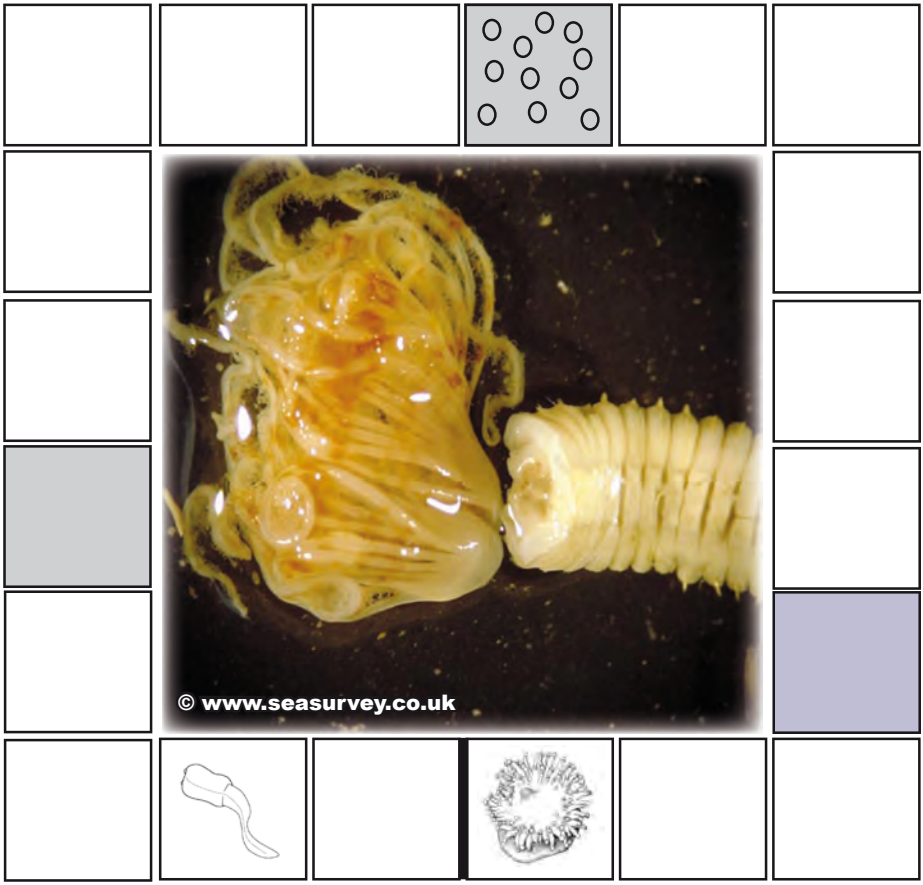
Bathyporeia

ROBUST

Vulnerability: *Bathyporeia* is a small active amphipod crustacean belonging to the Family Pontoporeiidae. The body length is between 3-8mm & the animal lives in fine-medium sands & in muddy sands. Many species within this genus are known to migrate up through the water column & are active burrowers in the deposits. It is vulnerable to dredging, but is likely to be able to resurface through significant quantities of sediment deposited during the dredging process.

Recoverability: This genus is short lived, reaching sexual maturity within 6 months. Reproduction is continuous with one set of embryos developing in the brood pouch whilst the next set of eggs is developing in the ovaries. There is no opportunity for larval dispersal as they are brooded. The adults are, however, highly mobile in the water column & recolonisation by the adults is likely to be significant in sediments that have been disturbed by dredging. Fast growth & development means that biomass could also be expected to recovery quickly.

Bispira



VULNERABLE

Vulnerability: *Bispira* is a genus of tube-dwelling polychaete worms belonging to the family Sabellidae. It lives mainly on rocky substrata & reaches a length of up to 10cm. Like other sabellid worms, gas exchange is through a crown of tentacles that also serve as a filtration-feeding system. Small particles are trapped from the plankton & are transported down the crown of tentacles by cilia. The worm has no mobility outside the confines of the tube, & the filtration mechanism is susceptible to clogging if excessive suspended solids are present. It is likely to be vulnerable both to disturbance by dredging & to excessive deposition of sand mobilised by the dredging process.

Recoverability: *Bispira* has an annual breeding period from July to September & produces eggs when the adults are <1yr of age. Little is known of the fecundity or life span of the adults but the eggs are fertilised in the water column & spend a very short time of <1 day as planktotrophic larvae before settlement. Dispersal from the site of spawning is therefore very limited, perhaps as little at 10-100m. The recoverability by recolonisation from adults outside an area of disturbance is therefore low.

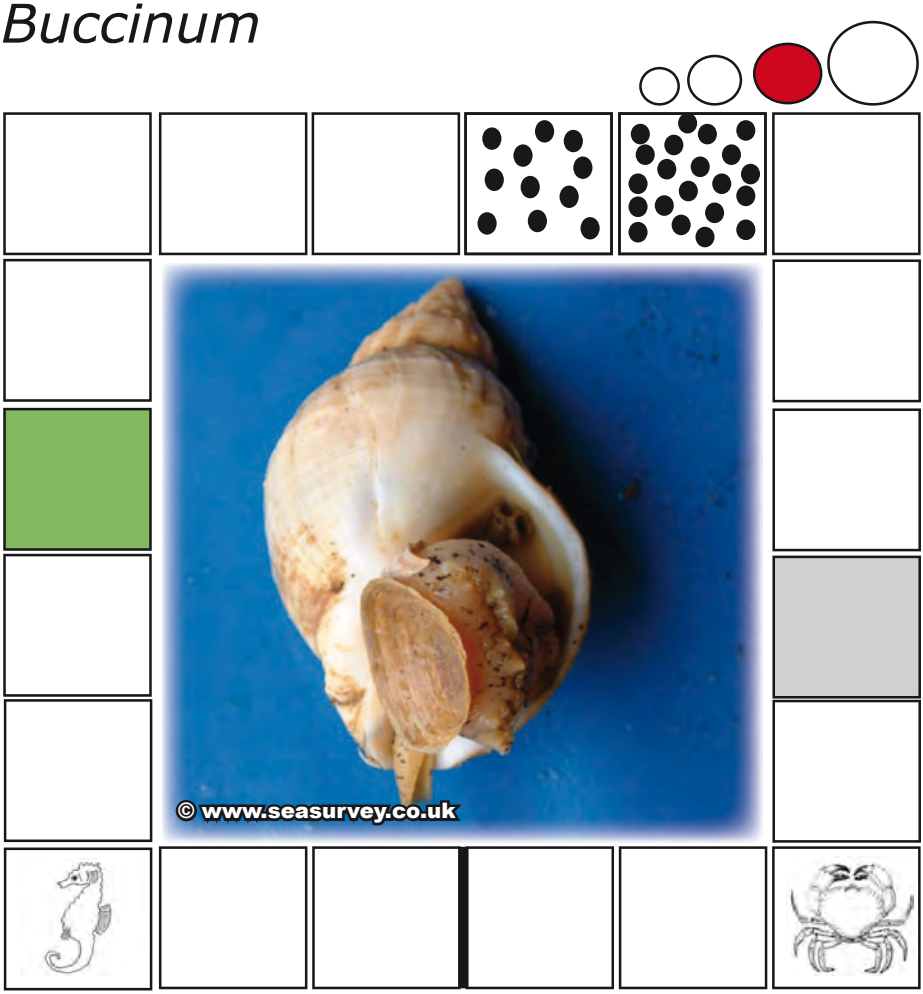
Bodotria

ROBUST

Vulnerability: *Bodotria* is a genus of very small shrimps belonging to the order Cumacea. The body length is about 7mm. The genus is characteristic of mobile fine sands. Whilst *Bodotria* has very limited mobility in relation to avoidance of dredging, it is well-adapted to life in mobile sands, & is likely to be able to accommodate significant deposition of sand mobilised during the dredging process.

Recoverability: Very little is known of the reproductive biology of this genus. The life-span for this active mobile crustacean is <1yr so it is likely to show relatively rapid growth & an ability to recolonise deposits by migration of the adults as well as by juveniles. Recoverability is likely to be relatively high although much more needs to be known about the fecundity before recoverability traits can be fully assessed.

Buccinum

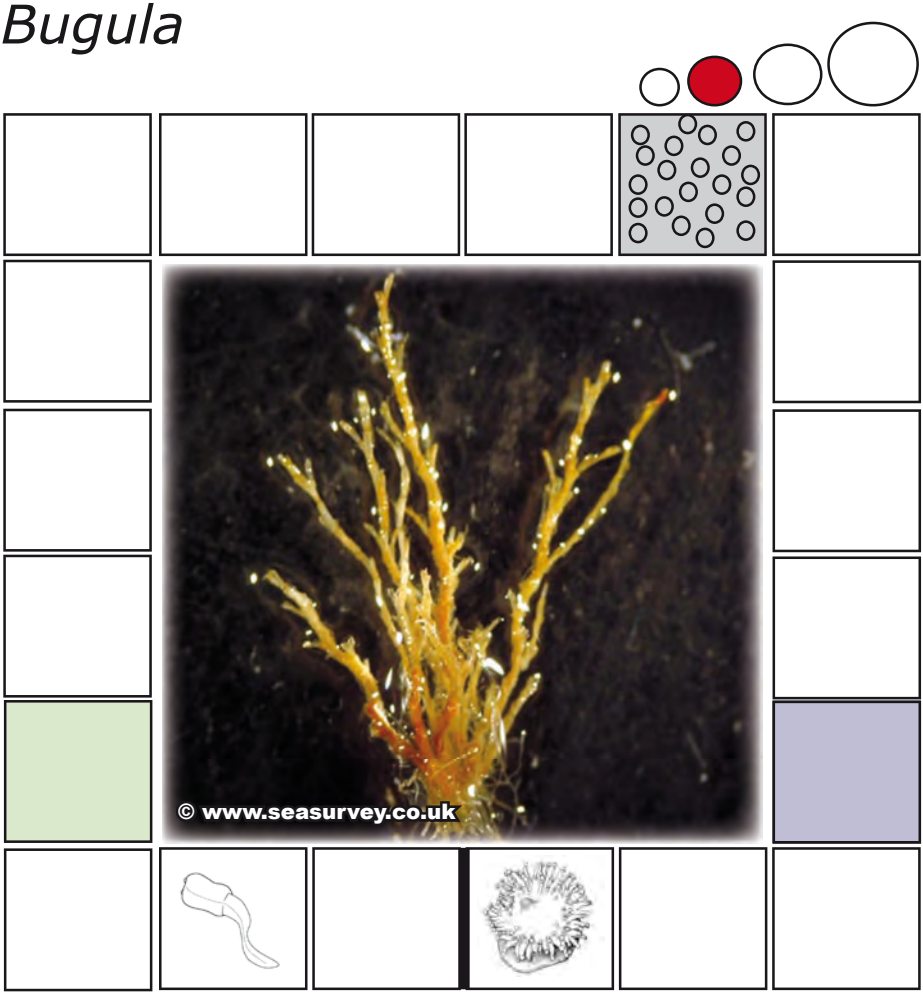


VULNERABLE

Vulnerability: The common whelk *Buccinum* is a large free-living gastropod mollusc that feeds on carrion on a wide variety of substrata from rocks & cobbles to muddy sand. The shell reaches 11cm in length & the whelk is able to move for several hundred metres in search of food. It is vulnerable to dredging but is likely to be able to resurface through sediments deposited during the dredging process.

Recoverability: *Buccinum* has a life-span of about 10yrs. The sexes are separate & after internal fertilisation the female lays eggs in large clusters to the substratum. Each cluster comprises about 200 yolk-filled eggs (up to 20,000 eggs produce in a life time) that develop directly into juveniles. Larval dispersal potential is therefore low. Restoration of the biomass is also likely to be slow over the long life-span of this genus. Recoverability is assessed as low.

Bugula

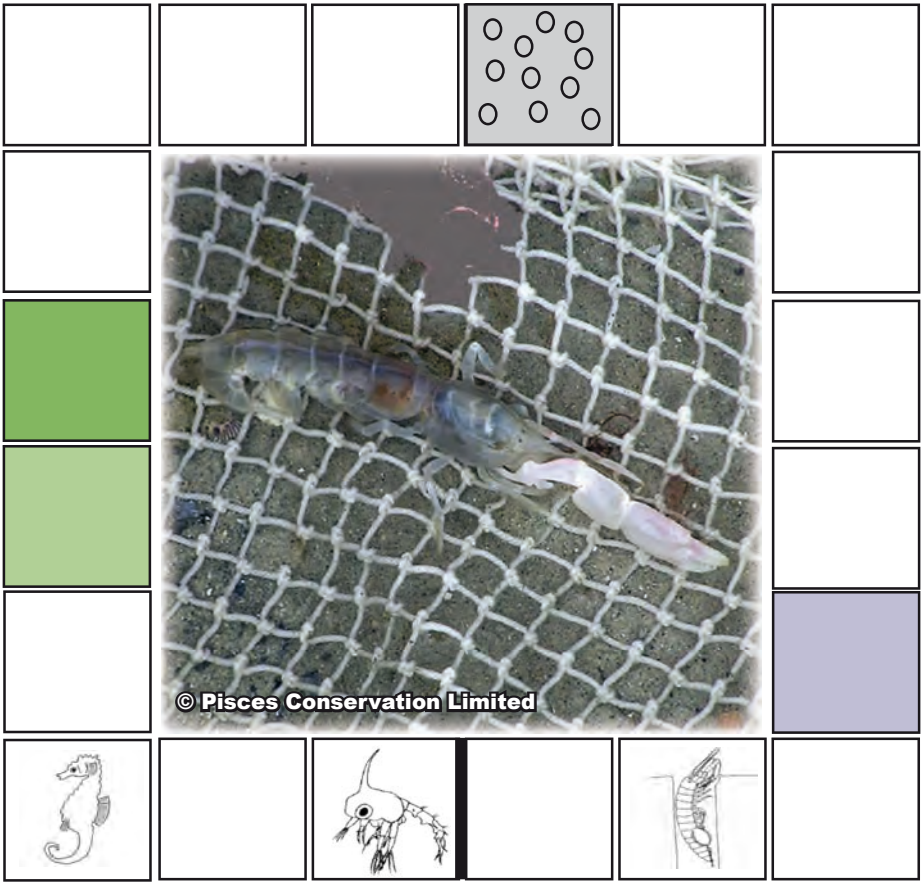


INTERMEDIATE

Vulnerability: *Bugula* is an erect bryozoan which grows in tufts on hard substrata including stones, shells, algae & other bryozoans. The colony of zooids commonly reaches 3-6cm in height, depending on species. It is sessile & is therefore vulnerable to disturbance by dredging & deposition of sediments associated with dredging.

Recoverability: *Bugula* has a short larval life but produces large numbers of larvae. This results in good local recruitment, but poor dispersal to adjacent habitats. Recolonisation from outside the site of disturbance is therefore likely to be slow. Once established, *Bugula* communities develop quickly with two major growth events within a year so recovery of the biomass following disturbance may be fast.

Callianassa

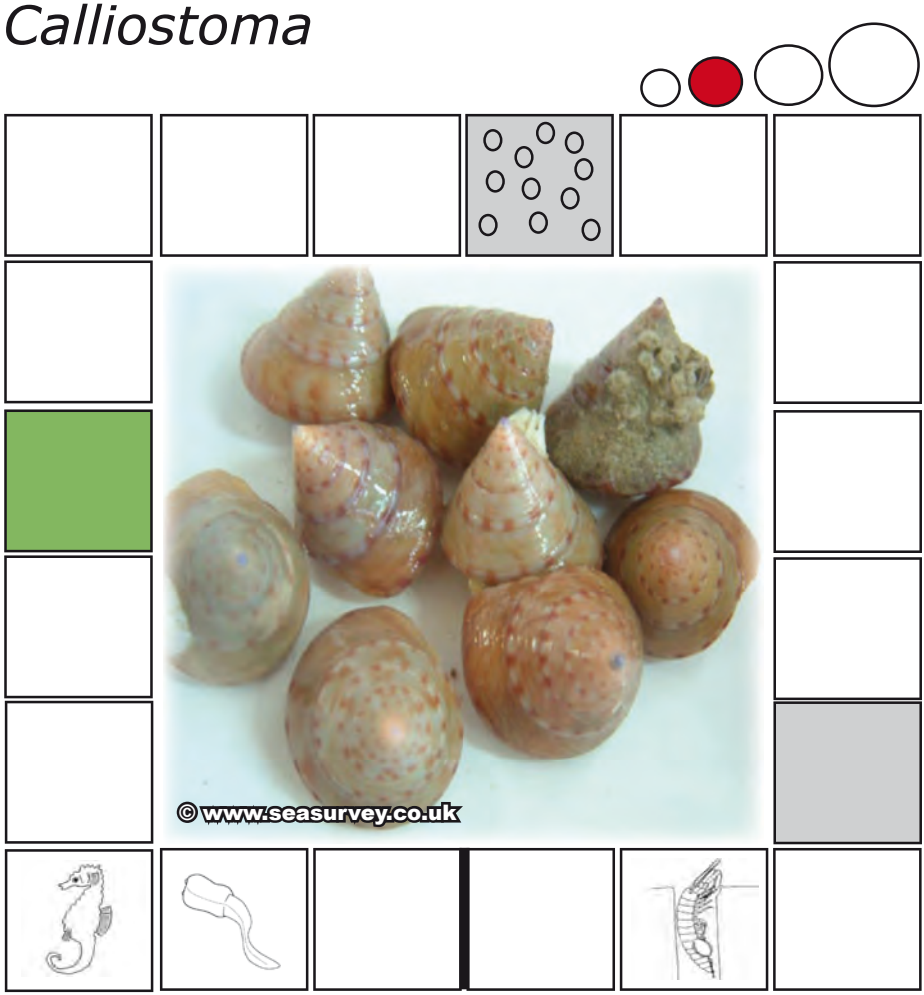


ROBUST

Vulnerability: *Callianassa* is a burrowing, deposit-feeding mud shrimp of 3-10cm in length found in sandy & muddy environments. It builds burrows in the sediment of varying depth & complexity depending on the sediment type & availability of food. *Callianassa* is mobile but its tube dwelling habits mean that its mobility is limited & it would not be able to avoid the physical disturbances associated with aggregate extraction. It should however, have a high tolerance to sedimentation associated with dredging.

Recoverability: Evidence strongly suggests that *Callianassa* reproduces biannually & whilst there is no information available on their fecundity they do produce numerous eggs which the females brood on their pleopods. The larvae remain in the water column for approximately 1-2 months giving them a high dispersal potential (>10km). There is therefore a high chance of them re-colonising an area following disturbance. *Callianassa* has a relatively fast growth rate approaching 1cm per year & reaches sexual maturity within 1yr. The population could recover to pre-dredge abundance & biomass in a relatively short period of time.

Calliostoma

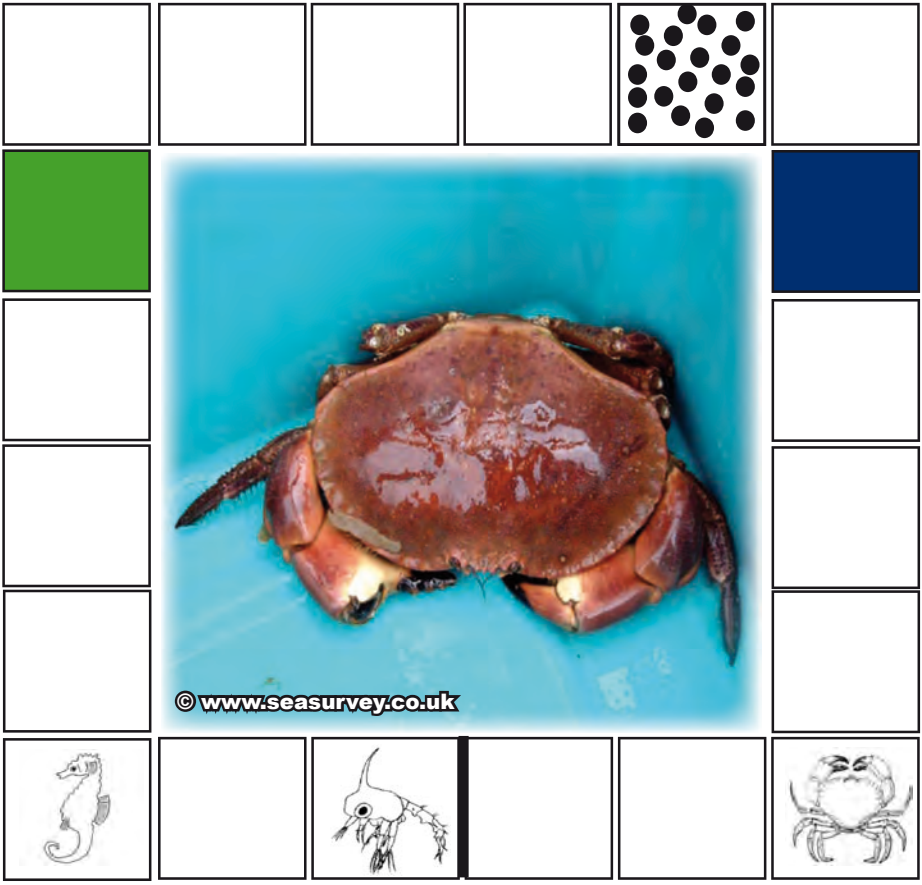


VULNERABLE

Vulnerability: *Calliostoma* is a genus of prosobranch mollusc known as the the top shell. It reaches a size of up to 3cm & lives on stones & cobbles, & muddy gravels. It rarely occurs where there is a significant proportion of mobile sand. It feeds by browsing on encrusting micro-algae on the surface of hard substrata & has limited mobility. Hence it is vulnerable to disturbance both by dredging & also by deposition of material mobilised during the dredging process.

Recoverability: There is little information on the life-span, fecundity or age at reproductive maturity for this genus. However it is likely that the life span is up to 3-4yrs. Reproduction is throughout the year, with a peak in June. Eggs of about 0.47mm are attached to the surface of the substratum near to the site of spawning. Larval development occurs over a period of 2-10 days & dispersal is <10m from the site of spawning. The relatively slow growth & limited larval dispersal of this genus implies that it has a low recoverability.

Cancer

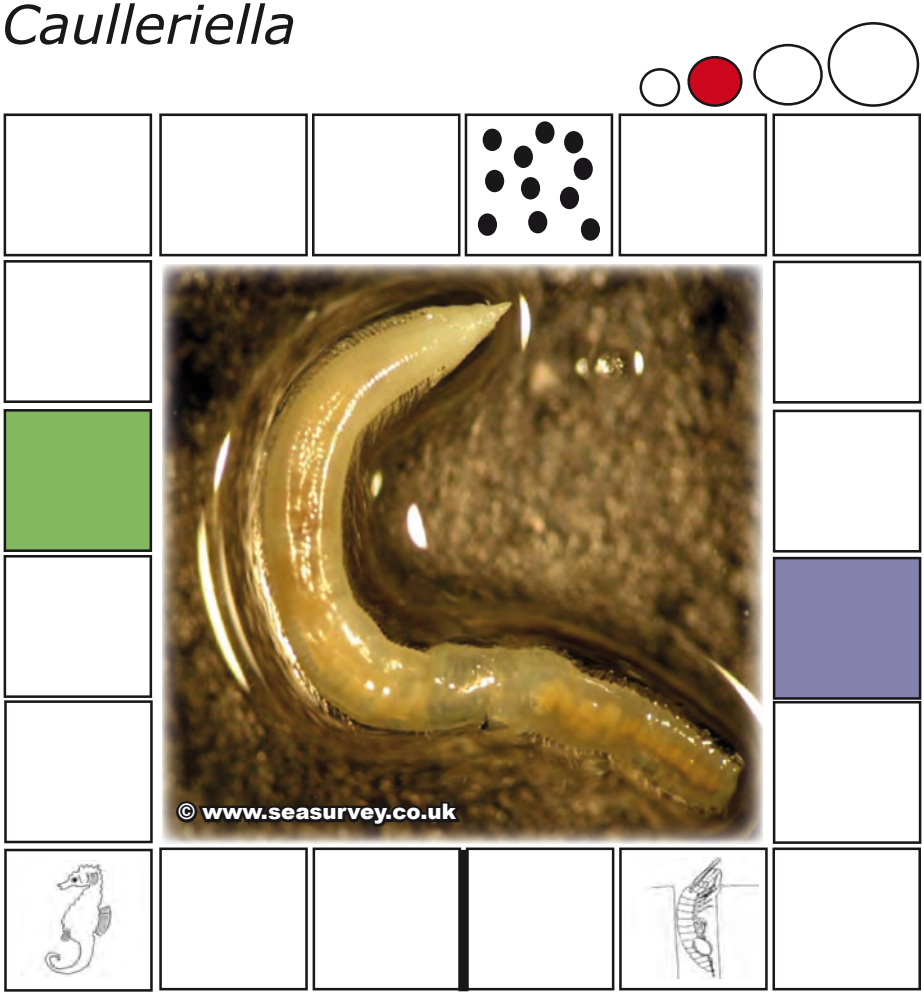


VULNERABLE

Vulnerability: *Cancer* (the edible or brown crab) is a large, mobile crab which is known to undergo significant migrations. It is likely to be vulnerable to dredging, but is sufficiently active to avoid the effects of deposition of sediment mobilised by the dredging process. However it is dependent on the presence of suitable boulders or crevices hollowed out of the deposits for survival & is hence susceptible to habitat modification if large quantities of sand overlay the substratum. There is some anecdotal evidence that significant alterations to the sediment type may cause *Cancer* to move out of an area. There are some stages in the breeding cycle when *Cancer* may be particularly vulnerable to sedimentation. When the females are "berried", brooding their eggs, they hide in pits or under rocks & do not feed for 6-9 months & are likely to be vulnerable to disturbance.

Recoverability: *Cancer* can live up to 20yrs & is relatively slow growing taking 6-10yrs to reach sexual maturity. It produces a large number of eggs that are fertilised internally & brooded by the female before being released as planktotrophic zoea larvae between April-August. These spend about 30 days in the plankton before developing into the megalopa stage & settling to the seabed. Larval dispersal potential is therefore high, but the very slow growth rate & the substrate requirements for this genus suggest that recoverability may be low.

Caulleriella

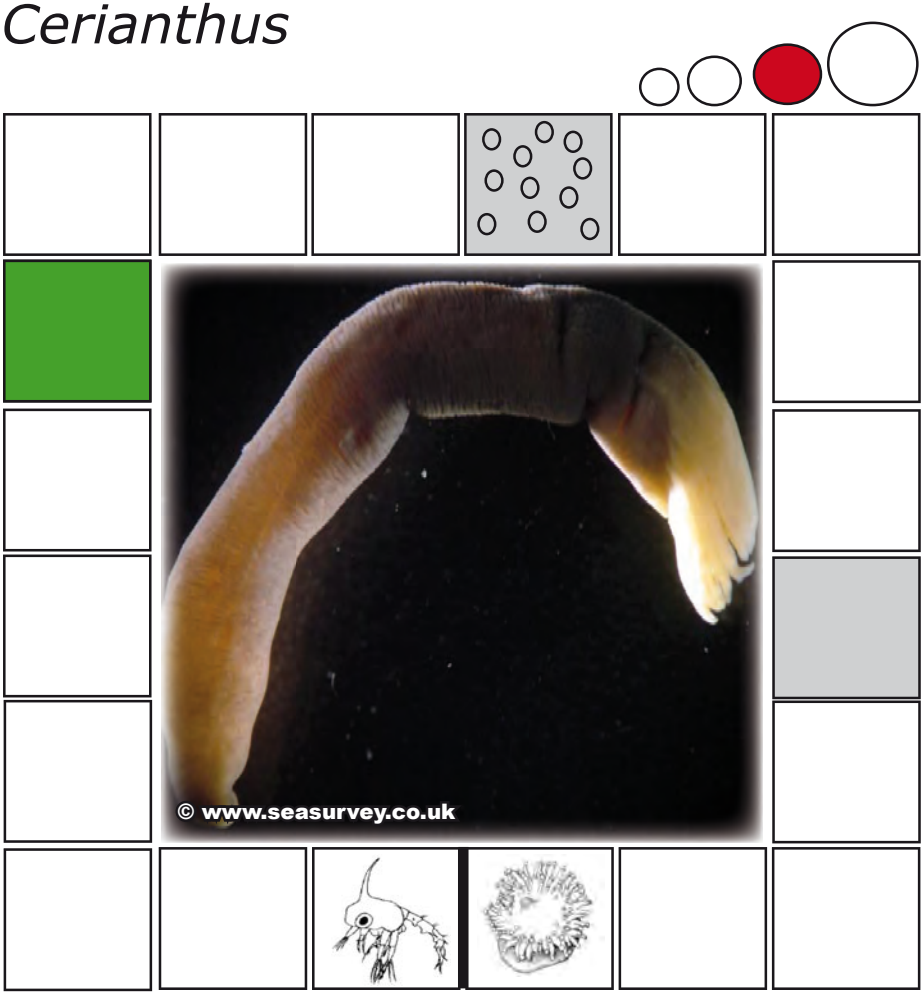


VULNERABLE

Vulnerability: *Caulleriella* is a small (1-4cm), tubiculous polychaete worm found typically in mud & muddy sands. It has limited mobility & likely to be vulnerable to both the physical disturbance & the sedimentation associated with aggregate dredging.

Recoverability: *Caulleriella* is thought to have a lifespan of 3-5yrs, reaching maturity by the second year. It has a moderately high fecundity of 1,000-5,000 offspring. It is not known whether the larvae of *Caulleriella* have a planktotrophic phase although there is some evidence that they are brooded & undergo direct development. This implies that the potential larval dispersion is low & that colonisation from sources outside an impacted area would take some time. The relatively long life span suggests that restoration of the biomass following colonisation may take 3-5yrs.

Cerianthus

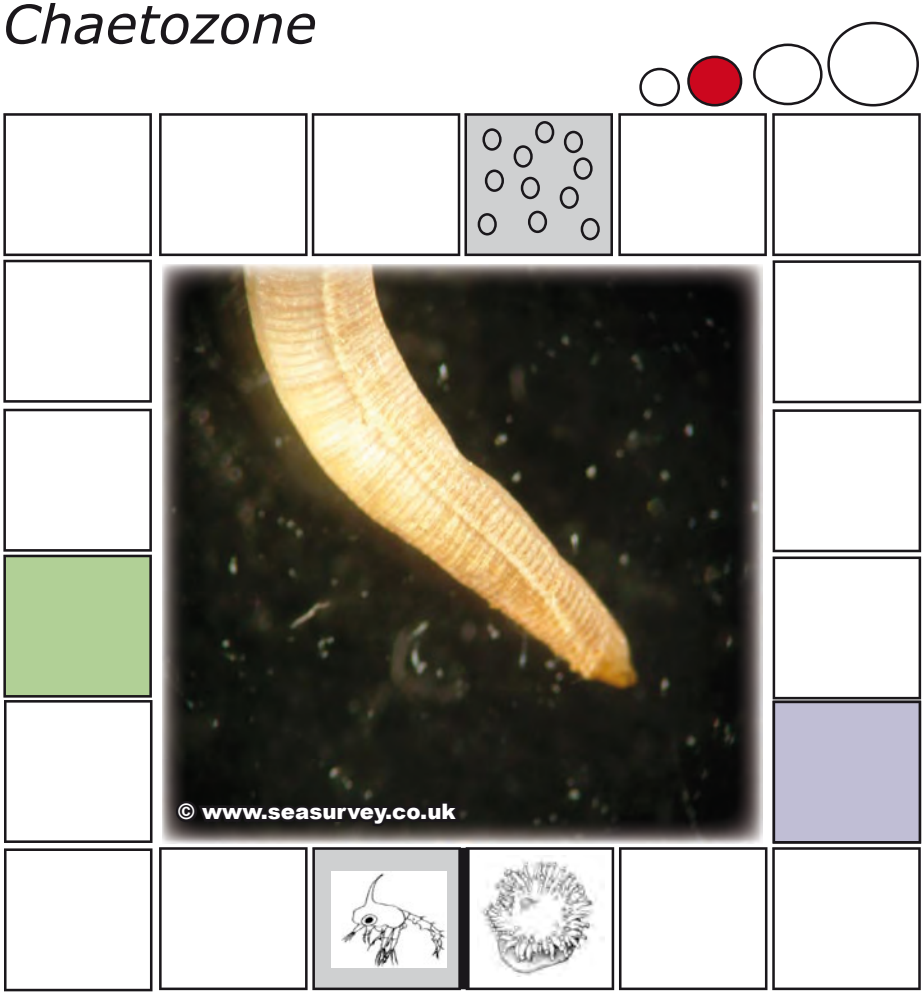


VULNERABLE

Vulnerability: *Cerianthus* is a 10-15cm tubiculous sea anemone. It lives permanently in a felt-like tube constructed from mucus & mud, sand or gravel. It is able to retract rapidly into the tube when disturbed, but at other times feeds by capturing material at the sediment-water interface with tentacles armed with nematocysts. It is vulnerable to both the physical disturbance & possible sedimentation associated with aggregate dredging.

Recoverability: *Cerianthus* is a long-lived anemone with a life-span of as much as 11-20yrs. The age at sexual maturity & fecundity is unknown. Fertilisation is external fertilisation & the larvae are pelagic. The dispersal potential may therefore be high, although without information on the fecundity, it is not possible to estimate the recolonisation potential for this genus. The long life-span & slow growth of this anemone suggests that it has a low rate of restoration of the biomass following recolonisation.

Chaetozone

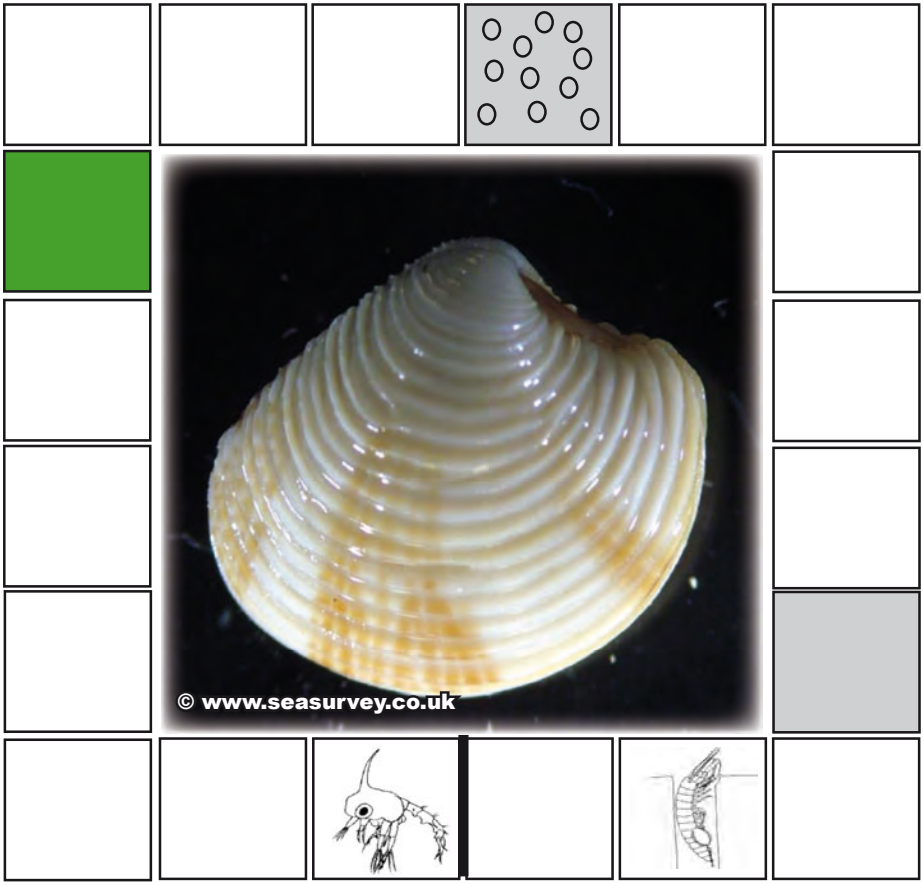


ROBUST

Vulnerability: *Chaetozone* is a genus of small polychaete worms belonging to the Family Cirratulidae. It reaches a length of 2-3cm & lives in a burrow in muddy substrata. It is likely to be vulnerable to dredging although it may be able to resurface through relatively small amounts of deposits mobilised by the dredging process.

Recoverability: *Chaetozone* has a life-span of 1-2yrs & reaches sexual maturity in <1yr. There is little information on the fecundity but the eggs are fertilised externally & may have a significant larval dispersal potential. It shows all the characteristics of an opportunistic species with a short life-span, & rapid growth rate. Where the environmental conditions are suitable, is likely to recover to be one of the first genera to recover following disturbance.

Chamelea



VULNERABLE

Vulnerability: *Chamelea* (synonym *Venus*) is a medium-sized bivalve mollusc (Striped venus) of up to 4cm length belonging to the family Veneridae. It lives in sandy substrata where it feeds on suspended particulate matter in the water column. It has very limited mobility, but is probably capable of upward migration through deposited sand, provided that the rate of accretion is slow. The limited ability to move suggests that this genus is vulnerable to disturbance by dredging, although the impacts of sediments mobilised by the dredging process are likely to be small unless these lead to interference through clogging of the filtration of material by the gills.

Recoverability: This is a long-lived genus with a life-span of 11-20yrs. Little is known of the fecundity, but reproduction occurs over a long period from May to September with external fertilisation in the water column. The eggs are about 0.075mm in diameter & are yolk-filled (lecithotrophic). Each egg develops into a veliger larva that settles after 11-30 days in the plankton at a size of about 0.2mm. Very little is known of the potential for larval dispersal. The long life span & slow growth rate suggest that this genus is likely to have a low recoverability, even if initial recolonisation were to occur rapidly.

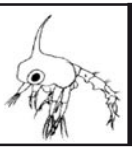
Cheirocratus

VULNERABLE

Vulnerability: *Cheirocratus* is a small amphipod crustacean belonging to the family Melitidae. It reaches 1.5cm body length. It is unlikely to be able to avoid disturbance by dredging, but is probably capable of accommodating deposition of sediment mobilised by the dredging process.

Recoverability: There is very little information on the life-span, reproductive season & fecundity of this genus, although it is known that the eggs are fertilised internally & are brooded by the adult before release as juveniles. Dispersal is likely to be over very short distances of <10m. Relatively few eggs are likely to be brooded by the adult & this, combined with the small dispersal distances suggest that this genus has a low rate of recoverability.

Chlamys

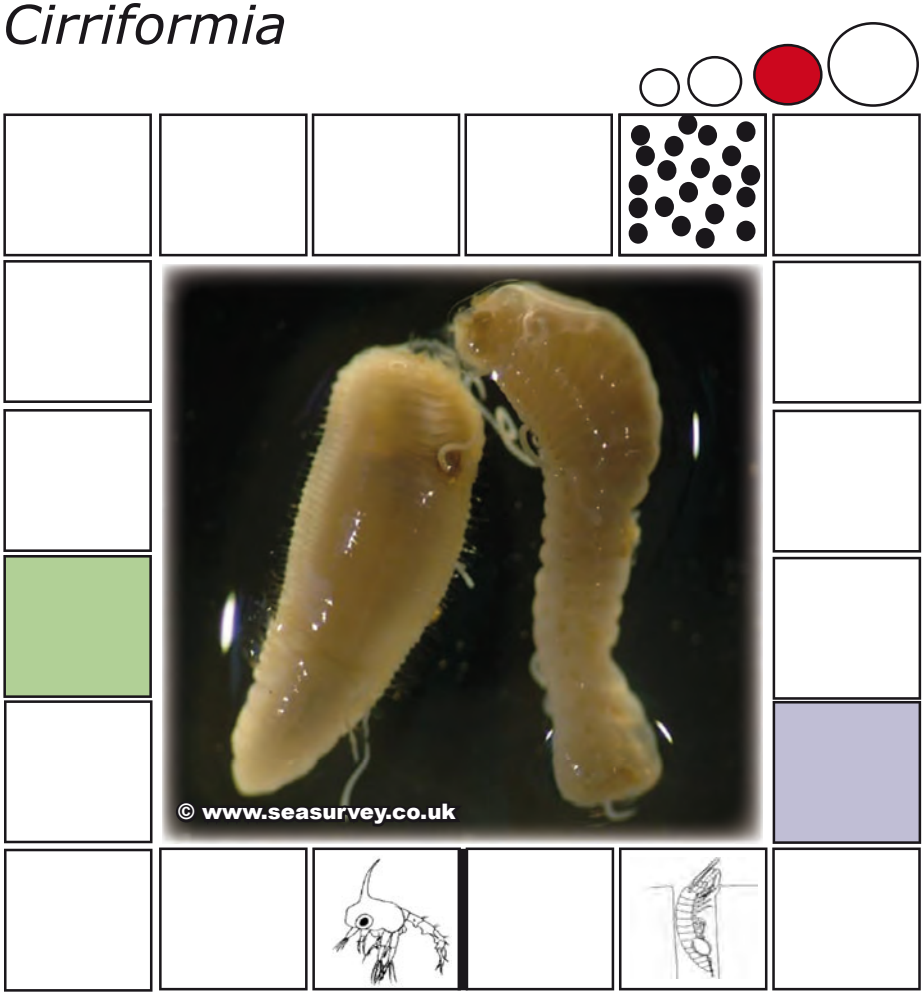


INTERMEDIATE

Vulnerability: *Chlamys* is a genus of bivalve molluscs belonging to the family Pectinidae or scallops. It is of small-medium size (6cm). It lives attached to the surface of stones & in algal holdfasts, feeding by filtration of plankton from the water column. It rarely occurs where there are significant quantities of mobile sand & is therefore fairly substrate-dependent. It has limited mobility & is likely to be vulnerable to disturbance both by dredging as well as from sediments mobilised by the dredging process. The latter may have impacts both on the filtration mechanism & on the stability of the substrate.

Recoverability: There are many different species of *Chlamys*, with life-spans varying between 3-5yrs & in some cases (*Chlamys icelandica*) to as much as 20yrs. The adults are hermaphrodite, producing huge quantities of as many as 3-6 million eggs of about 0.07mm diameter which are fertilised in the water column & develop into planktotrophic (veliger) larvae. Spawning is up to three times per year, with the main spawning period in August. The larvae have an active site-selection phase & settle after 15-25 days, but they can postpone settlement for up to 2 months. Dispersal is likely to be over distances of 1-10km. The high fecundity & widespread planktonic dispersal suggests that this genus has a high rate of recolonisation, but the relatively slow growth & long life-span of 3-5yrs suggests that recovery of biomass following initial recolonisation is relatively slow.

Cirriformia



ROBUST

Vulnerability: *Cirriformia* is a small-medium sized polychaete worm belonging to the Family Cirratulidae. It reaches a body length of 15-20cm & lives in a mucus-lined tube in organic-rich mud, under stones, & amongst sea-grasses. It has limited mobility except within the burrow & is likely to be vulnerable to dredging & to deposition of sediment mobilised by the dredging process.

Recoverability: *Cirriformia* has a lifespan of 1-2yrs reaching sexual maturity within the first year. It has a relatively high fecundity, producing about 15,000 eggs. These are fertilised externally & develop into free-swimming lecithotrophic larvae that settle to the seabed after about 10 days. It is likely that this worm has a high dispersal & colonisation potential & could recover fairly quickly following a physical disturbance.

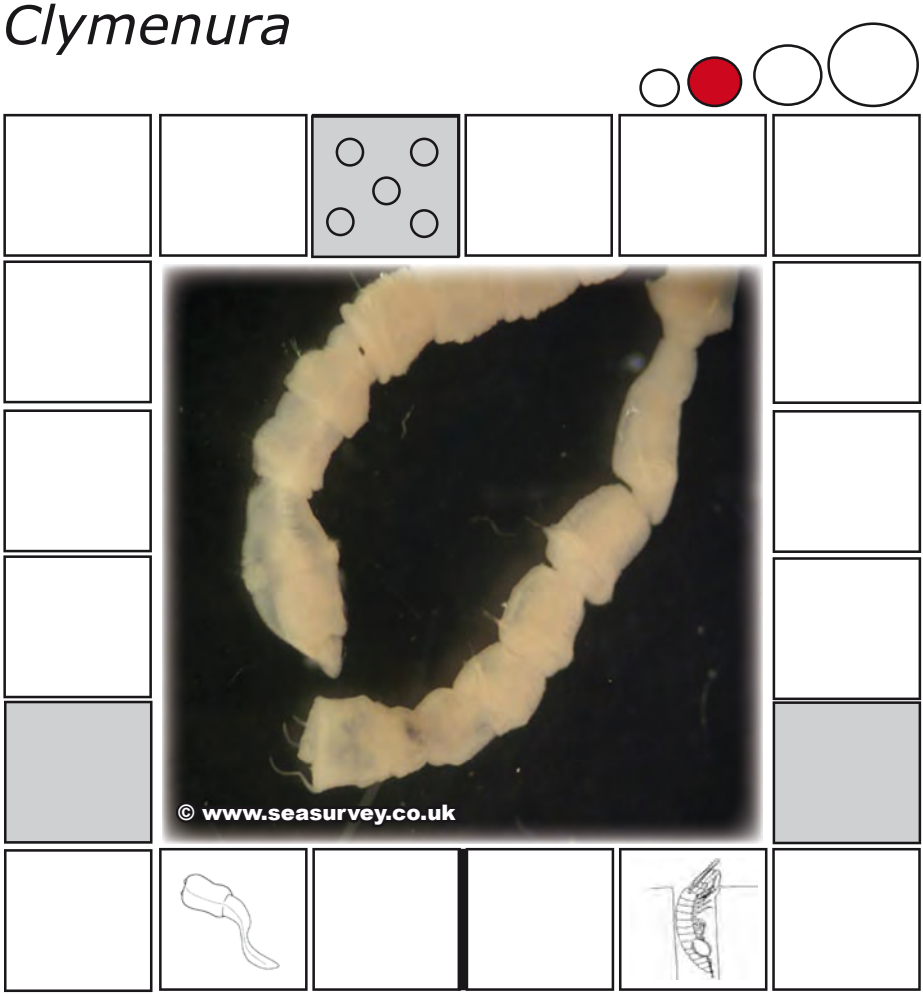
Clausinella

VULNERABLE

Vulnerability: *Clausinella* (Banded venus) is a small bivalve mollusc of about 2.5cm shell length belonging to the family Veneridae. It feeds by filtering plankton from the water column from the shelter of a shallow burrow in coarse sandy gravels. Whilst it can re-bury itself following disturbance, it has limited powers of movement & is therefore vulnerable to dredging. It is likely to be able to tolerate deposition of small quantities of sediment mobilised by the dredging process, but is probably vulnerable to large quantities of deposited material or to large quantities of suspended solids in the water column.

Recoverability: There is very little information on the life-span, fecundity or larval dispersal potential for this genus. Yolk-filled (lecithotrophic) eggs are produced over a protracted breeding season between February & November & are fertilised externally. Larval settlement is between July-November. This species should probably be regarded as having a low-intermediate potential for recovery because yolk-filled eggs are produced in much smaller quantities than in organisms that have planktotrophic larvae.

Clymenura

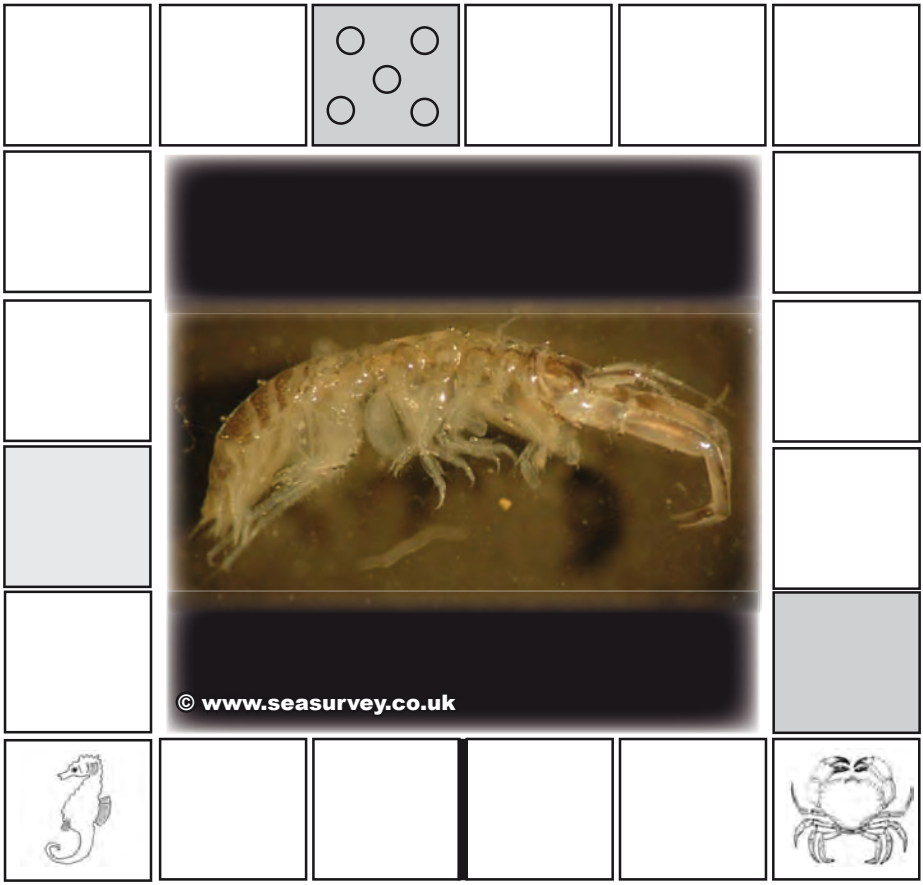


VULNERABLE

Vulnerability: *Clymenura* is a genus of burrowing polychaete worms belonging to the family Maldanidae (bamboo worms). It reaches a body length of only 1-2cm & is a free-living genus found in sands & sandy gravels. It is likely to be vulnerable both to disturbance by dredging & to deposition of material mobilised during the dredging process.

Recoverability: There is little information on the life-span, reproductive season or fecundity of this genus. Breeding is annual, & yolk-filled eggs are fertilised externally in the water column. The duration of the larval phase is unknown, but the dispersal potential is considered to be relatively low at distances up to 1km from the site of release.

Corophium

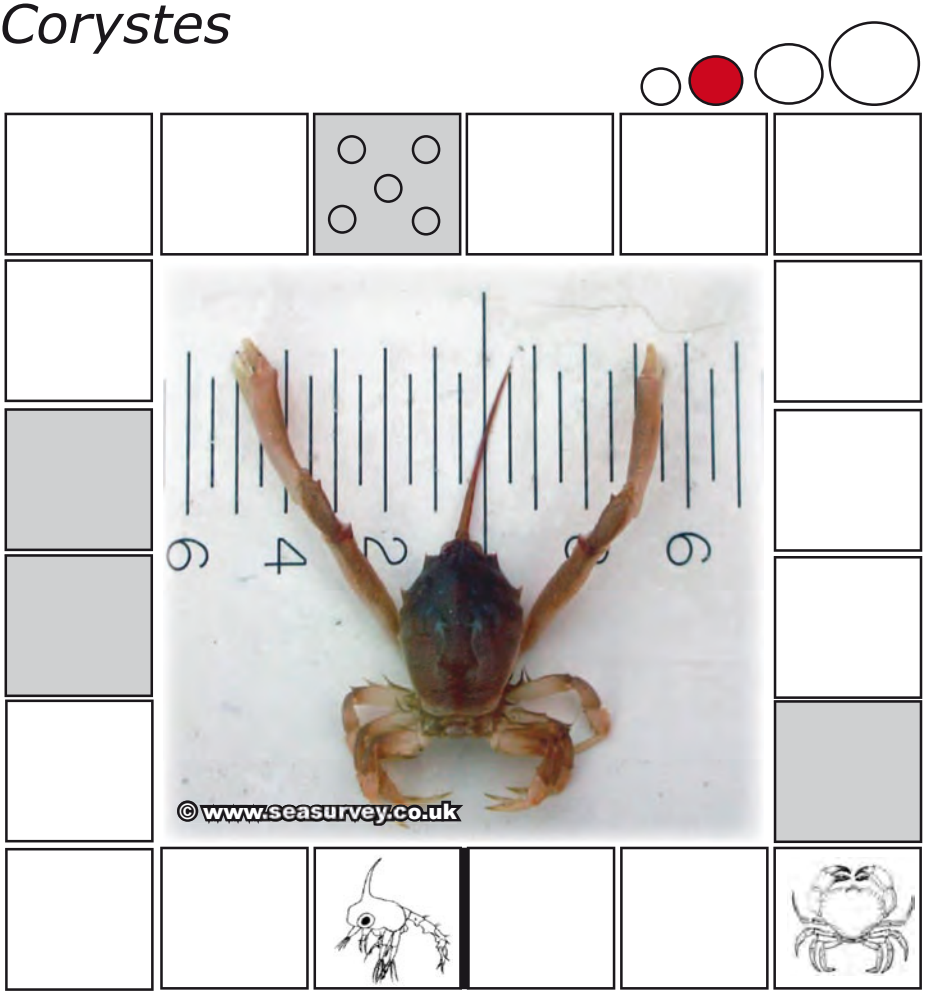


INTERMEDIATE

Vulnerability: *Corophium* is a burrowing amphipod crustacean of about 4-6mm body length. It builds semi-permanent burrows in mud or sand & occasionally constructs sand tubes attached to hydroids, kelp & other surfaces. It is a relatively mobile animal & is able to swim, burrow & crawl. It is likely to be vulnerable to dredging but may be tolerant of any associated sedimentation & could probably burrow through any excess sediment overlaid on the seabed.

Recoverability: *Corophium* is a small crustacean with a rapid rate of growth. There are two broods per year, although fecundity is relatively low & the juveniles are brooded & released as juveniles without a subsequent larval dispersal phase. Dispersal of the juveniles is sometimes assisted by release into the water column by the female, but their dispersal potential is still likely to be less than 10m from the site of release. There is some possibility of recolonisation by adults migrating from adjacent areas as they have the ability to swim & also crawl. Once an area has been colonised by this amphipod restoration of the biomass is likely to occur quickly.

Corystes

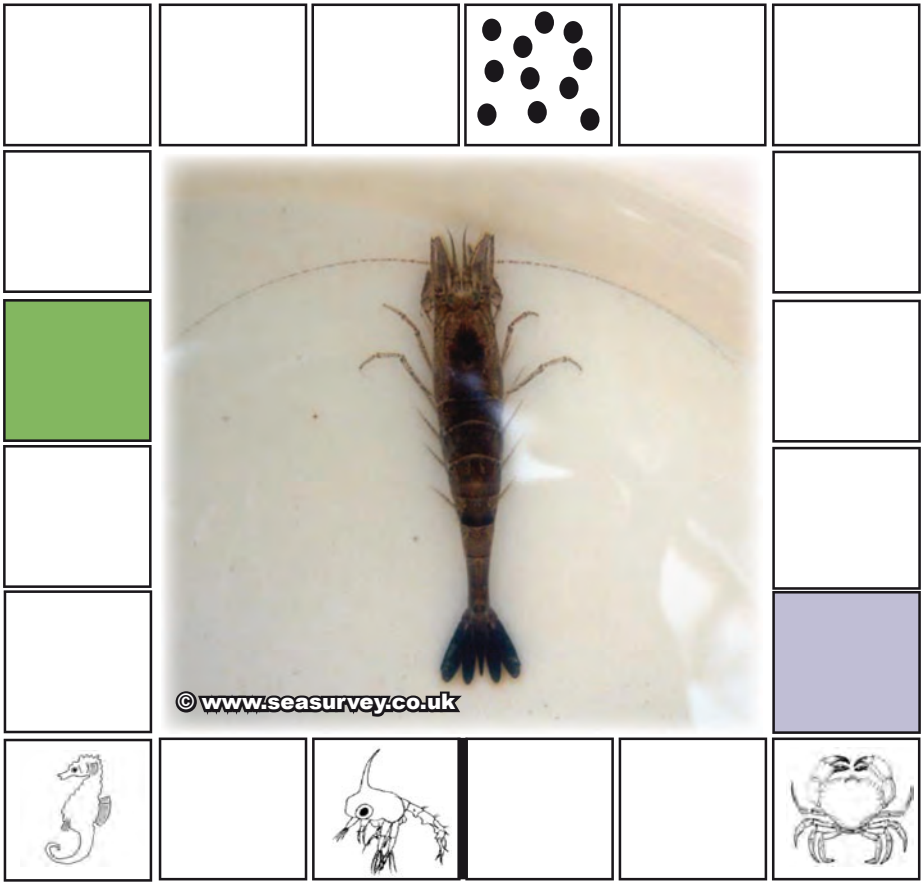


ROBUST

Vulnerability: *Corystes* is a burrowing crab of up to 4cm body length that lives in sandy deposits. It draws in water for gas exchange through the bristles of modified antennae. The crab is moderately mobile & is able to re-bury itself following disturbance. It is likely to be vulnerable to dredging, but is well-adapted to life in mobile sandy deposits & is probably tolerant of sediments mobilised during the dredging process.

Recoverability: There is little information on the life-span or age at maturity for this genus. Breeding is from May-July & following internal fertilisation, eggs of 0.5mm diameter are released & develop into planktotrophic (zoea) larvae over a period of 11-30 days. These & the subsequent megalopa stage are often abundant in the plankton from March-June. Larval dispersal potential is probably relatively high. Recoverability probably high, although more information on life-span & fecundity is needed to confirm this.

Crangon

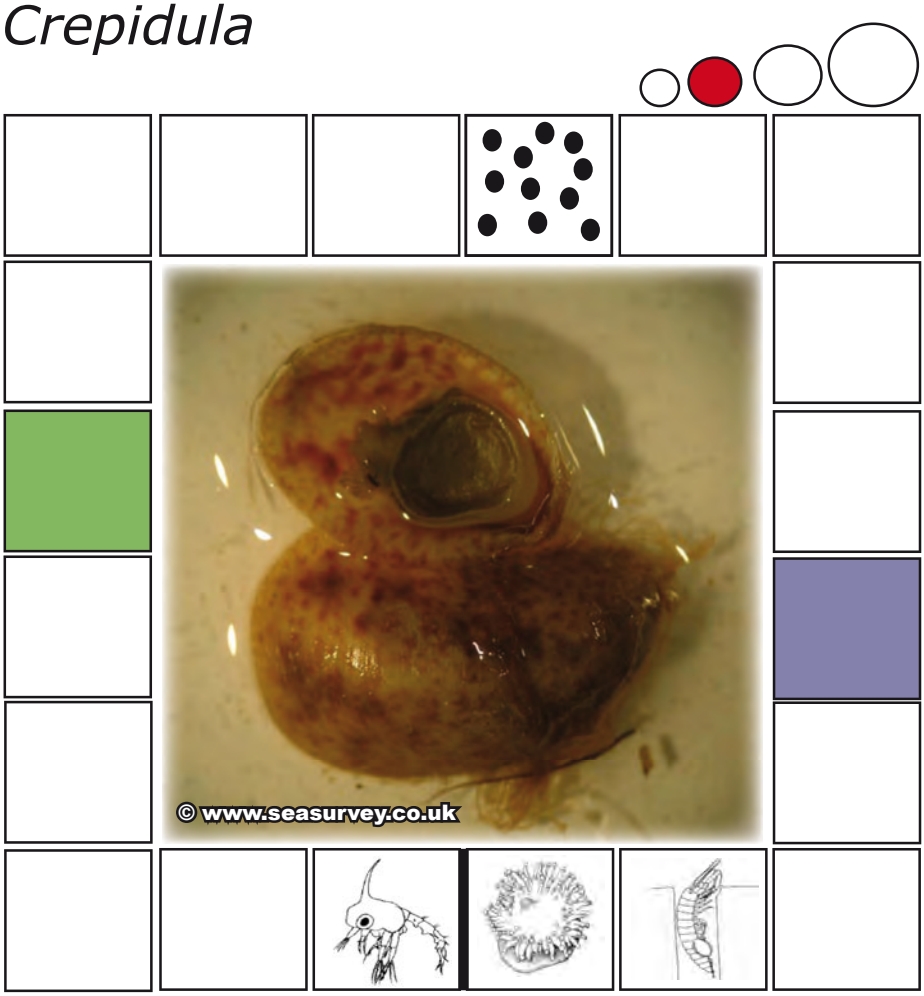


ROBUST

Vulnerability: The brown shrimp *Crangon* is a free living mobile shrimp that is an opportunistic omnivore in sands, & muddy sands. Although relatively small (1-3cm), it may have sufficient mobility to avoid the physical impacts of aggregate extraction. It is also likely to be tolerant of significant levels of sedimentation, & is abundant in estuaries with a high sediment load.

Recoverability: *Crangon* has a life-span of 3-5yrs & reaches sexual maturity in 1yr. The females have a high fecundity producing between 2,000 & 5,000 eggs. These are fertilised internally & then brooded under the abdomen before being released as planktoprophic zoea larvae in the spring. The zoea larvae are initially about 2mm in length & develop into a mysis stage of about 6.5mm length after about 30 days in the plankton. *Crangon* has a high dispersal potential both in its adult form & in its planktotrophic larval form so that colonisation of a disturbed area is likely to be fast.

Crepidula

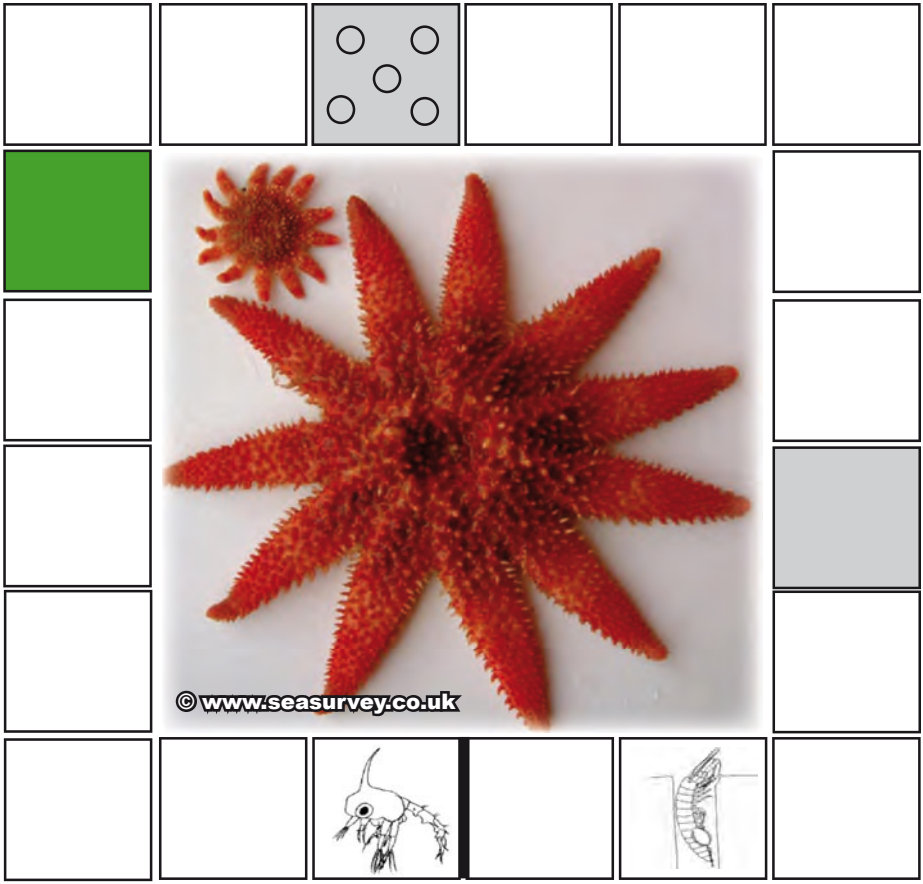


INTERMEDIATE

Vulnerability: The slipper limpet, *Crepidula* is a medium-sized mollusc belonging to the Family Calyptraeidae. It reaches a shell length of about 5cm & feeds by filtering fine particulate matter from the water column. It is regarded as a 'pest' on oyster beds having been introduced into the U.K with American oyster spat between 1887 & 1890. The juveniles are mobile & can creep over the seabed in order to find a suitable surface for attachment such as shells, stones or other *Crepidula*. It has limited mobility & is susceptible to dredging & to deposition of sediment mobilised by the dredging process.

Recoverability: *Crepidula* is a long-lived mollusc reaching an age of up to 7-10yrs. Sexual maturity is reached by about 1yr. It has a moderate fecundity producing approximately 4,000 planktotrophic veliger larvae that spend about 30 days in the plankton. The dispersal potential is estimated to be in excess of 10km so recolonisation is possible from outside the boundaries of a disturbed site. Restoration of the biomass following initial recolonisation could, however, take as much as 7-10yrs.

Crossaster

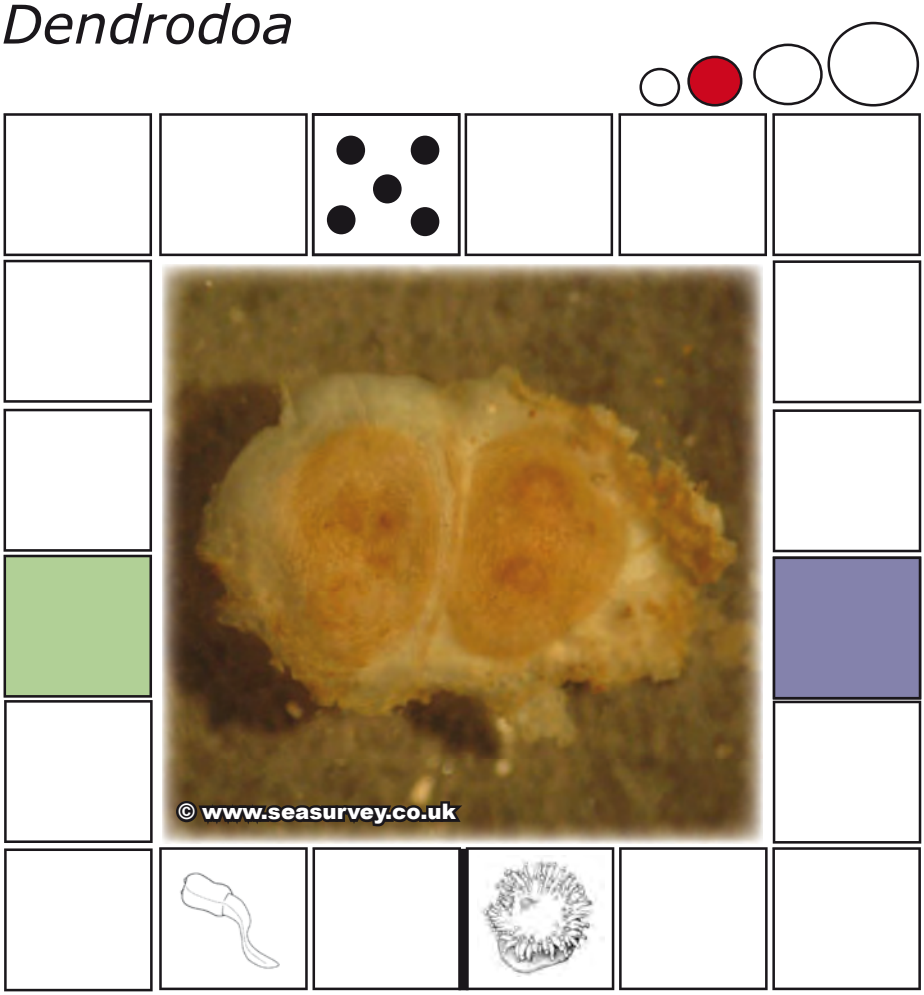


VULNERABLE

Vulnerability: *Crossaster* is a medium-large genus of starfish belonging to the family Solasteridae (Sun-starfish). The adult reaches a diameter of about 35cm & lives on the surface of the seabed on gravels & sandy-gravels. It is vulnerable to the dredging process, & is likely to be intolerant of large quantities of sand mobilised by the dredging process.

Recoverability: The breeding season of this genus is March-April with yolk-filled eggs of about 0.75mm being released into the water column where fertilisation takes place. Settlement of the larvae takes place from May-July after a lengthy planktonic phase of 1-2 months. Very little is known about the fecundity of this species, or of its dispersion potential, but probably the juveniles are dispersed widely after a prolonged planktonic phase. *Crossaster* is, however, a long-lived & slow-growing genus with a life-span of as much as 10-20yrs. Recovery of biomass following initial recolonisation by the larvae is therefore likely to take a long time. Based on the slow growth rate of this genus recoverability is assessed as low.

Dendrodoa

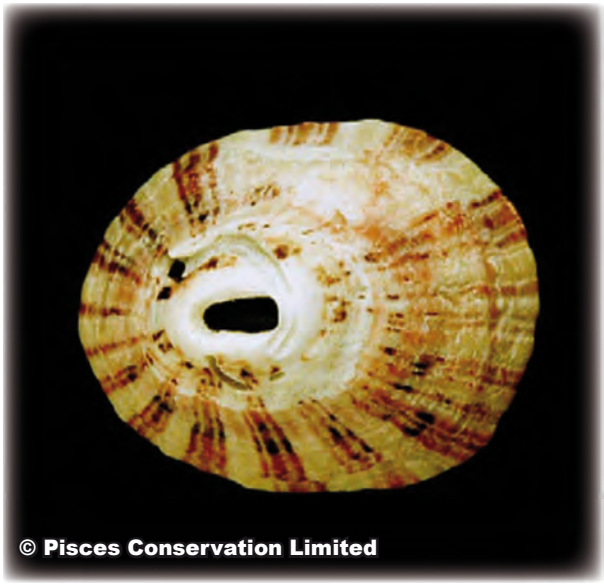


VULNERABLE

Vulnerability: *Dendrodoa* is a solitary sea squirt that sometimes forms dense aggregations attached to stones, shells or other hard surfaces. It is sessile & feeds by filtering particulate matter from the water column through a complex branchial basket. It is likely to be vulnerable to dredging & to deposition of material mobilised by the dredging process. This can smother the animals or clog the branchial filtration system. The sea squirt requires solid substrata for attachment & is vulnerable to deposition of sand over surfaces that might otherwise be available for colonisation.

Recoverability: *Dendrodoa* is a relatively short-lived animal, living for only 1-2yrs, & reaching sexual maturity after a year. It produces a moderate number of offspring ca.250 which remain in the water column as tadpole larvae for <1 day. The dispersal potential is therefore not expected to be great. Recoverability of this genus is assessed as low in the absence of adult populations in the immediate vicinity.

Diodora

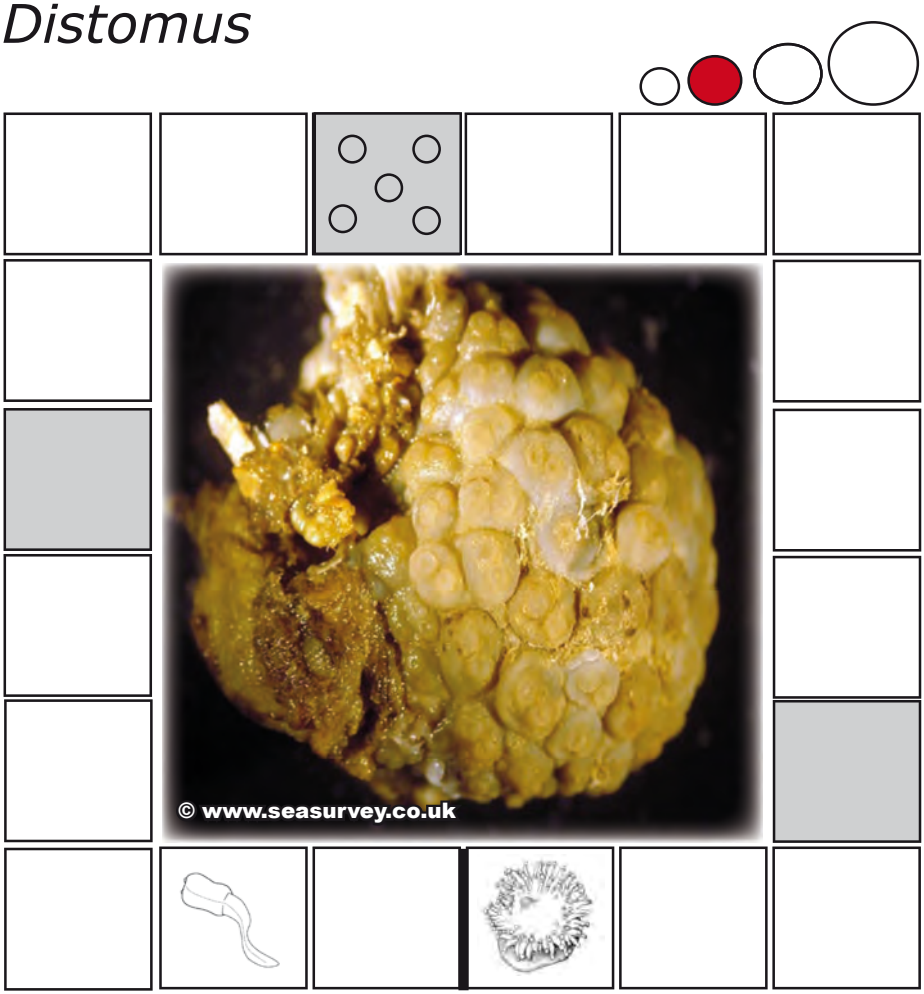


VULNERABLE

Vulnerability: *Diodora* is a small-medium sized limpet belonging to the family Fissurellidae (Keyhole limpets). It reaches a size of 3cm and, like all limpets, requires a solid substratum of rocks or cobbles from which it browses micro-algae with a rasp-like radula. It is likely to be vulnerable both the direct effects of dredging & to an increase in suspended particulate matter or deposition of sand mobilised during the dredging process.

Recoverability: The genus has a very slow growth rate & long life-span of 10-20yrs. It is hermaphrodite, producing tiny eggs of about 0.2mm with a direct development between December & February. The eggs take about 3 weeks to hatch & since there is no larval phase, dispersion is limited to the immediate vicinity of the adults (ie <10m). This genus has a very low recoverability both in terms of recolonisation by juveniles & subsequent restoration of biomass following growth of the recolonising individuals.

Distomus

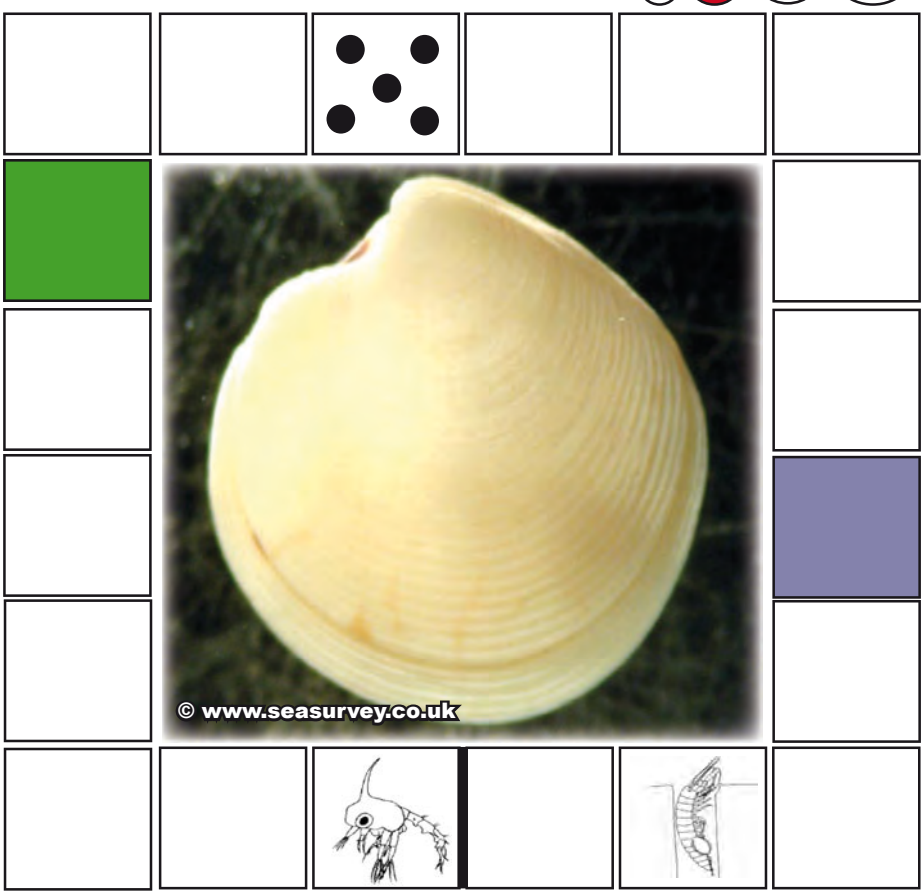


VULNERABLE

Vulnerability: *Distomus* is a small ascidian (sea squirt) belonging to the Family Styelidae. It comprises clumps of solitary zooids each of about 1cm height & united at the base by a test. It is attached to stones & rocks but more often on kelp where it filters particulate matter from the water column through a complex branchial basket. It is vulnerable to dredging & to the deposition of sediment mobilised by the dredging process. This may clog the filtration system & also prevent settlement on surfaces that would otherwise be suitable for recolonisation.

Recoverability: There is little information on the longevity or age at maturity for this genus. The zooids are hermaphrodite & are also capable of asexual reproduction by budding. Fecundity is likely to be low, with a single egg released from each of 6-10 ovaries. There is a very restricted larval phase & settlement is likely to be close to the site of release. Dispersal potential is therefore low.

Dosinia

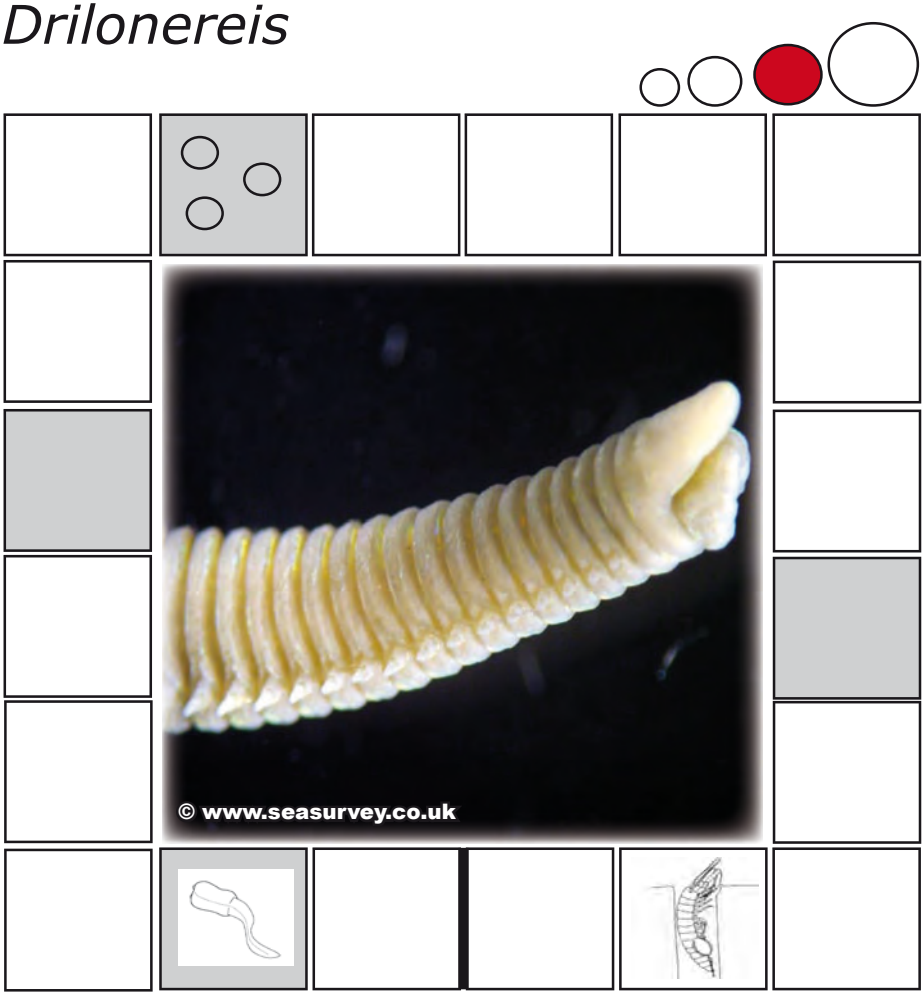


INTERMEDIATE

Vulnerability: *Dosinia* is a genus of small-medium sized burrowing bivalve molluscs known as Artemis shells belonging to the Family Veneridae or Venus shells. The shell length is 4-6cm & the bivalves burrow in muddy gravel or shell gravel where they filter particulate matter suspended in the water column. It is likely to be vulnerable to dredging although it is likely to be able to resurface after burial by sediment mobilised by the dredging process.

Recoverability: *Dosinia* is a long-lived bivalve with recorded ages of up to 20yrs. It reaches sexual maturity after 2yrs but the fecundity is unknown. The sexes are separate & fertilisation is external. The zygote develops into a planktotrophic veliger that spends about 30 days in the plankton. The dispersal potential is probably high, but the recovery of biomass is likely to take up to 20yrs.

Drilonereis



VULNERABLE

Vulnerability: *Drilonereis* is a free living, burrowing marine worm found in mixed sand & gravel habitats, although there are also endo-parasitic forms which inhabit cirratulid polychaetes. Both the free-living & the endo-parasitic form of this worm are likely to be vulnerable to the physical disturbance associated with aggregate extraction due to their small size & the small size of their host. They may however be able to tolerate some sedimentation associated with dredging since they (and by in large their hosts) have the ability to burrow through finer sediments.

Recoverability: The information available on the reproduction & general biology of this worm is very sparse. It is quite large in size with records of it reaching up to 20cm. This would suggest that it is relatively long-lived compared with other marine polychaetes & biomass at least may take some time to recover.

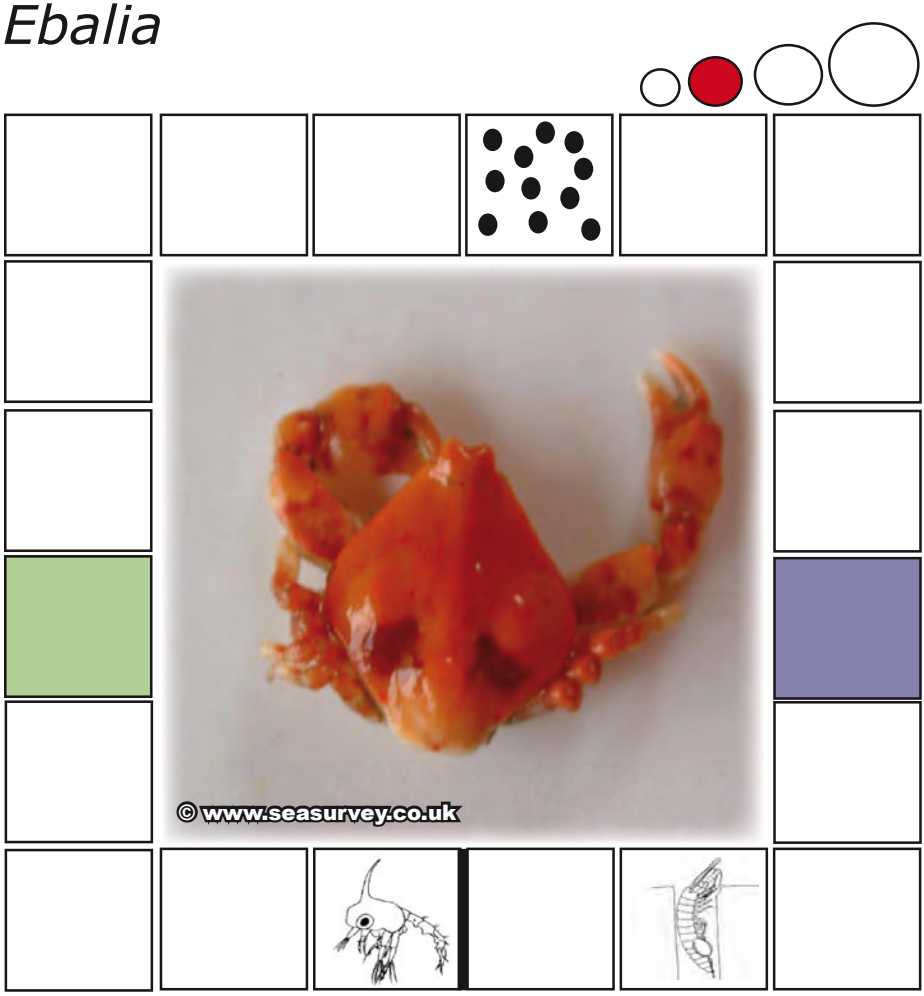
Dysidea

VULNERABLE

Vulnerability: *Dysidea* is a medium-sized sponge of up to 30cm across & up to 1cm thickness belonging to the family Dysideidea. It may be thinly encrusting or develop into a massive lobose form. Like all sponges, it requires a firm stable rock or cobble substrate for attachment & feeds by filtering fine particulate matter from the water column. It has no ability to move, & hence is vulnerable to dredging & is likely also to be vulnerable to increased concentrations of suspended solids or to deposition of material mobilised by the dredging process.

Recoverability: The genus is hermaphroditic & breeds in the summer months from June to August. Clouds of sperm are released into the water & are carried by the current to another sponge where they are captured before being transported by special cells to eggs where fertilisation occurs. There is little information on the number of ciliated larvae that are released, the duration of the dispersal phase or other details to assess dispersal potential for this genus. The rate of growth is likely to be slow & several (or many) years may be required for establishment of larger colonies. Recoverability is assessed as probably low.

Ebalia

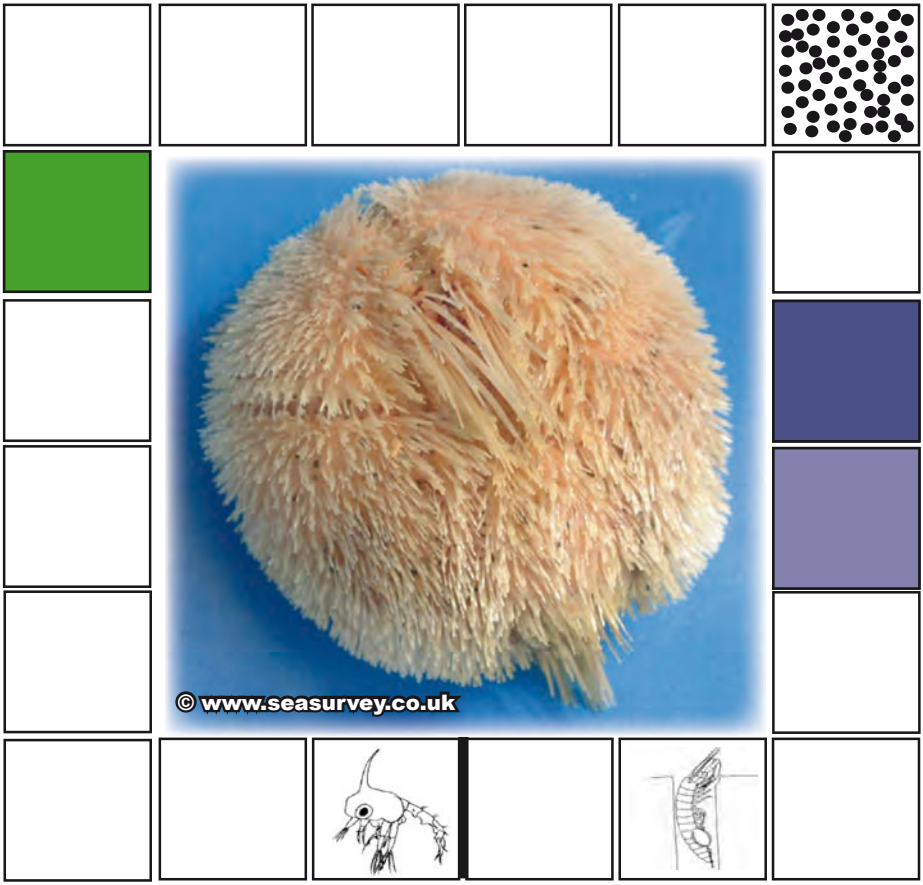


ROBUST

Vulnerability: *Ebalia* is a small free-living crab (a nut crab) of about 1.5cm body width that belongs to the Family Leucosiidae. It is not uncommon in gravels & coarser deposits. It is likely to be sensitive to disturbance by dredging & to deposition of material mobilised during the dredging process.

Recoverability*:* This genus has a life-span of 1-2yrs & an annual breeding season in the Autumn from September to November. Reproductive maturity is achieved at 1yr of age, & as many as 2,500 eggs of about 0.28mm are produced by the females. Fertilisation is internal & very small planktotrophic (zoea) larvae are released into the water column. These are not uncommon in the plankton in spring & summer. Settlement occurs after a period of 1-2 months by which time the dispersal may be up to 1km from the site of release. The relatively short life span, rapid growth rate & large number of eggs suggest that this genus has a moderately high recoverability.

Echinocardium

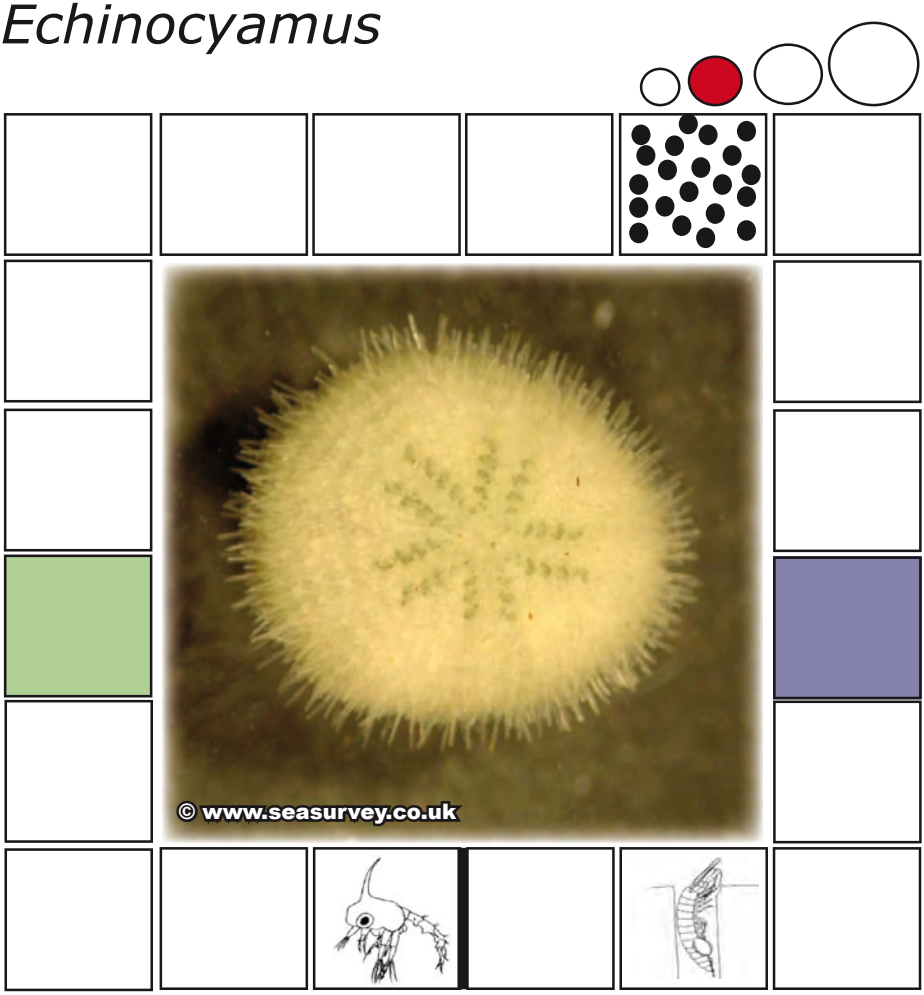


INTERMEDIATE

Vulnerability: The sea potato *Echinocardium* is a deep burrowing sea urchin (8-10cm) which is common in sandy deposits. It is a mobile animal & is found in deep burrows of up to 15cm deep. It is likely to be vulnerable to dredging but may be able to resurface through sediments deposited during the dredging process.

Recoverability: *Echinocardium* has a very high fecundity producing in excess of a million offspring, it reproduces externally & the encinopluteus larvae are planktotrophic. These are about 0.6mm long & occur in the plankton between July-September. The dispersal potential is therefore high. *Echinocardium* grows quickly in the first 2yrs until it reaches sexual maturity at 2-3yrs. The longevity is as much as 10yrs with relatively slow growth after sexual maturity.

Echinocyamus

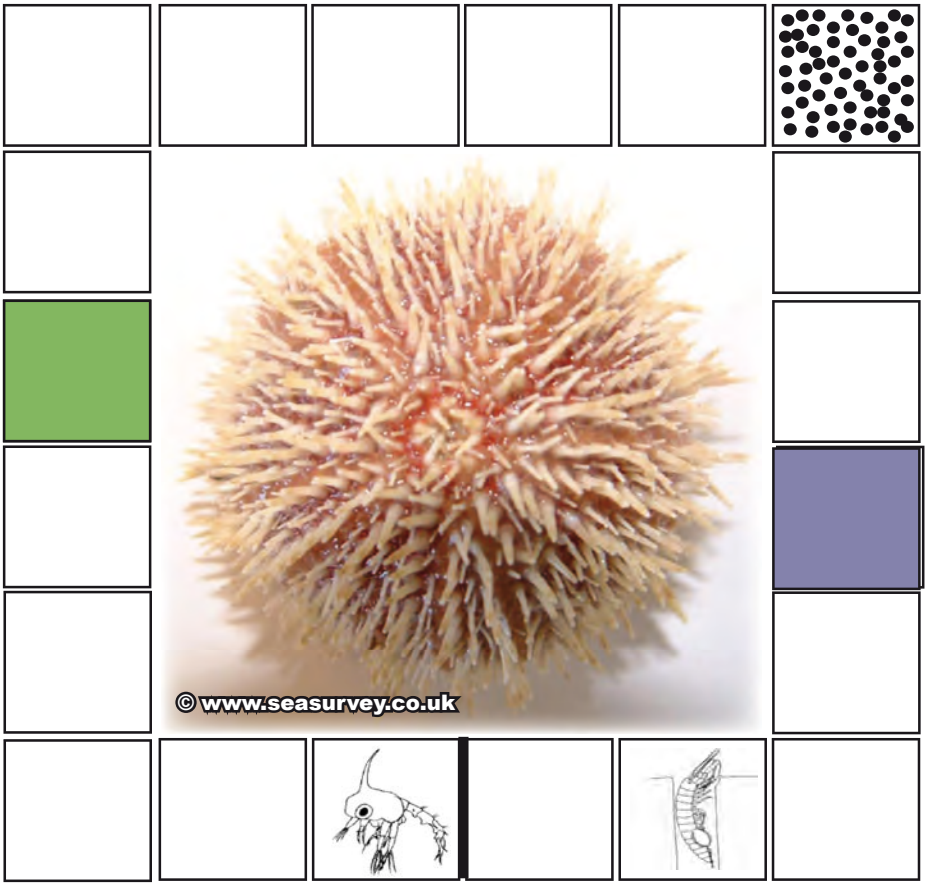


INTERMEDIATE

Vulnerability: The pea or green urchin *Echinocyamus* is a very small, free-living urchin of about 1.5cm body length. It is common in coarse sand or fine gravel. Owing to its small size is likely to be vulnerable to the physical disturbance of dredging & is too fragile to survive an extraction event. It's sensitivity to sedimentation is difficult to assess due the paucity of information but it is likely to be able to resurface through thin veneers of sediment.

Recoverability: *Echinocyamus* is small & only lives for 1-3yrs, reaching sexual maturity after 1yr. There is little information available on its fecundity. Reproduction is external & the echinopluteus larvae are of about 0.5mm long. These planktotrophic larvae occur in the plankton from March to September indicating a high dispersal potential. Once the sediment has become colonised, the abundance & biomass of *Echinocyamus* could be expected to recover within 3yrs.

Echinus

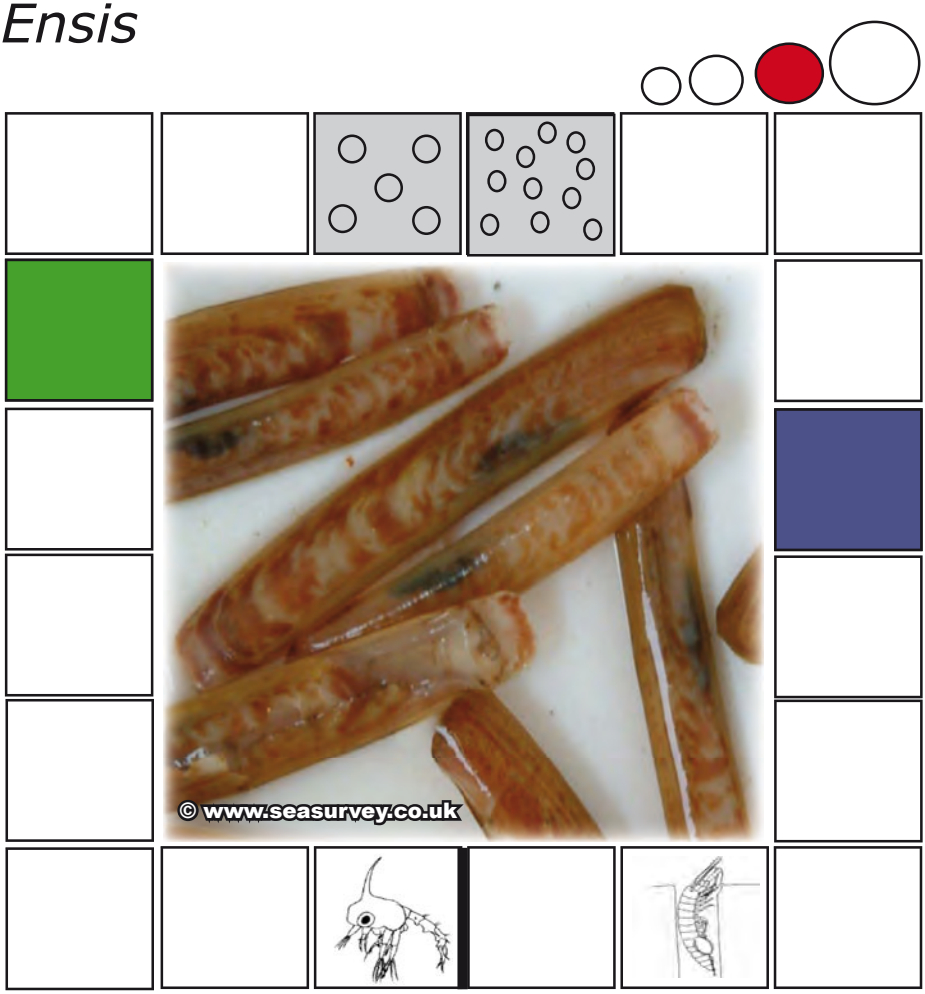


INTERMEDIATE

Vulnerability: *Echinus* is a free-living spherical echinoid (sea urchin) of up to 16cm size. It is found on rocky substrata where it rasps material from the surface of the seabed by means of calcareous teeth. It is attached to the substratum by tube feet which it also uses for relatively slow movement across the substratum. It is likely to be vulnerable to dredging & to the deposition of large quantities of sediment mobilised by the dredging process, although it is likely to be able to tolerate small quantities of sediment deposition. It does, however, require a substratum of rocks & boulders & would be susceptible to habitat modification if deposition of sediment was significant.

Recoverability: *Echinus* is a large bodied, long-lived genus with a life-span of at least 8yrs. The fecundity is high & fertilisation is external. The planktotrophic echinopluteus larvae are about 1.5mm long & are common in the spring & summer plankton. The duration of the planktonic larval phase is 1-2 months & the dispersal potential is >10km. *Echinus* is slow to mature & it would take up to 8yrs for adult biomass to be restored. This combined with the requirement for a hard substrate makes this urchin of intermediate recoverability.

Ensis

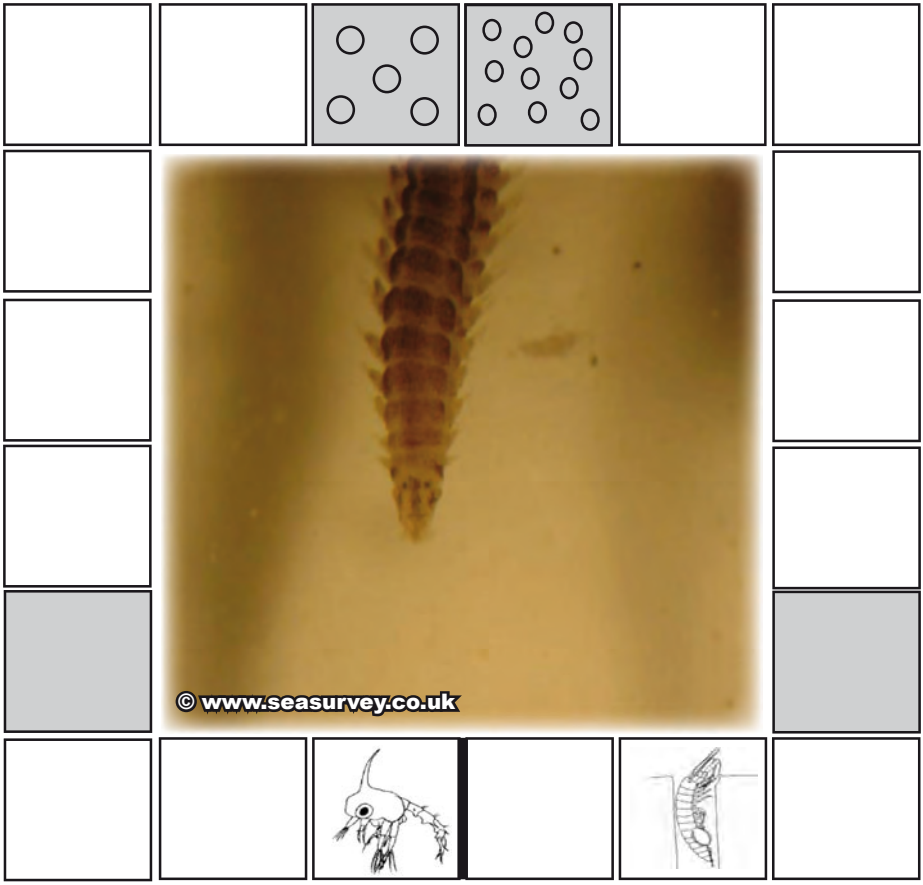


VULNERABLE

Vulnerability: *Ensis* is a genus of bivalve belonging to the Family Pharidae (Razor shells) & lives by filtering plankton from the overlying water column. The adult shell size is 11-20cm & the bivalve burrows to a considerable depth in sand & shell gravel. It has a restricted mobility but is able to re-burrow following disturbance. It occurs in relatively high densities in shallow waters extending into the intertidal zone, but has also been recorded as isolated specimens down to depths of 60m. This shellfish is vulnerable to disturbance by dredging, but is probably able to migrate vertically through sediments mobilised by the dredging process.

Recoverability: *Ensis* is a long-lived genus with a life-span of up to 10-20yrs. The age at maturity is 3-5yrs & breeding takes place between February & April. The eggs are approximately 70mm in diameter & are fertilised externally after which the 0.25mm planktotrophic larvae spend up to 30 days in the water column. There is little information on fecundity & larval dispersal potential. Based on the relatively long time before adult razor shells breed, their slow growth rate & long life-span, *Ensis* has a low potential for recovery.

Eteone

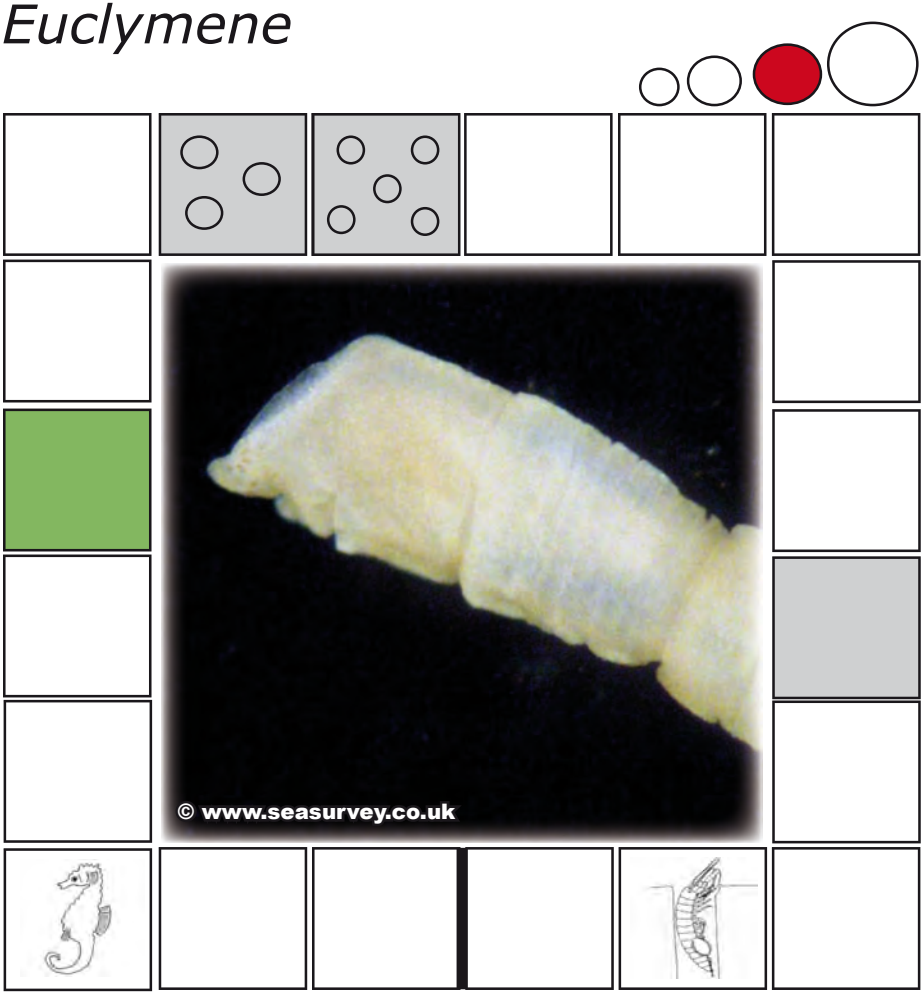


INTERMEDIATE

Vulnerability: *Eteone* is a free-living polychaete worm belonging to the Family Phyllodocidae (Paddle worms). The adult body size is between 25-60mm & the worm lives in shallow burrows in gravels & muddy gravels where it is a carnivore that preys on small invertebrates. It is likely to be vulnerable to disturbance by dredging & to sediment mobilised during the dredging process.

Recoverability: Little is known of the longevity, fecundity & age at maturity of this genus. Reproduction is mainly in March. The eggs are about 120mm diameter & are fertilised externally, with settlement of the larvae in April-May after a period of about 4 weeks in a planktotrophic phase. The life-span for this small worm is probably relatively short & the growth rate fast, so this genus has a capacity to recolonise & grow to adult size in a relatively short period of time. Information on the fecundity is required, but based on a short generation time, this genus has an relatively high recoverability.

Euclymene

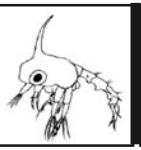


VULNERABLE

Vulnerability: *Euclymene* is a small maldanid polychaete of 11-20cm body length. It lives head down in a tube just below the surface of shelly & muddy sand where it feeds on sub-surface detritus, protests & bacteria. There is no ability to move other than within the tube. Hence this polychaete is vulnerable to dredging & to deposition of material mobilised by the dredging process.

Recoverability: The life-span of this genus is 3-5yrs. Large eggs are probably produced in October. The eggs are fertilised externally & the larvae are then brooded in the tube. The relatively long life-span & limited dispersal is suited to the development of dense communities in stable conditions. However the recoverability following disturbance by dredging is likely to be low.

Eulalia



INTERMEDIATE

Vulnerability: *Eulalia* is a medium-sized free-living phyllodocid (Paddle worm) worm that reaches 11-20cm in length. It feeds as a predator-scavenger on small invertebrates on the surface of the seabed, especially on stones, shells & rocks. Its preferred habitat is large boulders & cobbles down to shingle & gravel, but it is intolerant of mobile sands. Although it has moderate mobility, it is likely to be vulnerable to dredging & to changes in sediment composition from sand mobilised during the dredging process.

Recoverability: There is no information on the longevity of this genus. Breeding is from May-June & results in the production of gelatinous egg sacs that are attached to the seabed & contain eggs of 0.1-0.2mm diameter. After hatching, the larvae spend about 6 weeks in the plankton settling to the seabed in July-August. The larval dispersal potential suggests that the recolonisation rate for this genus from external sources could be significant. Probably this genus is of intermediate recoverability.

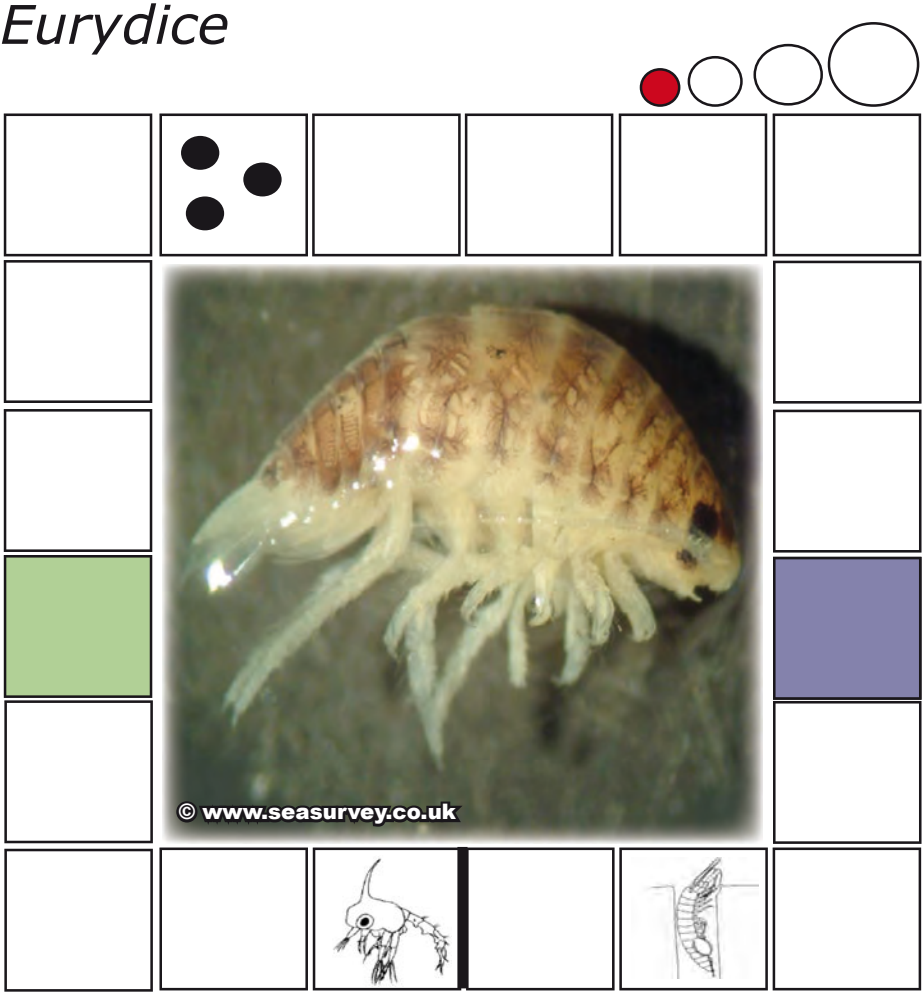
Eumida

INTERMEDIATE

Vulnerability: *Eumida* is a medium-sized free-living phyllodocid (Paddle worm) worm that reaches 5-15cm in length. It feeds as a carnivore on small invertebrates living on the surface of stones & shells. Although it has moderate mobility, it is likely to be vulnerable to dredging & to changes in sediment composition from sand mobilised during the dredging process.

Recoverability: There is no information on the longevity or age at maturity of this genus. Breeding is from May-July with external fertilisation of eggs that are about 0.08mm diameter. Settlement occurs after a period of about 6 weeks as a planktotrophic larva. Larval dispersion potential suggests that recolonisation of disturbed deposits from external sources could occur but without data for fecundity it is not possible to assess the likely rate of recolonisation.

Eurydice

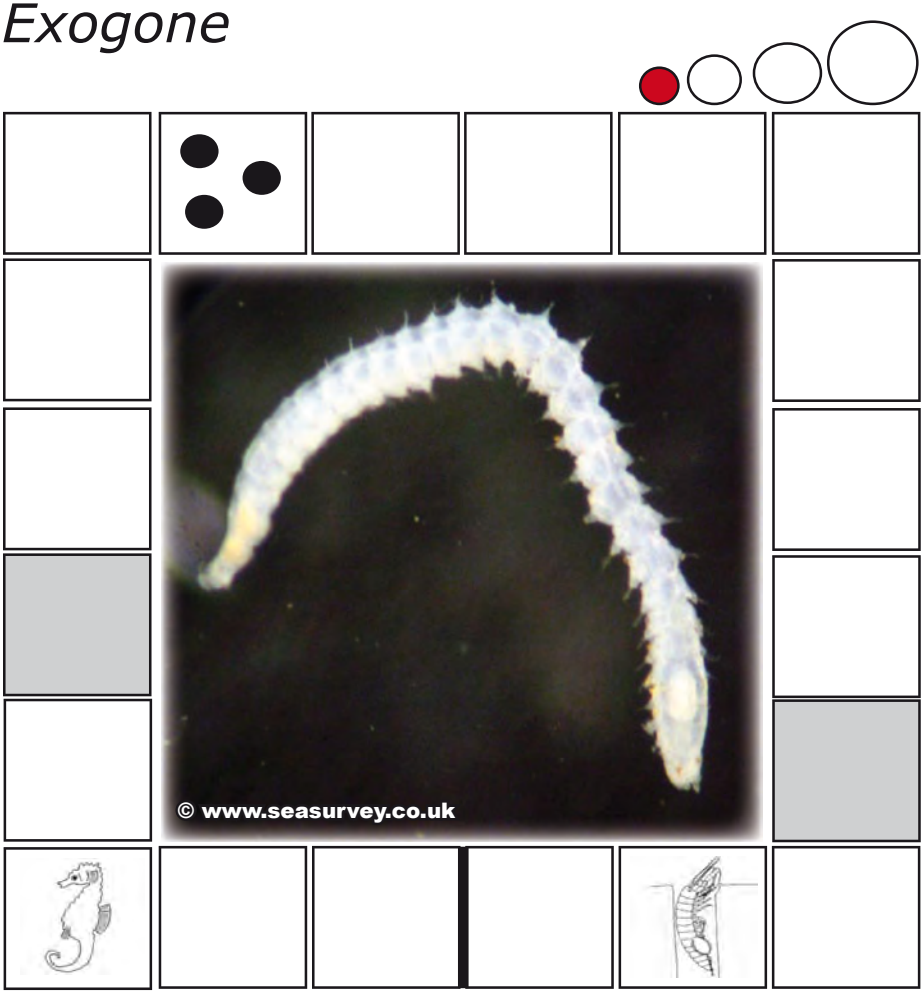


VULNERABLE

Vulnerability: *Eurydice* is a small isopod crustacean belonging to the Family Cirolanidae (Sea lice). It reaches 8-9mm in length & is of moderate mobility, being able to swim up into the water column & burrow in the surface deposits of sand & gravel to feed on invertebrates & carrion in the sediment. It is likely to be vulnerable to dredging, but would be able to tolerate moderate sediment deposition from material mobilised during the dredging process.

Recoverability: The life span of this genus is up to 2yrs, with reproduction from 1yr onwards. The eggs are produced from June-October. They are of a relatively large size (0.5mm) but are only 10-45 in number. These are fertilised internally before being held in a brood-pouch for up to 8 weeks. The larvae are then released into the plankton where they spend up to 40-60 days before settlement. The small number of eggs produced suggests that this genus has a low recoverability following disturbance.

Exogone



VULNERABLE

Vulnerability: *Exogone* is a small free-living polychaete belonging to the Family Syllidae. It reaches a body length of only 2-10mm & lives as a carnivore of small invertebrates, & as an omnivore on detritus & algae on the surface of sand, shell gravel & amongst epigrowths. It has limited mobility & is likely to be vulnerable to the effects of dredging & to sediment mobilised during the dredging process.

Recoverability: Little is known of the longevity or age at maturity of this genus. The sexes are separate & the adults swim into the water column to breed in August. The females produce 30-40 eggs of 0.1mm diameter which are brooded in egg pouches. The very limited number of eggs, & the lack of a pelagic larval dispersal phase suggest that this genus has a low recoverability following disturbance.

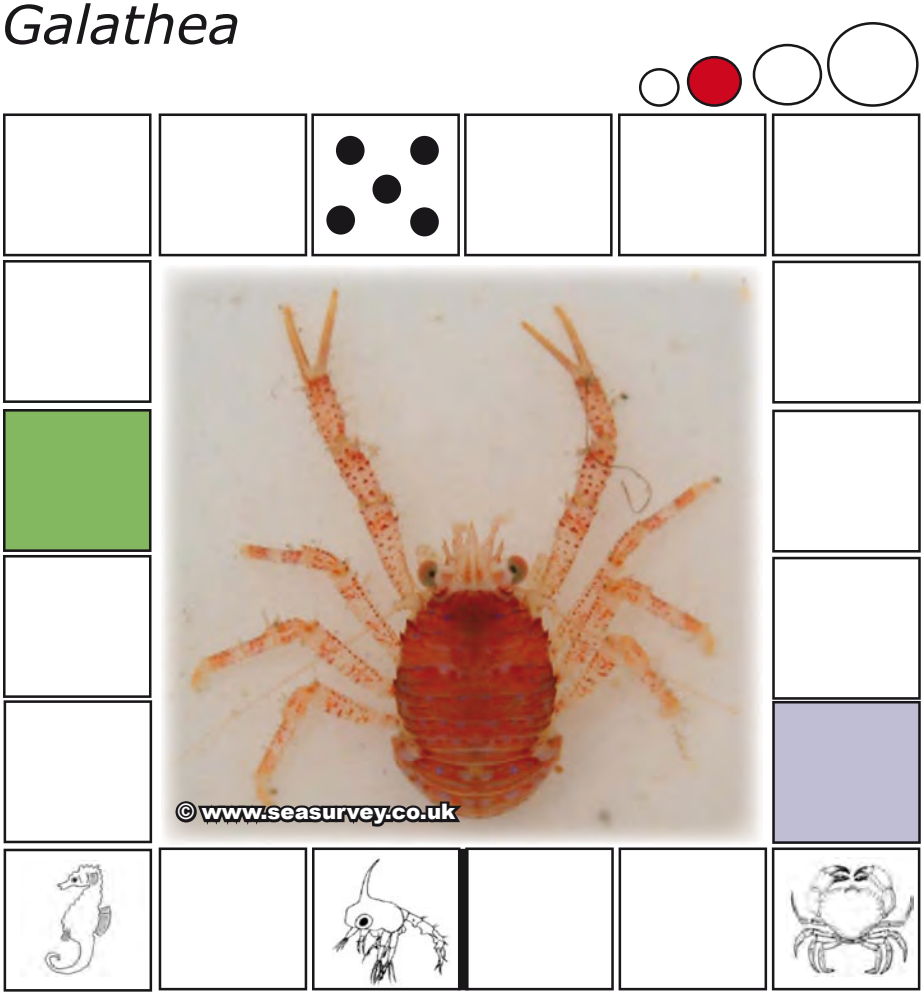
Flustra

VULNERABLE

Vulnerability: *Flustra* is an erect colonial bryozoan belonging to the Family Flustridae (Hornwrack). It can have a turf, foliose or crustose hard growth form reaching up to 20cm height, but is only a flat incrustation during its first year of growth. The zooids filter particulate matter from the water column & are dependent on stable hard substrata such as large rocks, cobbles & stones. The genus is sessile & intolerant of sediment movement & abrasion. It is likely to be vulnerable to both the direct impacts of disturbance by dredging as well as indirect effects from sediment mobilised during the dredging process.

Recoverability: *Flustra* is a long-lived genus with a growth rate of 1-6cm per year & colonies living from 6-12yrs. The zooids mature at 2 months. Eggs are probably fertilised internally & are brooded as a single egg within each zooid from October-February. As many as 10,000 (cyphonautes) larvae can be released from a single *Flustra* colony, so there is a capacity for significant local recolonisation provided the parent colony has not been removed. After release, the larvae settle within minutes or hours in the vicinity of release. The very short dispersal distance, slow growth rate & long life-span of this genus suggests that it is of low recoverability if the adult colonies have been removed by dredging.

Galathea



VULNERABLE

Vulnerability: *Galathea* is a small-medium sized decapod crustacean of 2-10cm body length that belongs to the Family Galatheidae (Squat Lobsters). It is a relatively mobile genus that scavenges detritus, carrion & algae from the surface of rocks & gravel. It is not found on mobile sands & is likely to be vulnerable to both the direct effects of dredging & to sand mobilised during the dredging process.

Recoverability: *Galathea* has a life-span of about 3-10yrs & reaches maturity at about 10 months. As many as 30-600 eggs are carried by the female between January-March. These are fertilised internally & then brooded before being released as zoea larvae into the plankton between January-June. After a period in the plankton the juveniles settle to the seabed from April-August. The wide dispersal of the larvae of *Galathea* in the plankton assists recolonisation from outside sources. However the relatively long life-span & slow growth rate of this genus implies that restoration of the biomass may take several years after initial recolonisation of the seabed following disturbance.

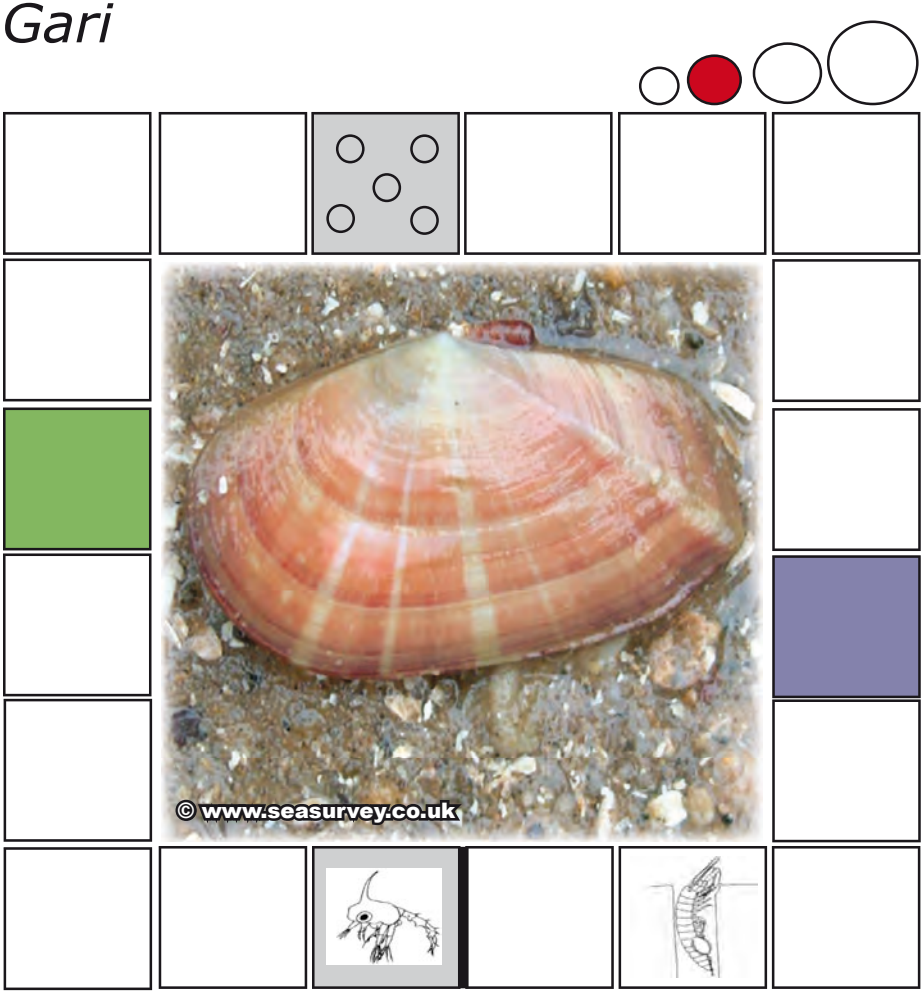
Gammaropsis

VULNERABLE

Vulnerability: *Gammaropsis* is a small free-living amphipod crustacean of up to 1cm body length that belongs to the Family Isaeidae. It lives amongst hydroids, algae & holdfasts & is likely to be vulnerable to both disturbance by dredging & the indirect effects of sediment mobilised during the dredging process.

Recoverability: There is little information on the life span of this genus, but reproductive maturity is reached after 8 months at around 4mm body length. Eggs of about 0.25mm diameter are produced from March to October & fertilisation is internal followed by development of the embryos in a brood pouch. About 20 small embryos per female are produced in June & fewer, larger eggs later in the year. The small number of embryos & lack of a dispersal phase suggests that this species is of a low recoverability.

Gari

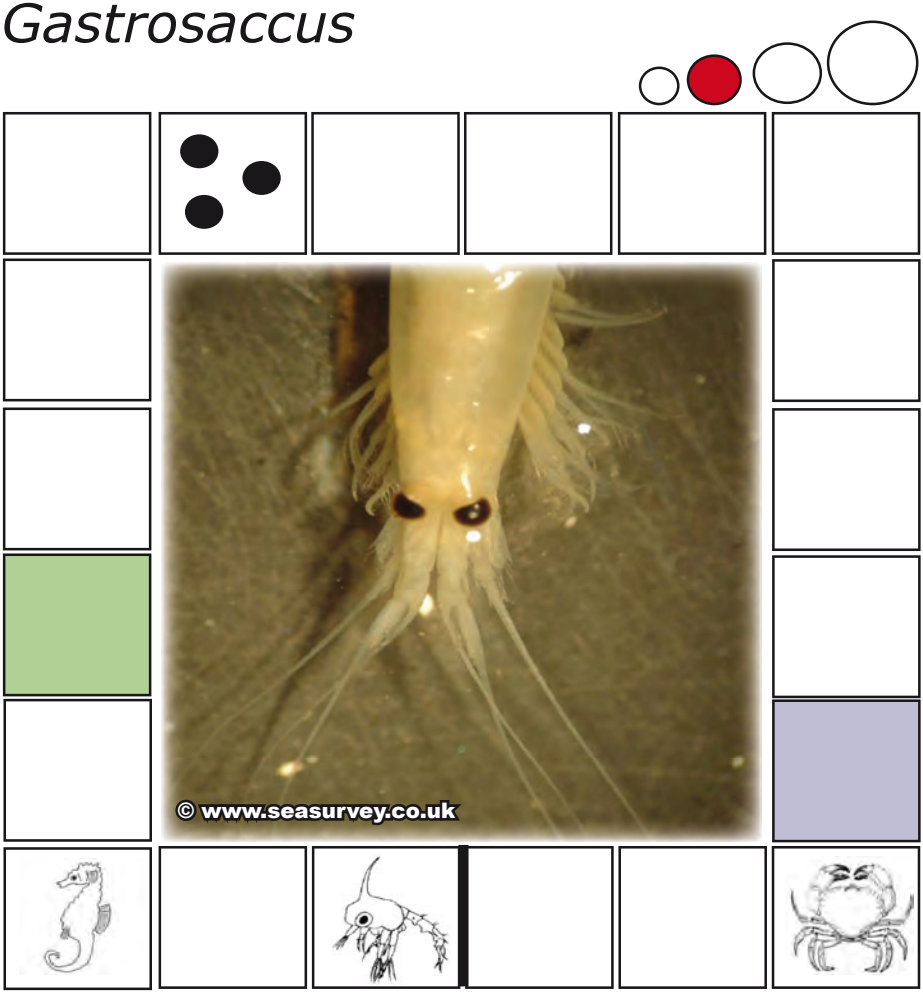


VULNERABLE

Vulnerability: *Gari* is a small-medium sized bivalve mollusc belonging to the Family Psammobiidae. The shell length is 5-6cm & the bivalve lives in sand & sandy gravel deposits in a shallow burrow where it filters plankton from the water column. It has limited powers of movement, but can re-bury itself after disturbance. It is likely to be vulnerable to the effects of dredging, but probably has the ability to resurface through sediments mobilised by the dredging process.

Recoverability: In common with many bivalve molluscs, *Gari* has a relatively long life-span of 6-10yrs, with an age at reproductive maturity of 1-2yrs. Yolk-filled eggs of about 0.15mm are released annually between spring to summer & are fertilised externally in the water column. Little is known of the fecundity or larval settlement time & dispersion potential for this genus. The relatively long life-span suggests that restoration of biomass would take several years after initial recolonisation. This genus probably has a low-intermediate recoverability.

Gastrosaccus

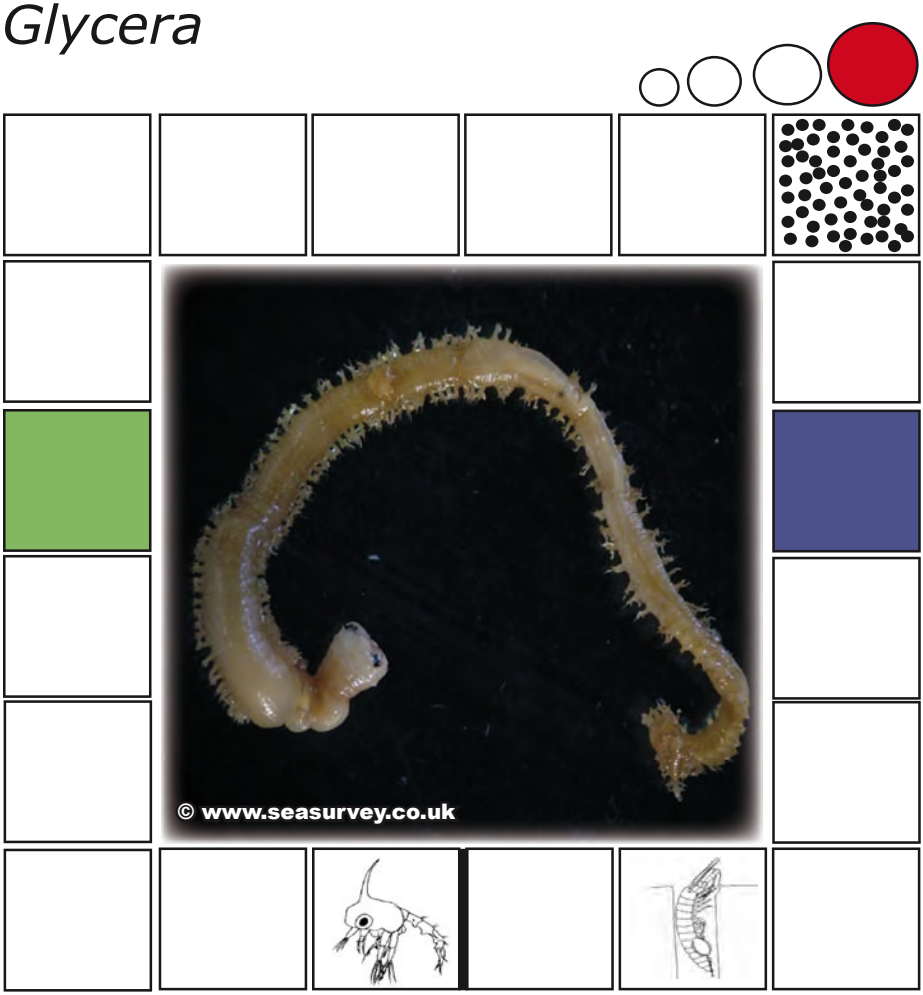


INTERMEDIATE

Vulnerability: *Gastrosaccus* is a small free-living crustacean belonging to the Family Mysidae (Opossum shrimps). It is of 1-2cm body length & lives on the surface of mud, sand & amongst stones feeding off detritus & small invertebrates. It is moderately mobile & can avoid disturbance by swimming. It is probably of low-intermediate vulnerability to dredging & potential impacts of sediments mobilised by the dredging process.

Recoverability: *Gastrosaccus* has a short life-span of about 1yr, & reaches sexual maturity at 4 months. Reproduction is continuous between March-October. About 9-40 relatively large eggs of 0.7mm are fertilised internally & brooded by the female before being released as a larval phase for a period of up to 4 months in the plankton. The small number of eggs produced suggests that this genus is likely to have a relatively low recolonisation rate. However the short generation time & fast growth rate implies that recovery of biomass is relatively fast once colonisation has taken place. Recoverability is assessed as intermediate.

Glycera

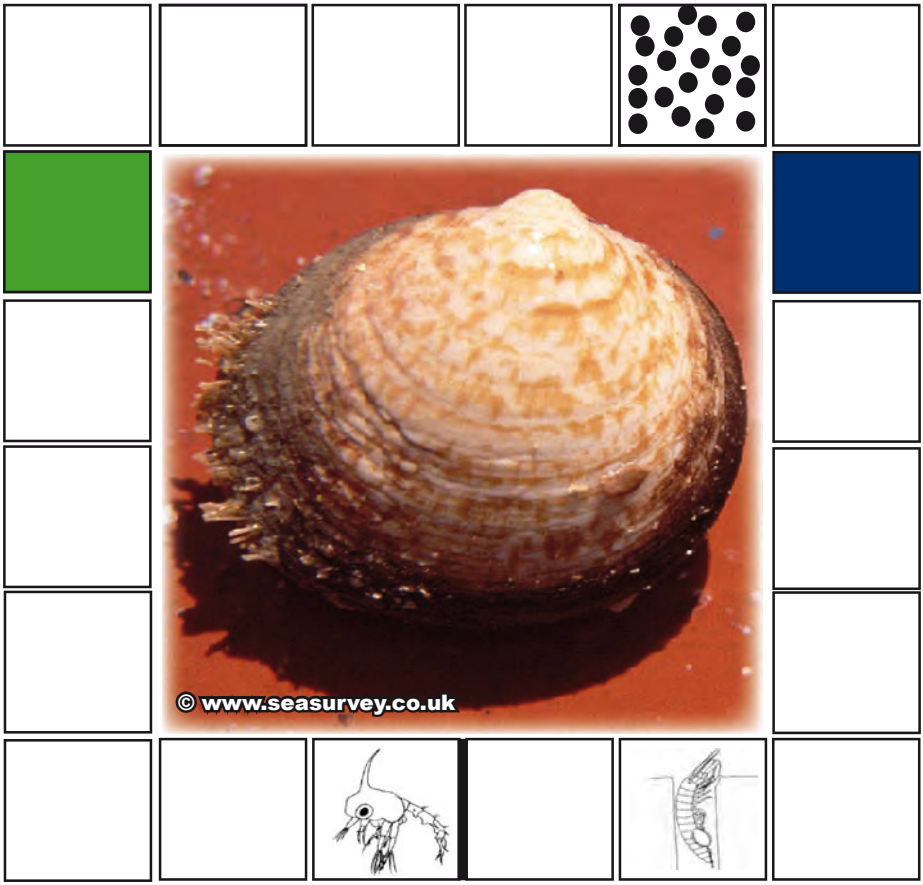


INTERMEDIATE

Vulnerability: *Glycera* is a medium-sized free-living polychaete worm belonging to the Family Glyceridae. It burrows in sand & muddy-sand, feeding as a predator on invertebrates & also exploiting detritus in the sediment. It has moderate mobility within the sediment, but is likely to be vulnerable to dredging. It can, however, re-burrow after disturbance & is unlikely to be sensitive to small amounts of sediment mobilised during the dredging process.

Recoverability: *Glycera* has a relatively long life-span of 5yrs. Reproductive maturity occurs at 3yrs. Large numbers of as many as 3-10 million eggs of about 0.15mm diameter are released by each of the female worms on the surface of the sediment in April & are fertilised externally by the males. The larvae are planktotrophic & spend 11-30 days in the water column, settling mainly in May. This genus has a high potential rate of recolonisation of sediments, but the relatively slow growth-rate & long-life span suggests that recovery of biomass following initial recolonisation by post-larvae is likely to take several years. Recoverability is assessed as intermediate.

Glycymeris

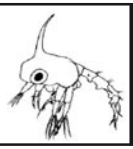


VULNERABLE

Vulnerability: *Glycymeris* is a small to medium-sized bivalve mollusc belonging to the Family Glycymerididae (Dog-cockle). It is 3-10cm shell length & lives buried just beneath the surface of shall gravel & sandy/muddy gravel from where is filters suspended particulate food from the water column. It has restricted mobility & is hence vulnerable to dredging, although it is likely to be able to accommodate modest increases in sand mobilised by the dredging process.

Recoverability: *Glycymeris* has a very long life-span of as much as 21-50yrs. The age at maturity is 12yrs although 4yrs has been reported for some locations. Breeding occurs throughout the year with small quantities of eggs of 0.1mm diameter being released over a long period & fertilised externally. The fecundity is regarded as high on an annual basis. The veliger larva is very large at 0.36-0.42mm & is found in the plankton mainly from September-November, but is also found from December-January & in the summer. The period spent in the water column is unknown. Successful recruitment is very sporadic. Decades may elapse between year-classes. Data for the English Channel deposits suggest that successful recruitment occurs at intervals of >5yrs. The recoverability of this species is very low, based both on the sporadic successful colonisation & the very long time taken for recovery of the biomass.

Golfingia

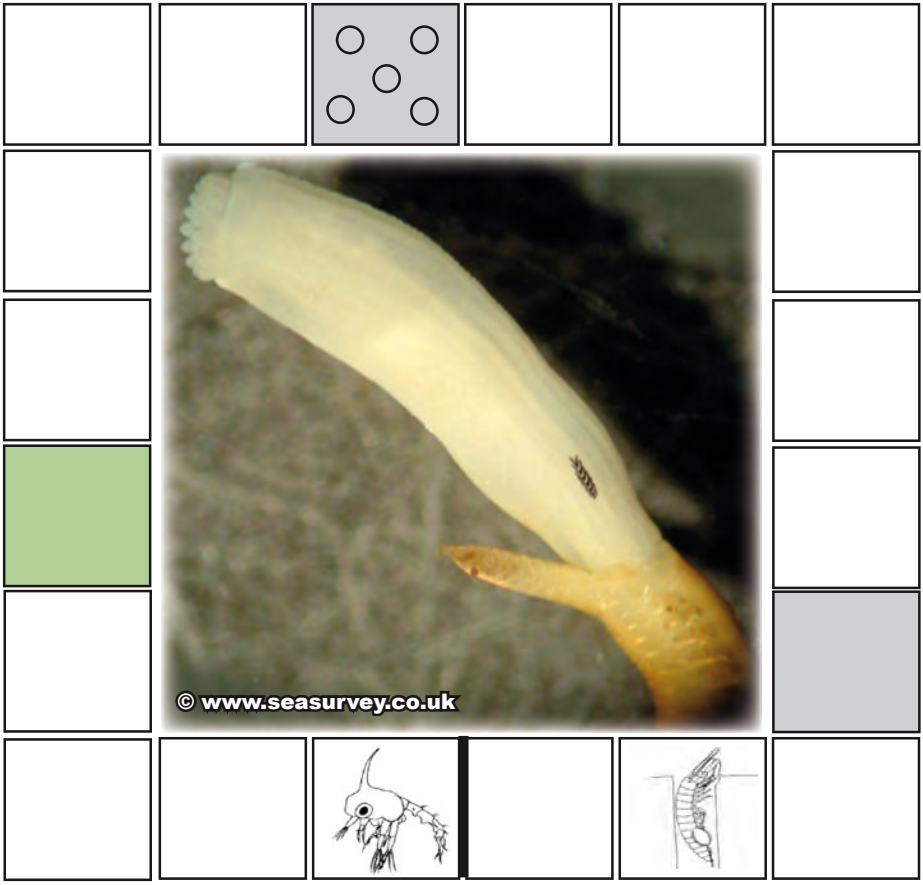


VULNERABLE

Vulnerability: *Golfingia* is a small-medium sized sipunculid worm belonging to the Family Golfingiidae. It reaches 2-20cm in length, depending on species, & lives in muddy sand & gravel. It has limited mobility & is likely to be vulnerable to dredging & to deposition of sediment mobilised by the dredging process.

Recoverability: There is little information on the life-span or age of reproductive maturity for this worm. The sexes are separate in most species (except for *G.elongata* which is hermaphroditic). There are also interspecific & regional differences in the breeding season. In most cases breeding in the autumn with up to 200 eggs of 0.15-0.25mm diameter fertilised externally & developing into a lecithotrophic larvae that spends from 1-5 months in the water column. This genus has a relatively low fecundity, & although larval dispersal potential is high, the larvae are not common & the recoverability is probably low.

Goniada

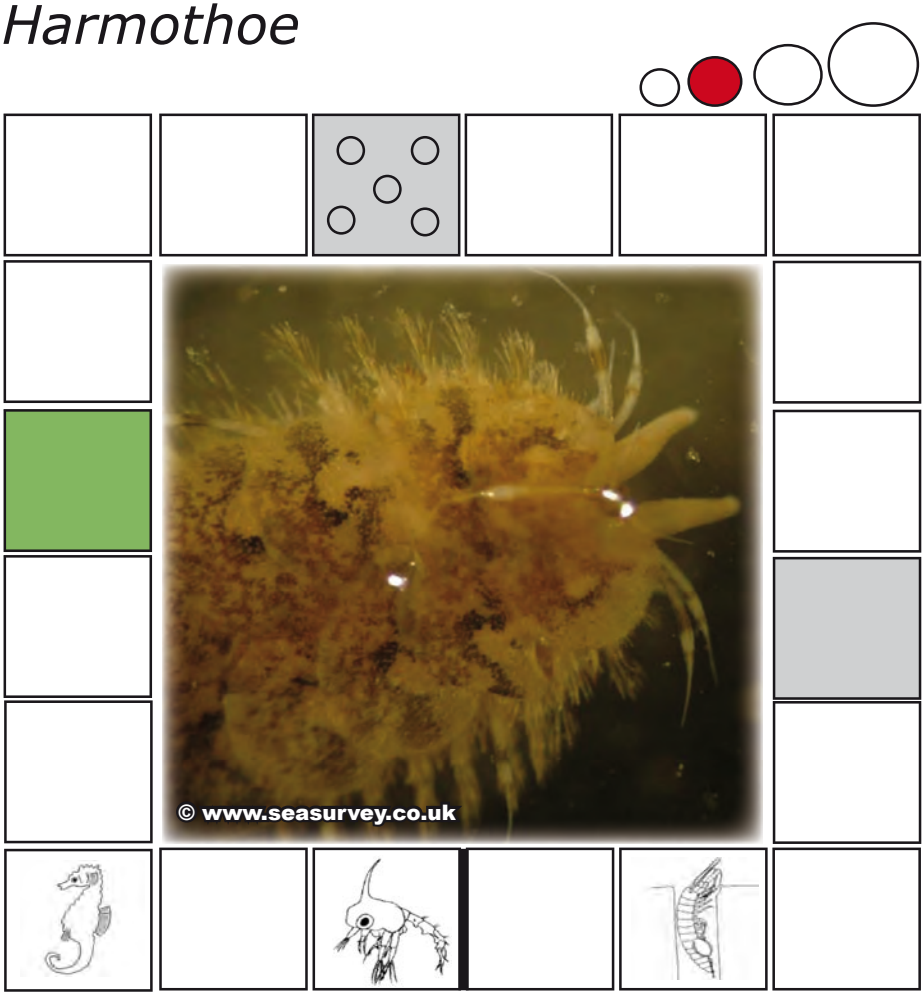


INTERMEDIATE

Vulnerability: *Goniadia* is a small polychaete worm belonging to the Family Goniadidae. It has a body length of up to 5-10cm & is free-living genus that is common in British coastal waters. It occurs mainly in clean sands where it is a carnivore preying on small invertebrates. It is able to burrow & has limited swimming ability but is likely to be vulnerable to dredging & to the deposition of sediment mobilised by the dredging process.

Recoverability: The life-span of *Goniadia* is 1-2yrs. There is little information on the egg size or fecundity but spawning is from March-June & the eggs are fertilised externally. There is a planktotrophic (trochophore) larva that probably spends up to 30 days in the plankton. The dispersal potential of this genus is relatively high, but more information is needed on the reproductive & larval biology before the recoverability can be assessed.

Harmothoe



INTERMEDIATE

Vulnerability: *Harmothoe* is a small free-living polychaete worm belonging to the Family Polynoidae (Scale-worms). It is of medium size, reaching 1-8cm in length & lives in crevices, amongst holdfasts, in the tubes of some burrowing polychaetes & under stones where it feeds on small invertebrates & diatoms. It has some mobility, but is likely to be vulnerable to the direct effects of dredging & to deposition of sand mobilised during the dredging process.

Recoverability: *Harmothoe* has a life-span of 3-5yrs. Spawning occurs from February-May with males & females coming close together. Eggs of about 0.05mm are then fertilised externally by the male. The eggs are then brooded & the larvae released to spend about 3 months in the plankton. Settlement is mainly in July-August. There is insufficient information to assess fecundity, but the lengthy planktonic larval phase allows recolonisation of disturbed sediments from outside the area. The relatively long life span suggests that restoration of biomass may take several years.

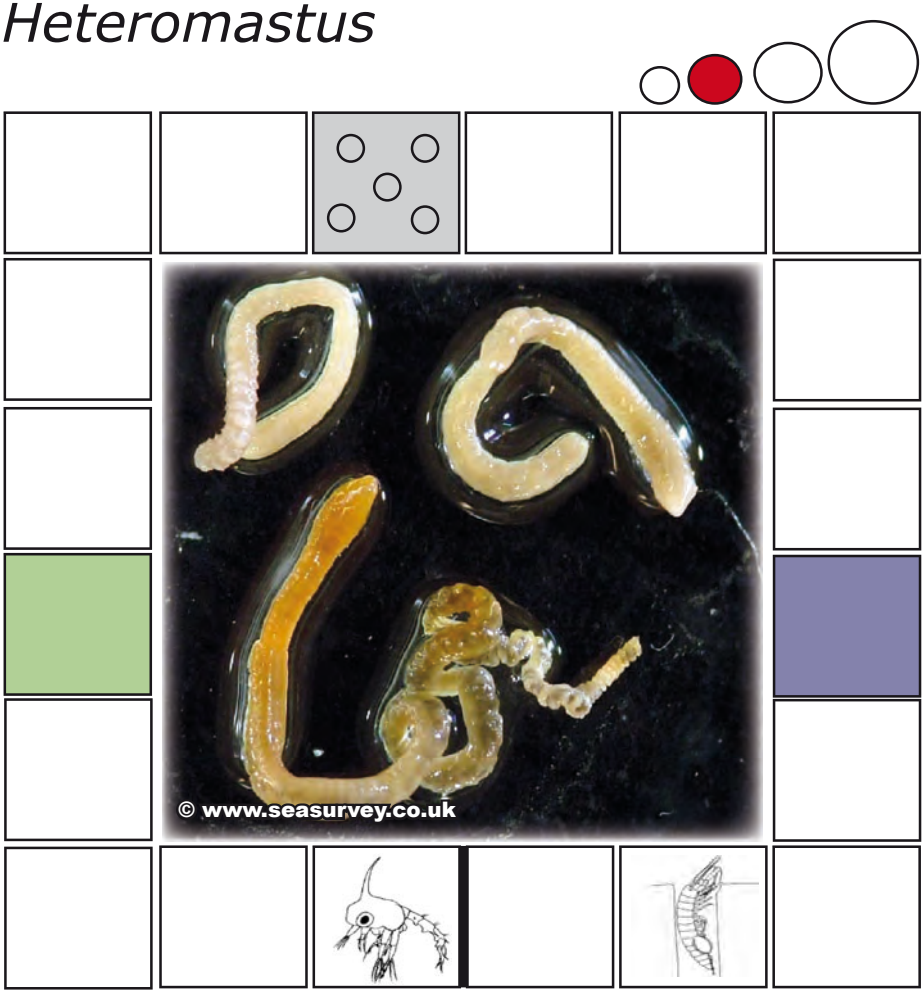
Hesionura

INTERMEDIATE

Vulnerability: *Hesionura* is a very small polychaete worm belonging to the Family Phyllodocidae ('Paddle worms). It reaches <1cm body length & lives in medium/coarse sandy deposits preying on small invertebrates in the sediment. It has moderate mobility within the sediment, but because of its small size it is likely to be vulnerable to dredging & to deposition of material mobilised by the dredging process.

Recoverability: Little is known of the life-span or reproductive biology of *Hesionura.* It has a planktonic larval phase. Insufficient information is available to assess the recoverability of this genus.

Heteromastus

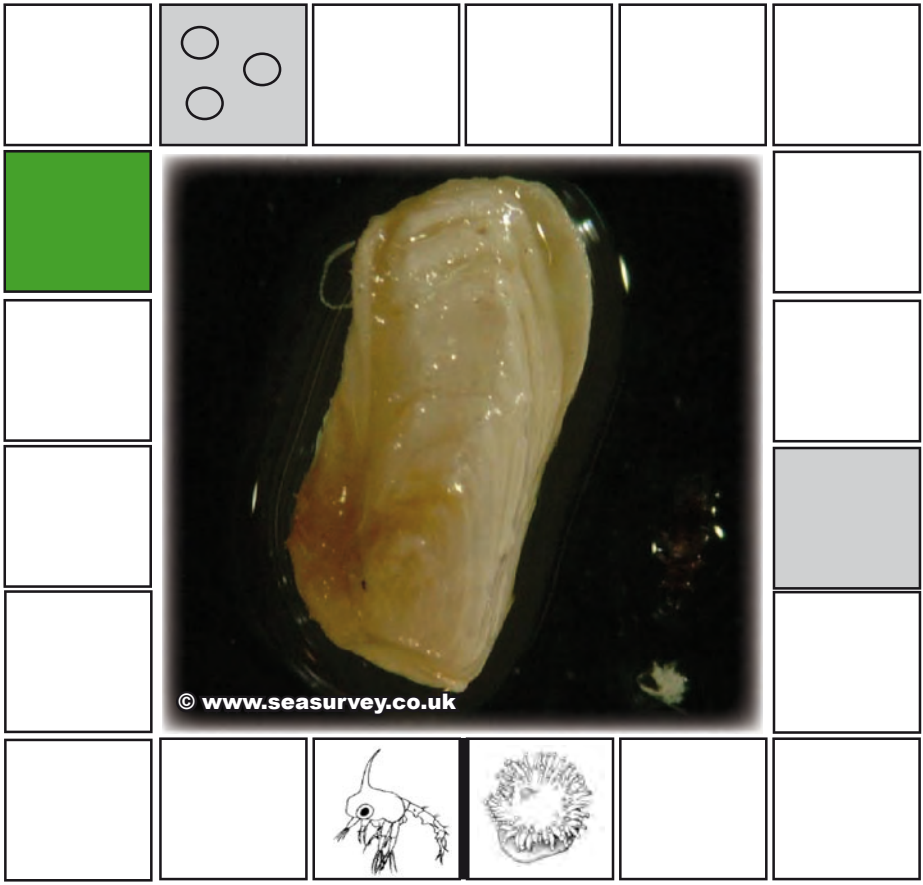


ROBUST

Vulnerability: *Heteromastus* is a medium-sized tube-dwelling polychaete belonging to the Family Capitellidae. The body length is about 10cm & the worm lives in a vertical tube extending to a depth of about 15cm into muddy sands. Mobility is limited to movement within the tube, so the worm is vulnerable to dredging & to deposition of sediment mobilised by the dredging process.

Recoverability: *Heteromastus* has a life-span of 2yrs with one reproduction occurring at 2yrs between January-April. After spawning, the eggs are fertilised externally & released as a planktotrophic larva that spends up to 4 months in the plankton. Settlement is generally from April-May. Little is known of the fecundity of this genus. The planktonic larval phase allows significant resolonisation from surrounding deposits, & the short life-span allows relatively rapid restoration of biomass following colonisation.

Hiatella

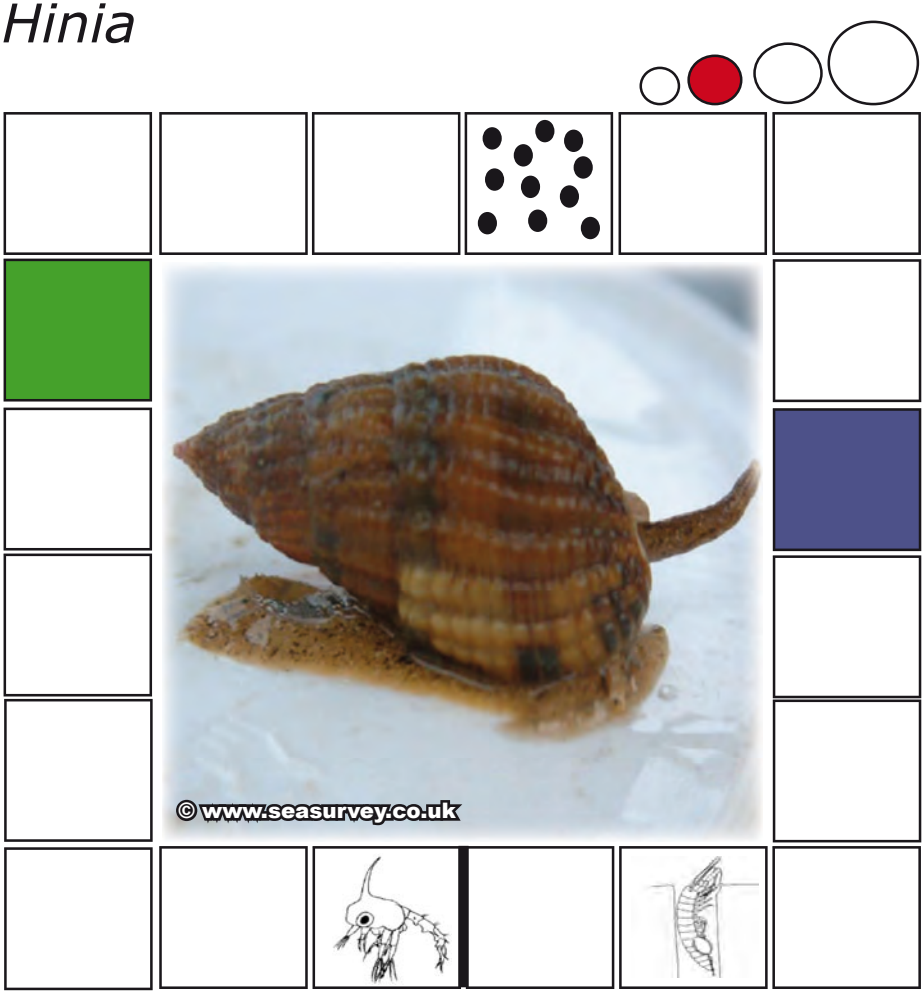


VULNERABLE

Vulnerability: *Hiatella* (Wrinkled rock-borer) is a small-medium sized bivalve mollusc belonging to the Family Hiatellidae. It reaches a shell length of 4cm & attaches by byssus threads in holes, crevices & holdfasts of larger algae. It is also capable of boring into soft rocks such as chalk & limestone. It is vulnerable to dredging & to deposition of sediment mobilised by the dredging process.

Recoverability: *Hiatella* is a very long-lived & slow-growing genus with a life-span of >100yrs. There is little information on the age at maturity or fecundity. The sexes are separate & there is an annual episodic spawning from Spring-Summer at which eggs of 0.05mm diameter are fertilised externally after release. They develop into lecithotrophic larvae into the plankton. The planktonic phase lasts from 1-2 months & dispersal is estimated to be up to 10km. Although this genus has a relatively high dispersal potential, the growth rate is very slow over many years. Recoverability is likely to be very low.

Hinia

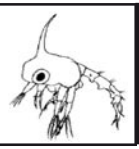


ROBUST

Vulnerability: *Hinia* (synonym *Nassarius*) is a small gastropod mollusc belonging to the Family Nassariidae (Dog-whelks). It reaches a shell length of between 1-2cm & lives on the surface of stones, boulders & muddy gravels where is feeds as a scavenger.

Recoverability: The life-span of *Hinia* is about 10-20yrs & the age at maturity is 3-5yrs. There is an annual episodic breeding season from March-August & fertilisation is external. As many as 6,000 egg capsules, each one containing about 200 eggs, are then attached to stones & rocks on the substratum a from March-August, but sometimes in the Autumn & winter. These hatch into planktotrophic veliger larvae that settle after about 8 weeks in the plankton when the larva is about 0.75mm in length. They are very common in the plankton & have a wide dispersal potential. This genus has a high recoverability.

Hippolyte

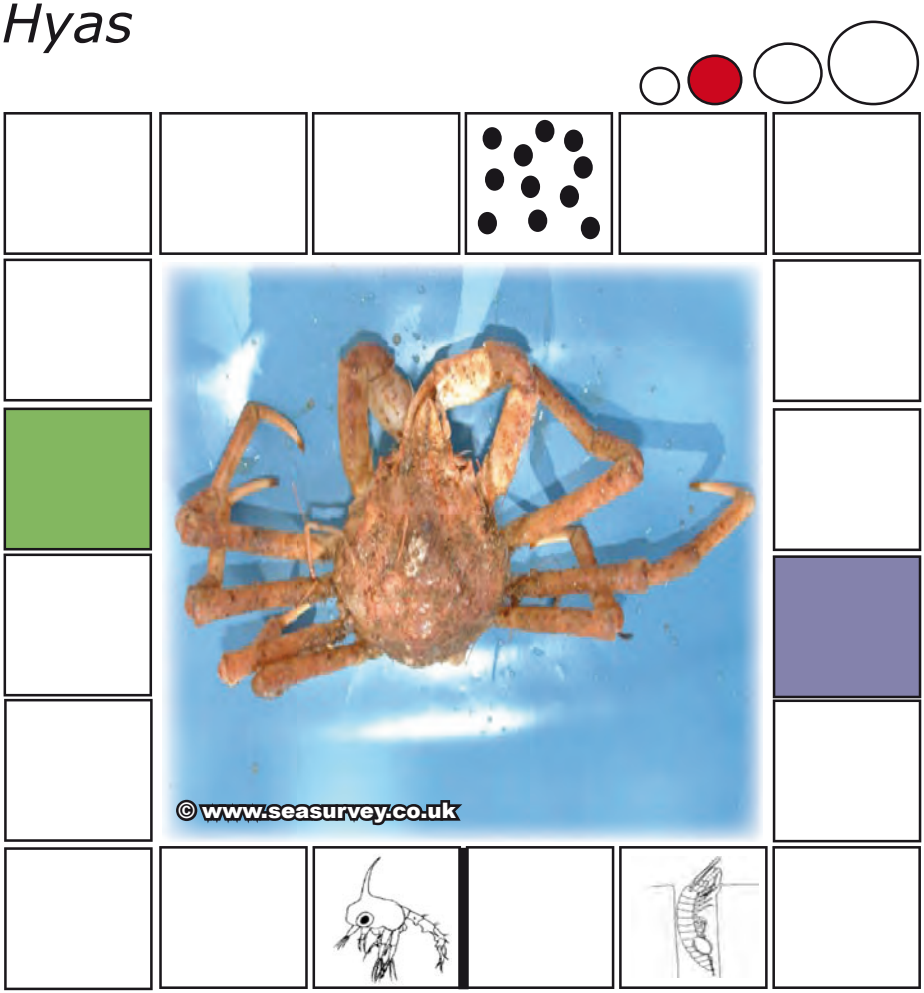


ROBUST

Vulnerability: *Hippolyte* is a genus of small 'prawns' belonging to the family Hippolytidae. The body length is 2-4cm & the animals live amongst algae & epigrowths on the seabed where they feed on diatoms & small invertebrates. They have some mobility & are able to swim up into the water over the seabed as well as to crawl on the substratum. They are vulnerable to dredging but are likely to be able to tolerate deposition of sediments mobilised by the dredging process. Damage to their preferred habitat by sediment deposition is probably significant.

Recoverability: Sex differentiation occurs in *Hippolyte* at 5-7mm body length, with some individuals showing a sex reversal from female to male at 10-13mm (about 7-12 months). Reproductive maturity is reached at 1yr. There is an annual episodic breeding season between April-October & eggs of about 0.4mm are fertilised internally before being released as planktotrophic (zoea) larvae that spend 1-2 months in the plankton. The relatively short generation time & long planktonic larval phase suggests that this genus has a high recoverability.

Hyas

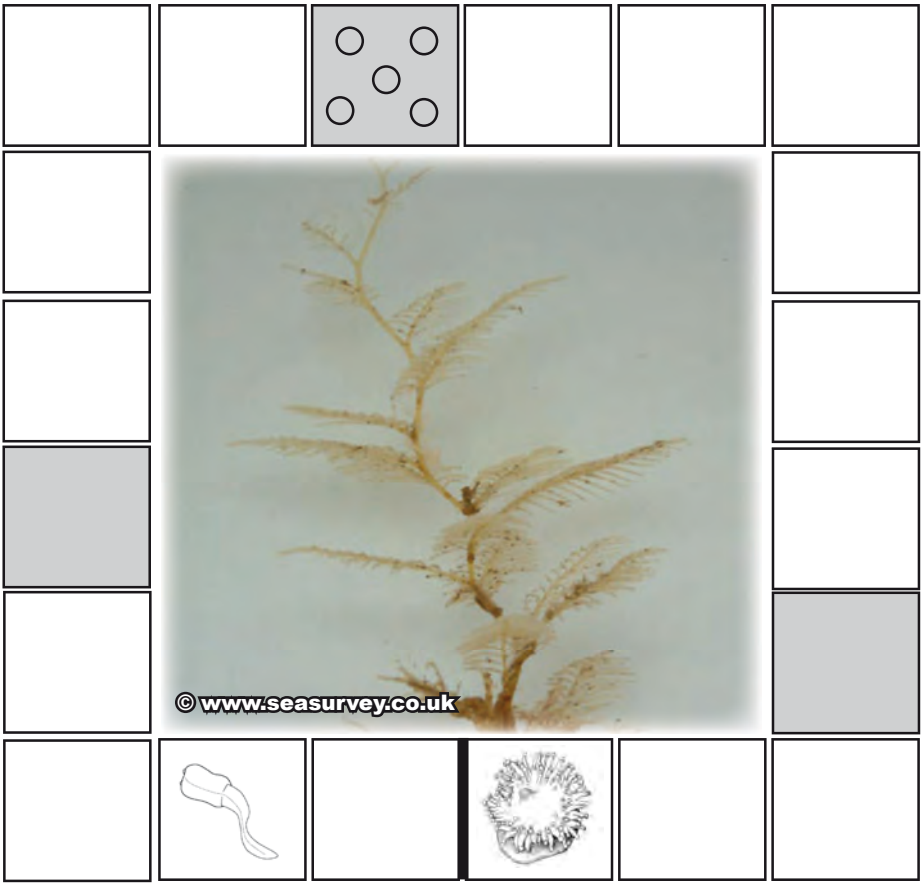


ROBUST

Vulnerability: *Hyas* is a genus of small-medium sized spider crabs belonging to the Family Majidae. It reaches a body length of 6-10cm & lives on hard & sandy substrates. It has limited mobility & is dependent on the presence of hard substrata & epigrowths for its survival. It is likely to be vulnerable to the effects of dredging & to alteration of substrate from sediments mobilised during the dredging process.

Recoverability: Little is known of the life-span of this genus, although it is probably about 5yrs. Reproductive maturity is reached in one year & there is an annual episodic breeding season between August-September. The females have a high fecundity, releasing as many as 1,500 eggs of about 0.56mm diameter that are fertilised internally by the males & then released as planktoptophic (zoea) larvae. The larvae spend from 2-4 months in the plankton, depending on ambient sea temperature. The relatively high fecundity & long larval phase suggests that this genus has a high recoverability.

Hydrallmania

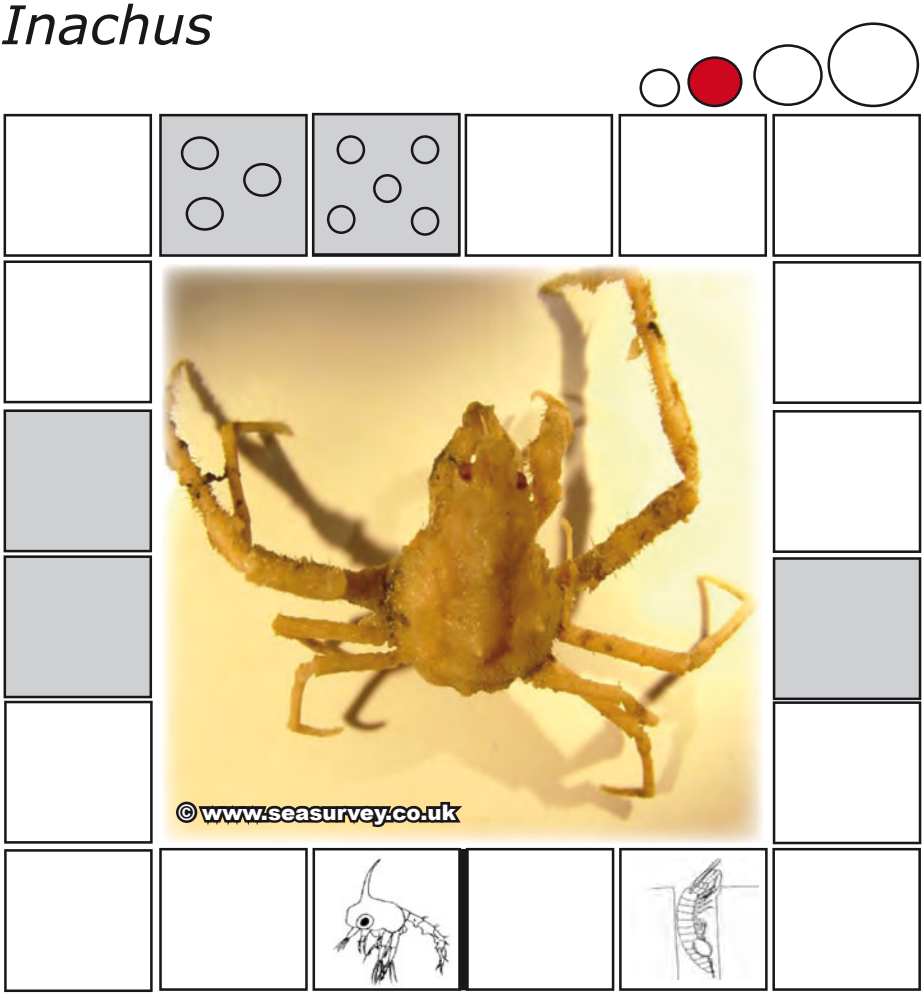


VULNERABLE

Vulnerability: *Hydrallmania* is a tall hydroid belonging to the Family Sertulariidae. The colony reaches a height of 50cm & is attached to substrata of shells & stones, particularly in sandy areas. It is sessile & so is vulnerable to dredging & to the deposition of sediment mobilised during the dredging process.

Recoverability: There is little information on the life-span or age at reproductive maturity for this hydroid. The genus is hermaphrodite & there is an annual episodic breeding period between December-April. Eggs of about 0.14mm are fertilised internally & then are thought to be released as lecithotrophic planula larvae. There is insufficient information on the fecundity of this genus & it is unlikely that the larvae spend a long period in the plankton. Recoverabilty is probably low.

Inachus

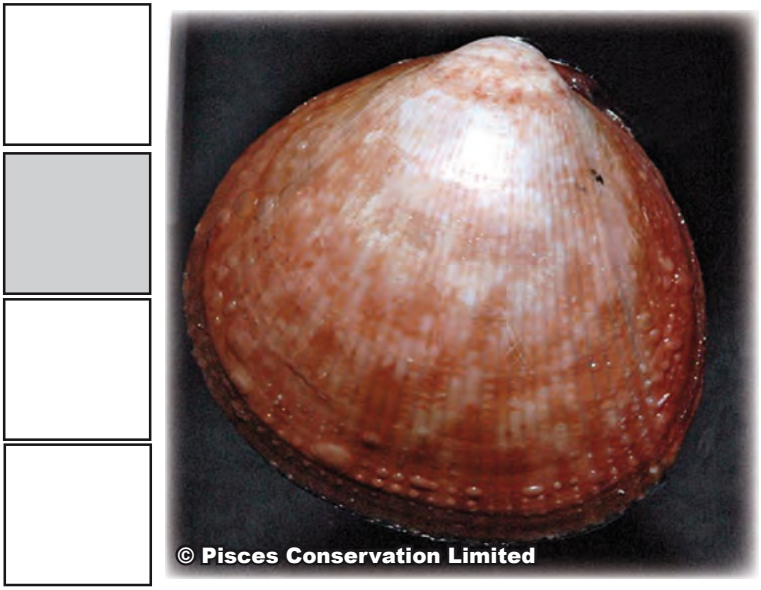


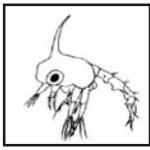
VULNERABLE

Vulnerability: *Inachus* is a genus of spider crabs that have a carapace length of 2-3cm. They are to be found on a wide variety of substrata from sands to gravels & mud where they live amongst shells, epigrowths of hydroids, algae & stones. The genus is vulnerable to dredging & to the deposition on sediment mobilised by the dredging process.

Recoverability: There is little information on the life-span & fecundity of this genus. The sexes are separate & fertilisation of the eggs is internal. The fertilised eggs are released as free-swimming planktotrophic zoea larvae of about 2.5-2.9mm length in the late summer & autumn. These metamorphose into a small megalopa larva before settling to the seabed after up to 8 weeks in the plankton. The long larval life suggests that this genus has a large dispersal potential but the larvae are never common & it is probable that the fecundity is relatively low. Recoverability intermediate-low.

Laevicardium



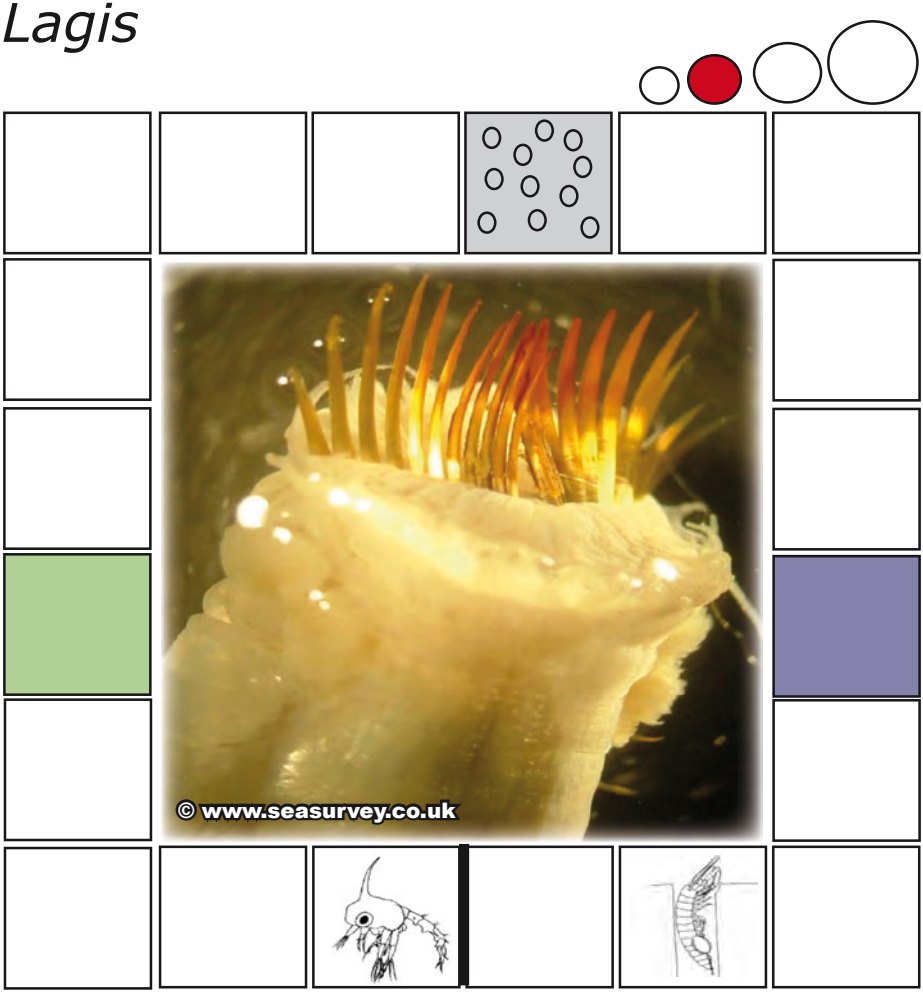


INTERMEDIATE

Vulnerability: *Laevicardium* (Norway cockle) is a medium-sized bivalve mollusc belonging to the Family Cardiidae (Cockles). It reaches a shell length of about 7cm & lives as a shallow burrower in sand & shelly gravel where it filters suspended particulate matter from the water column. It has limited mobility & is vulnerable to dredging, although it may be able to resurface through moderate depths of sand mobilised during the dredging process.

Recoverability: *Laevicardium* probably has a life-span of 3-5yrs. Fertilisation of the eggs is external & the zygotes develop into a relatively large planktotrophic veliger larva of about 0.20-0.45mm in length that occur mainly in the spring & summer plankton. More information is needed on the fecundity of this genus before the recoverability can be assessed, but the relative rarity of the larvae suggests that recoverability is low, despite the high dispersal potential.

Lagis

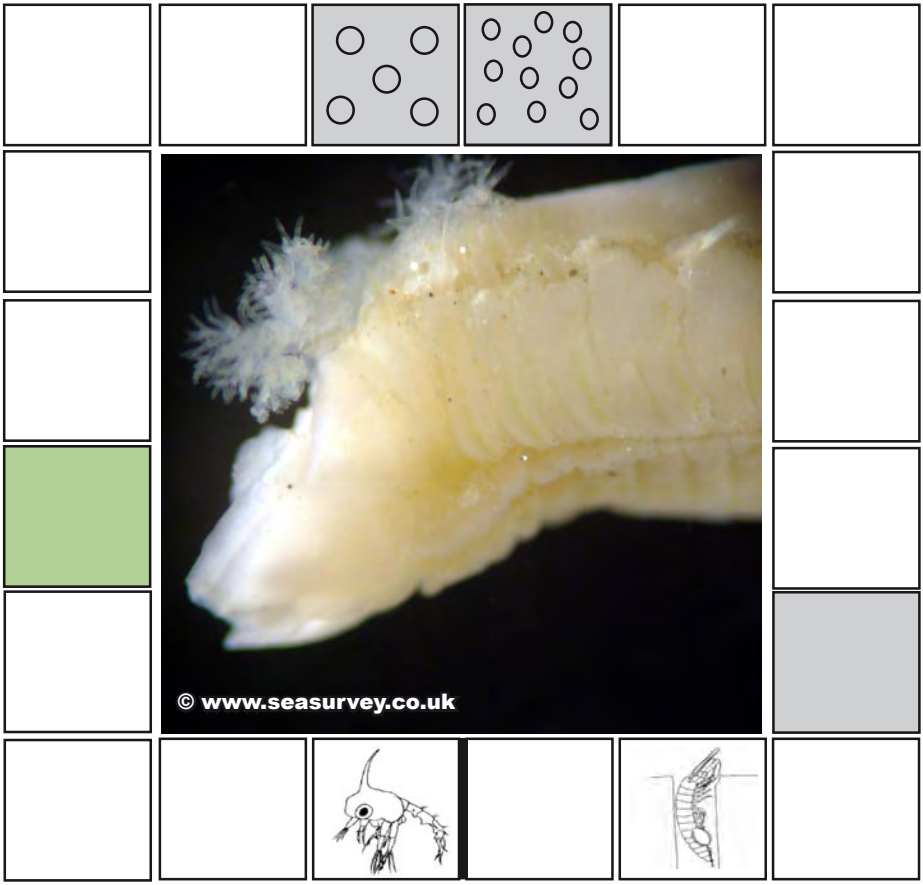


ROBUST

Vulnerability: *Lagis* is a small to medium-sized polychaete worm belonging to the Family Pectinariidae. The worm lives in an elongated conical sand tube of 2-5cm length in sand & muddy sand, & feeds head down on detrital material in the sediments. It capable of movement only within the tube & is vulnerable to dredging, although it may be capable of limited upward migration through relatively thin layers of sediment mobilised by the dredging process.

Recoverability: *Lagis* has a life-span of up to 2yrs & reaches maturity at 1yr. Breeding is from April-July. The eggs released by the female are about 0.06mm diameter & are fertilised externally in the water column. The larvae are planktotrophic & develop a proto-tube before settling after a period of about 2 months in the plankton. Dense communities of *Lagis* are to be found on the seabed, & it is likely that this species has a relatively high recolonisation rate. The short life span suggests that the biomass is restored rapidly after initial colonisation. Recoverability is therefore assessed as high.

Lanice

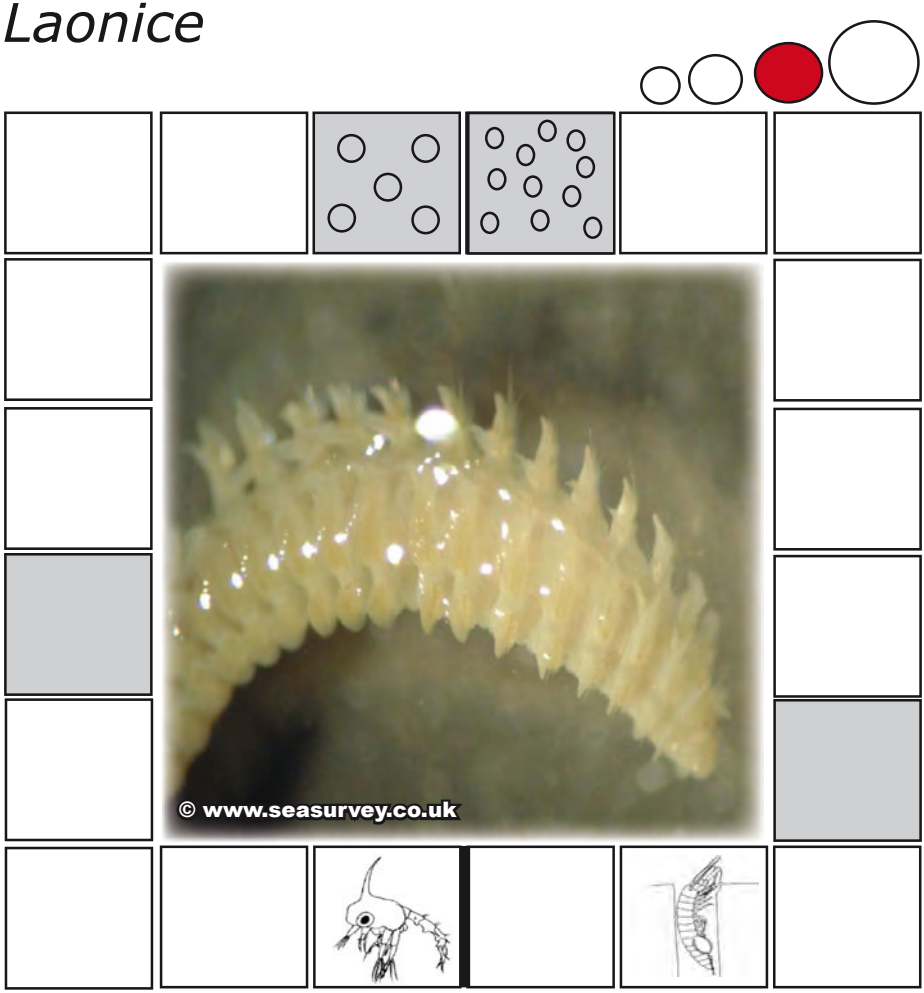


ROBUST

Vulnerability: *Lanice* (Sand-mason) is a medium-large polychaete worm belonging to the Family Terebellidae. It reaches a length of 25-30cm & forms a characteristic tube of sand-grains ending at the head end in a tuft of sandy filaments that project from the surface of the sediment. The genus can be found in a wide range of sediments from coarse sand to sandy muds. The tube is U-shaped & allows water to be drawn through for gas exchange. The worm feeds on particulate matter on the sediment surface captured by a crown of tentacles. *Lanice* is capable of movement only within the tube, & is vulnerable to dredging & to deposition of material mobilised by the dredging process.

Recoverability: *Lanice* lives for about 1yr at which point reproduction occurs between April-June. The female releases eggs of about 0.18mm diameter & these are fertilised at the sediment surface. The larva spends about 8 weeks in a planktotrophic phase during which time a proto-tube develops before the post-larva sinks to the seabed. It has a capacity to disperse over considerable distances & can be found in dense communities. The relatively short life-span suggests that restoration of the biomass is achieved within 1yr following initial recolonisation by the juveniles. This genus has a high recoverability.

Laonice

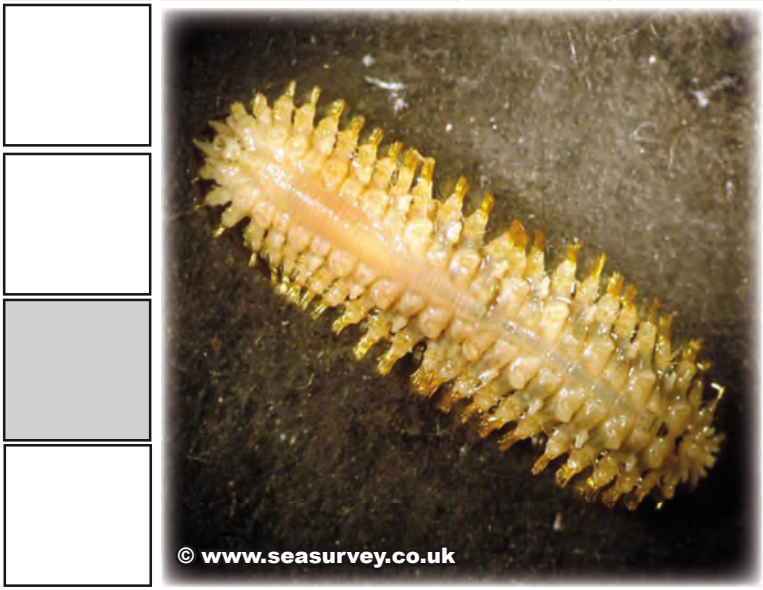


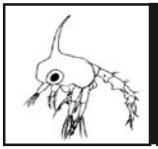
INTERMEDIATE

Vulnerability: *Laonice* is a medium-sized polychaete worm belonging to the Family Spionidae. It reaches a length of 10-15cm & lives in a flimsy tube in muddy sand, shell gravel & shingle deposits where it feeds on surface deposits including diatoms & detritus. It has limited mobility & is likely to be vulnerable to dredging & to sediment mobilised & deposited from the dredging process.

Recoverability: Little is known of the life-span of this genus. The worm reproduces once either during January-February or in August-September. The eggs are about 0.12mm diameter & are fertilised externally. There is a planktotrophic larva that spends 4-8 weeks in the water column. It probably has a capacity for widespread dispersal but is rarely common in the sediments. The recoverability is assessed as intermediate.

Lepidonotus



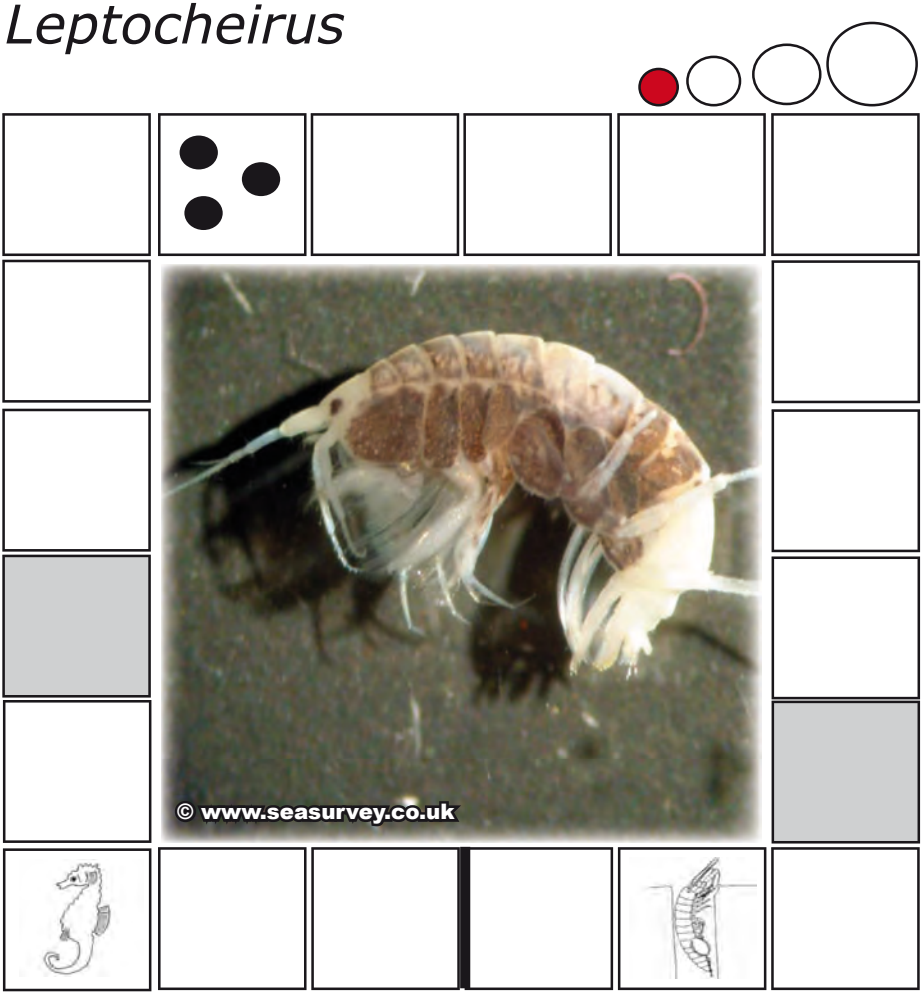


VULNERABLE

Vulnerability: *Lepidonotus* is a small-medium sized polychaete worm belonging to the family Polynoidae (Scale worms). It is 2-5cm in length & lives on the surface & under stones & shells where it feeds on small invertebrates & micro-algae. It has limited mobility & is likely to be vulnerable to the effects of dredging & sediment mobilised during the dredging process.

Recoverability: There is little information on the life-span of *Lepidonotus*. Reproduction is from May-August & after external fertilisation, the eggs develop into a planktonic larva. There is a likelihood of relatively widespread dispersal, but there is insufficient information to assess the recoverability of this genus.

Leptocheirus

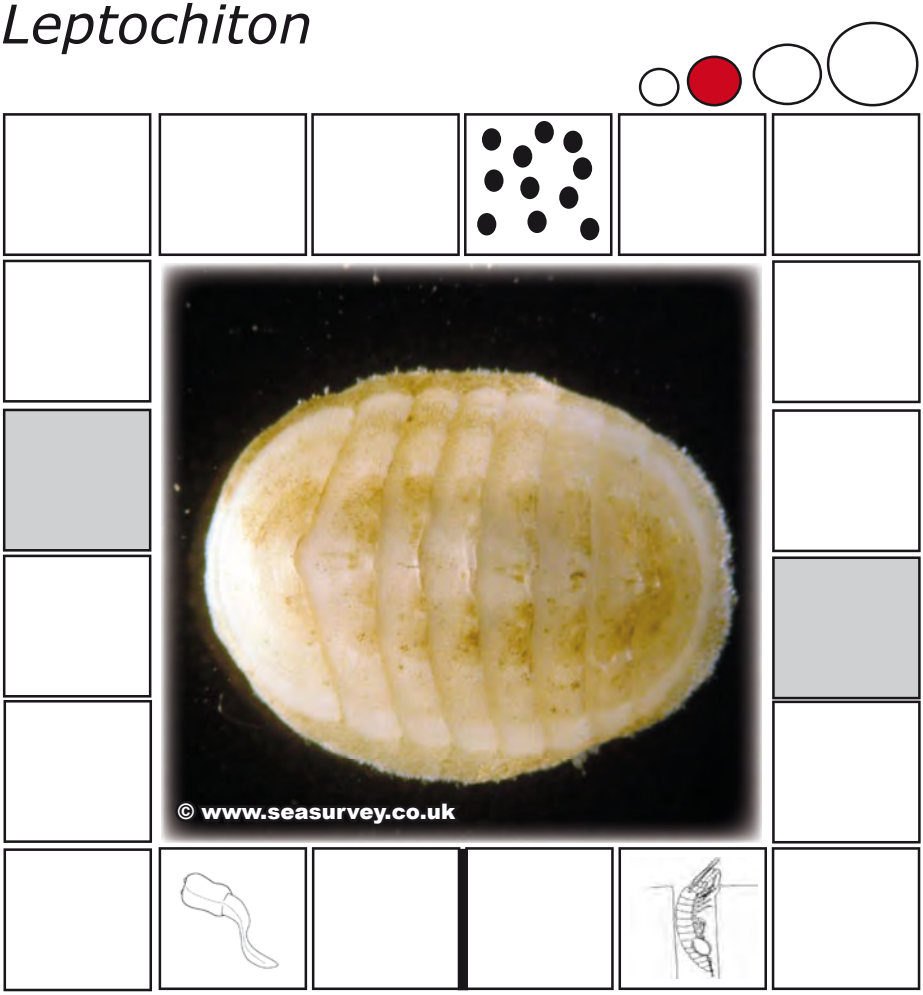


VULNERABLE

Vulnerability: *Leptocheirus* is a very small amphipod crustacean belonging to the Family Aoridae. It reaches a body length of about 0.4cm & is a free-living genus characteristic of coarse shelly gravel especially in areas of low salinity. It has moderate mobility & is likely to be able to tolerate deposition of sediment mobilised during the dredging process, although it is vulnerable to the direct effects of dredging.

Recoverability: Little is known of the longevity of *Leptocheirus*, or of the breeding season for this genus. A small number of 13-15 eggs are fertilised internally & carried in a brood pouch by the female. There is limited capacity for dispersal of the juveniles & the recoverability of this genus is assessed as low.

Leptochiton



VULNERABLE

Vulnerability: *Leptochiton* is a genus of small molluscs belonging to the Family Leptochitonidae. It is 0.8-2cm body length & lives adhering to rocks & stones on a hard substratum where it grazes on diatoms & other material adhering to the surface of the substratum. It has very limited powers of movement & is confined to hard substrata. It is vulnerable to both the direct effects of dredging & to sediment mobilised by the dredging process.

Recoverability: There is no information on the longevity of this genus, but it is likely to be several years. Relatively large numbers of 1300-1500 eggs of about 0.21mm diameter are released by the female during the summer & these are fertilised externally. The larvae then spend a very short time of 4-9 days in the plankton before settling to the substrate. The genus has a high reproductive potential but a relatively limited dispersal. It is therefore assessed as of intermediate recoverability.

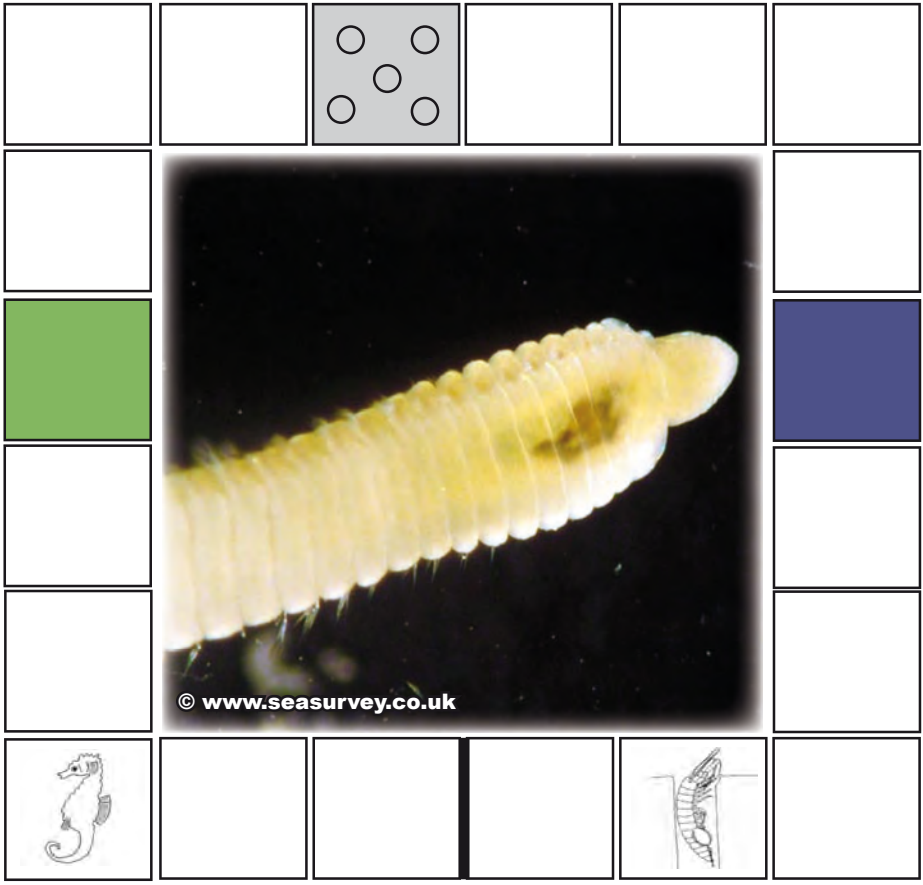
Leptosynapta

VULNERABLE

Vulnerability: *Leptosynapta* is a medium-large sized sea cucumber belonging to the Family Synaptidae. It reaches a body length of 20-50cm & lives buried in mud, muddy sand & muddy gravel substrates where it feeds on detrital material at the sediment surface. It has very limited powers of movement & is likely to be vulnerable to the direct effects of dredging & to sediment mobilised during the dredging process.

Recoverability: Little information is available on the life-span of this genus. The genus is hermaphrodite & breeding is in August-September. Fertilisation of the 0.2mm eggs is internal, with the juveniles being released as miniature adults from a brood pouch. This genus has very limited dispersal potential, & is assessed as of low recovery potential.

Lumbrineris



VULNERABLE

Vulnerability: *Lumbrineris* is a medium-large eunicid polychaete belonging to the Family Lumbrineridae. It is a free-living burrowing genus that reaches 10-40cm in length & lives in a mucus-lined burrow in gravel, muddy sand, mud & shelly substrata. It feeds on living & dead animals in the sediment & has very low mobility. It is vulnerable to the direct effects of dredging & to the deposition of sediments mobilised during the dredging process.

Recoverability: *Lumbrineris* lives for about 3-5yrs & reproduces once at the end of this time. The reproductive season is from June-August. Each egg is about 0.3mm in diameter & the eggs are released as egg masses that are fertilised externally at the sediment surface. There is no dispersal phase & growth takes place over a period of 3-5yrs, so this genus is assessed as of low recoverability following disturbance by dredging.

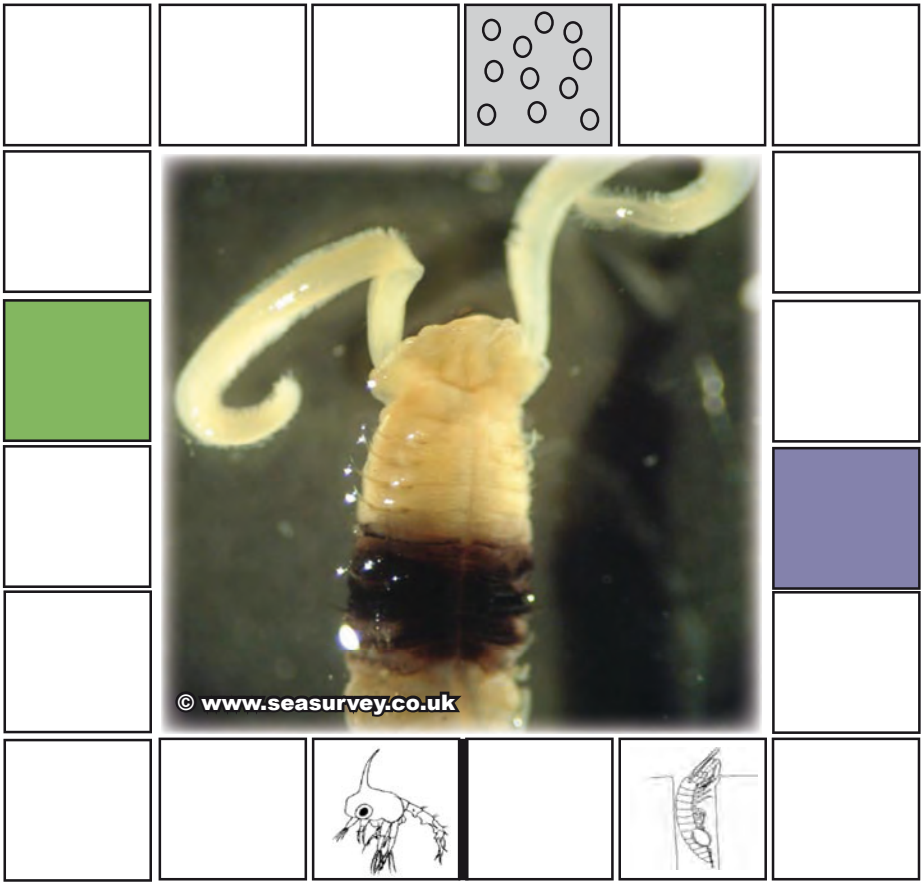
Macropodia

INTERMEDIATE

Vulnerability: *Macropodia* is a small spider crab of 1-3cm carapace length belonging to the family Majidae. It lives on hard substrata or mixed gravel & shell deposits. It is dependent on the presence of suitable hard substrata & epiphytes & is vulnerable to both dredging & the effects of sediment deposition on its habitat.

Recoverability: There is little information on the life-span of this genus. Maturity is reached within 12 months & there is a protracted breeding season with females brooding larvae throughout the year. The eggs are about 0.6mm in diameter & are fertilised internally by the male, then brooded by the female followed by release as a planktotrophic (zoea) larva. The planktonic phase is from 11-30 days. This genus matures relatively early & has a protracted breeding season with a high dispersal potential. It has a high recoverability.

Magelona

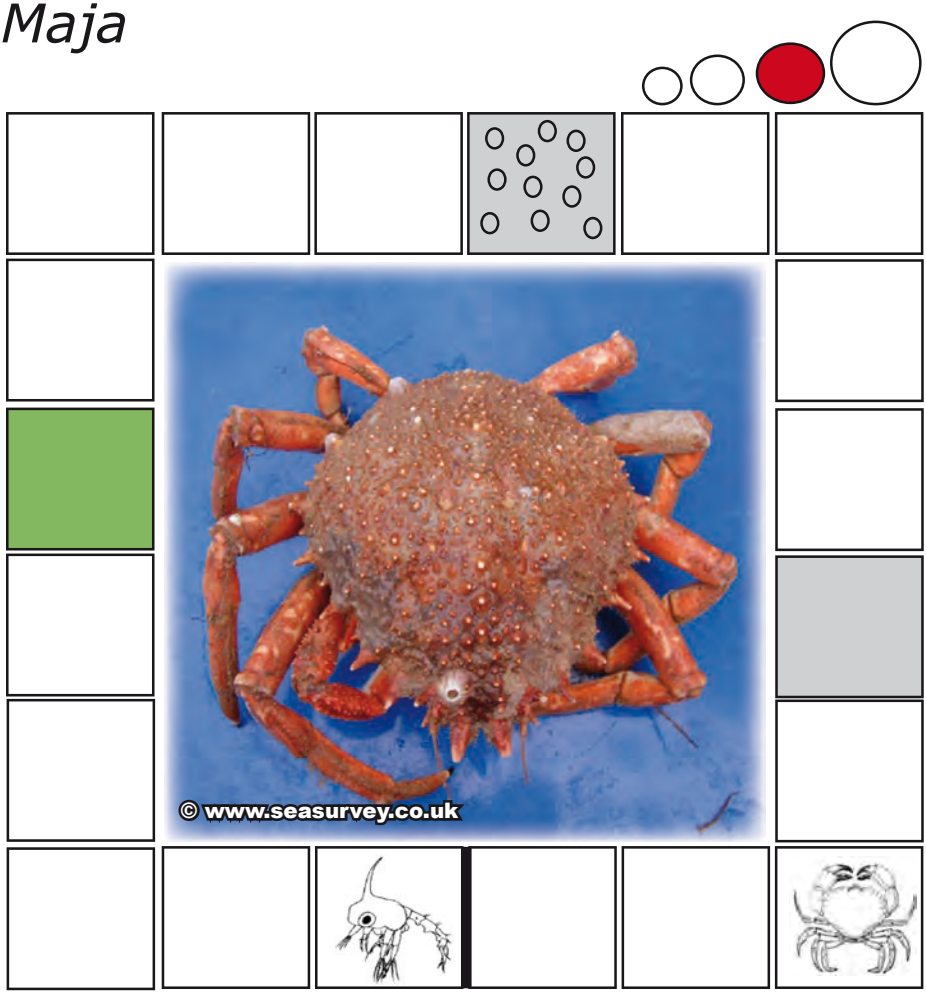


ROBUST

Vulnerability: *Magelona* is a genus of small-medium sized polychaete worms belonging to the Family Magelonidae. The adults reach a size of 5-20cm & are free-living burrowing worms that live in clean sand. They are selective deposit-feeders that exploit larger particulate matter including small invertebrates on the surface of the deposits. The genus can occur in dense communities of as many as 250 per 0.1m^2. It has some mobility within the sand, but is likely to be vulnerable to dredging. It is probably tolerant of sand mobilised during the dredging process.

Recoverability: *Magelona* lives for about 3yrs & reaches maturity at 2yrs. There is only one reproduction which occurs between May-October. The eggs released by the female are about 0.15mm in diameter & are fertilised externally & develop into planktotrophic larvae that settle from June-November. The genus has a high dispersal potential & evidently forms dense communities with a relatively rapid growth rate. It is assessed as having a high recoverability following disturbance.

Maja

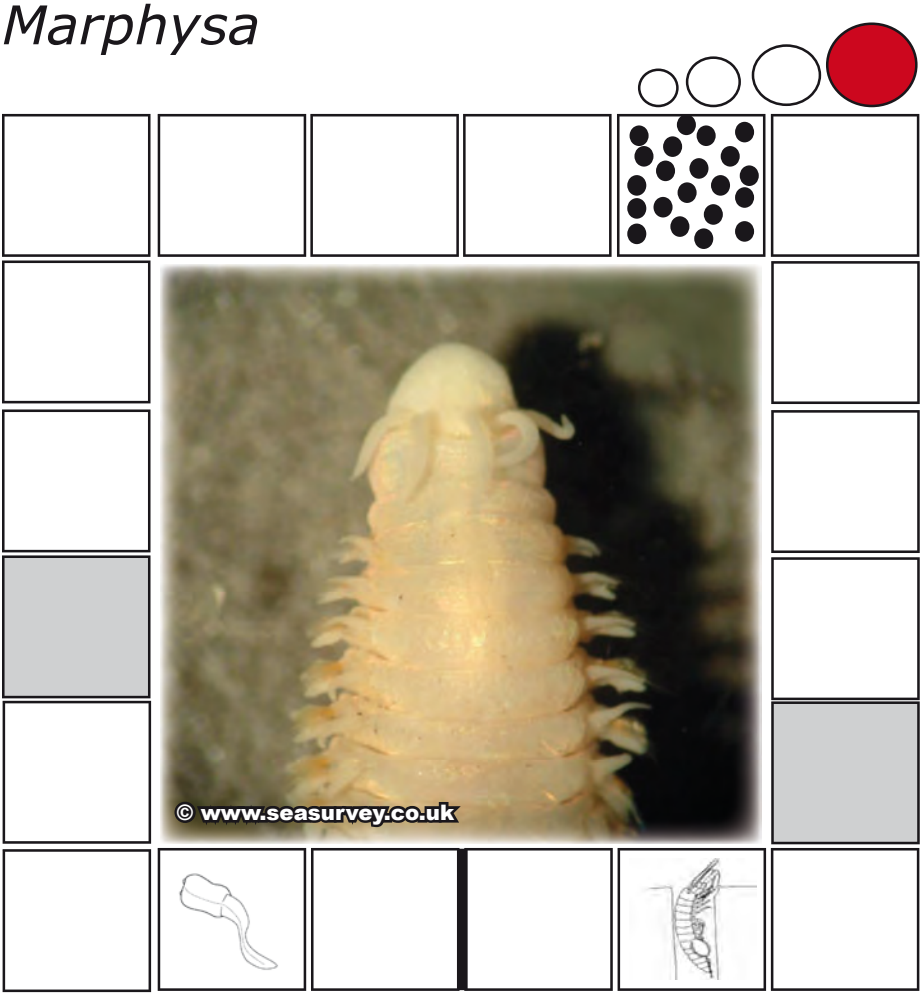


ROBUST

Vulnerability: *Maja* is a large spider crab with a carapace length of 20cm. It is often covered with attached algae & lives on the surface of a wide variety of substrates including sands, gravels & cobbles. It undertakes lengthy migrations & comes together in the late summer into breeding aggregations. It is likely to be vulnerable to dredging, but may be able to avoid disturbance from deposition of sediment mobilised by the dredging process.

Recoverability: *Maja* probably has a life-span of 3-5yrs. The sexes are separate & fertilisation is internal. The fertilised eggs are then released as planktotrophic zoea larvae of about 2.5mm length in the late summer. These then develop into megalopa larvae & settle after about 30-40 days in the plankton. There is little information on the fecundity, but the larvae are commonly found in the plankton & it is likely that this genus has an intermediate-high recoverability.

Marphysa

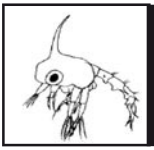


INTERMEDIATE

Vulnerability: *Marphysa* is a medium-large sized polychaete worm belonging to the Family Eunicidae. It reaches a length of 20-50cm & lives in a permanent mucus-lined burrow in muddy sands, in crevices & amongst shells. It has strong jaws & preys on small invertebrates. It has very limited mobility except within the burrow & is vulnerable to dredging & deposition of sediment mobilised by the dredging process.

Recoverability: There is little information on the life-span & age at reproductive maturity for this genus. It is a hermaphrodite that produces as many as 8,000-24,000 eggs of about 0.3mm diameter in an annual episodic breeding season in March. Fertilisation is external & the trochophore larvae move to the surface water using their yolk supply as a food resource. They then settle to the seabed within a few hours & attach themselves to the substratum with sticky mucus threads that then form the basis of a sand tube in which the worm lives. The high fecundity suggests that recoverability is high, although the limited time in the plankton implies that recolonisation of disturbed deposits from external sources might be slow. Recoverability intermediate.

Mediomastus

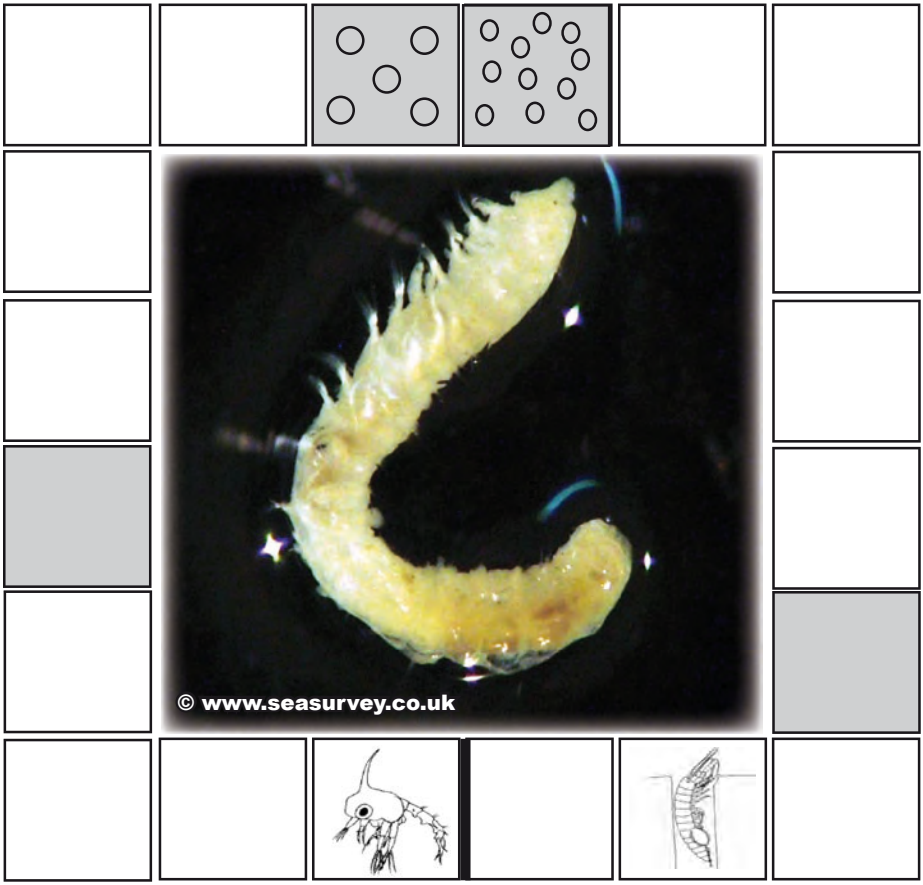


INTERMEDIATE

Vulnerability: *Mediomastus* is a small-medium sized polychaete worm belonging to the Family Capitellidae. The worm is about 2-10cm in length & lives in permanent sandy tubes in fine sands & muds where it exploits subsurface diatoms & detritus. It has limited mobility & is likely to be vulnerable to dredging, but it may be capable of tolerating sand mobilised by the dredging process.

Recoverability: Little is known of the life-span or age at reproductive maturity for this genus. The adults spawn in April & eggs of about 0.1mm are fertilised externally then form gelatinous egg masses that containing about 500 eggs per individual. These hatch into planktonic larvae that spend about 4 weeks in the water column. The relatively large number of eggs & the occurrence of a planktonic dispersal phase suggest that this genus has a moderate-high recoverability following disturbance by dredging.

Minuspio

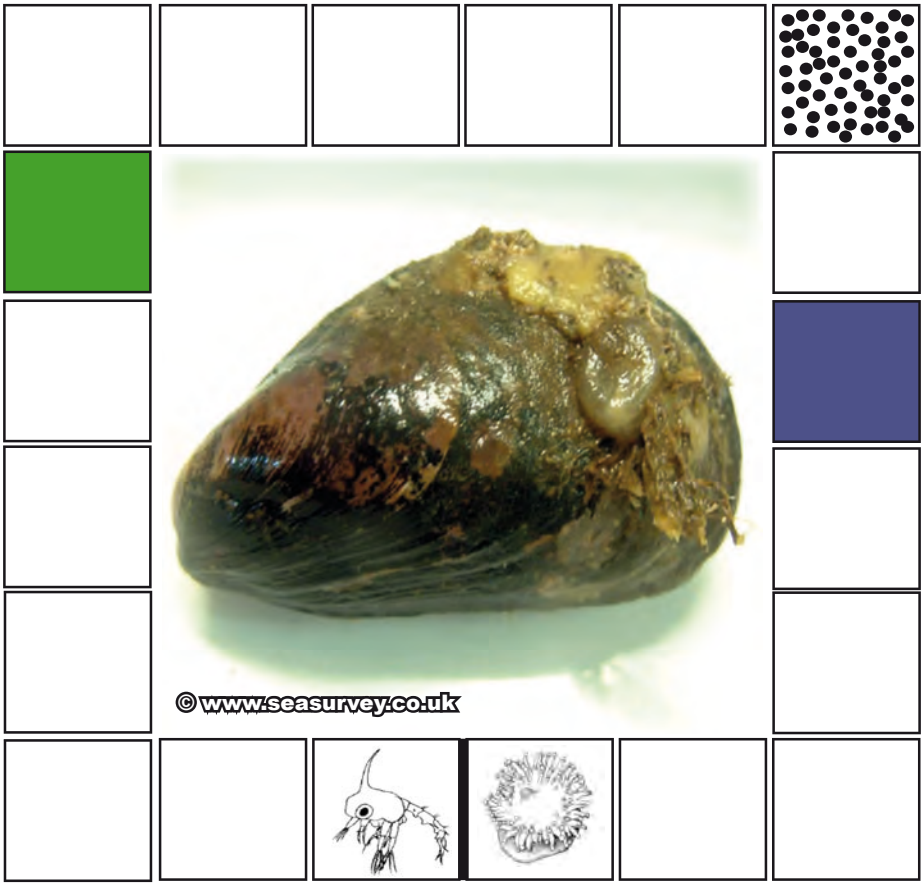


INTERMEDIATE

Vulnerability: *Minuspio* is a small-medium sized polychaete worm belonging to the Family Spionidae. It reaches a body length of 3-5cm & lives in tubes in muddy substrata where it feeds on surface deposits of diatoms & detritus. The worm is sedentary & is vulnerable to both the direct effects of dredging & to deposition of sediment mobilised by the dredging process.

Recoverability: Little is known of the longevity or age at sexual maturity of this genus. Breeding is from March-July when ripe sections of the female (Epitokes) move into the water column & release eggs for external fertilisation. The larvae then spend about 4 weeks in the plankton before settling. It is probable that the post-larvae are widely dispersed & that this genus has a capacity for moderate rates of recolonisation & recovery of biomass. Recoverability classed as intermediate-high.

Modiolus

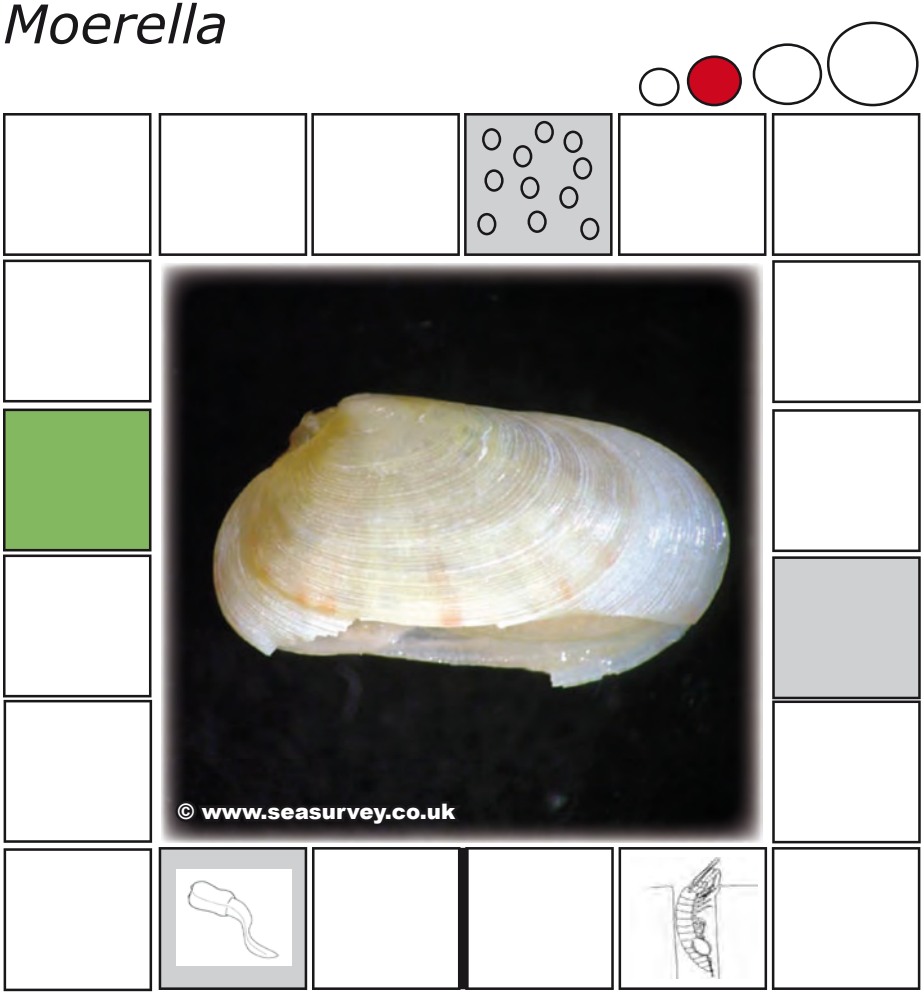


INTERMEDIATE

Vulnerability: *Modiolus* is a medium-sized bivalve belonging to the Family Mytilidae (Mussels). Commonly called the Horse Mussel, this genus reaches 10-20cm length & is typically attached by byssus threads secreted from the foot & which attach the mussel to rocks & boulders. Although some settlement of juveniles can occur on sandy muds, these rarely survive to adults. Mobility is very limited & the mussels can form dense communities that filter significant quantities of particulate matter from the water column. Mussels are vulnerable to dredging & deposition of sediments mobilised by the dredging process. They are able to tolerate short periods of unfavourable environmental conditions by closure of the shell valves.

Recoverability: *Modiolus* is a long-lived genus that can live for as long as 30-50 & perhaps as long as 100yrs. After an initial period of relatively rapid growth over the first 4-6yrs, growth becomes slow. Mussels mature at 3-5yrs & have a continuous breeding season. Over 1 million eggs of 0.6-0.75mm diameter are released by the female & are fertilised externally & then develop into planktotrophic (veliger) larvae. *Modiolus* has a very high rate of recolonisation & a fast growth rate up to the age of reproductive maturity. Recoverability is assessed as high although it should be recognised that restoration of biomass by growth over the whole life-span could take many years.

Moerella

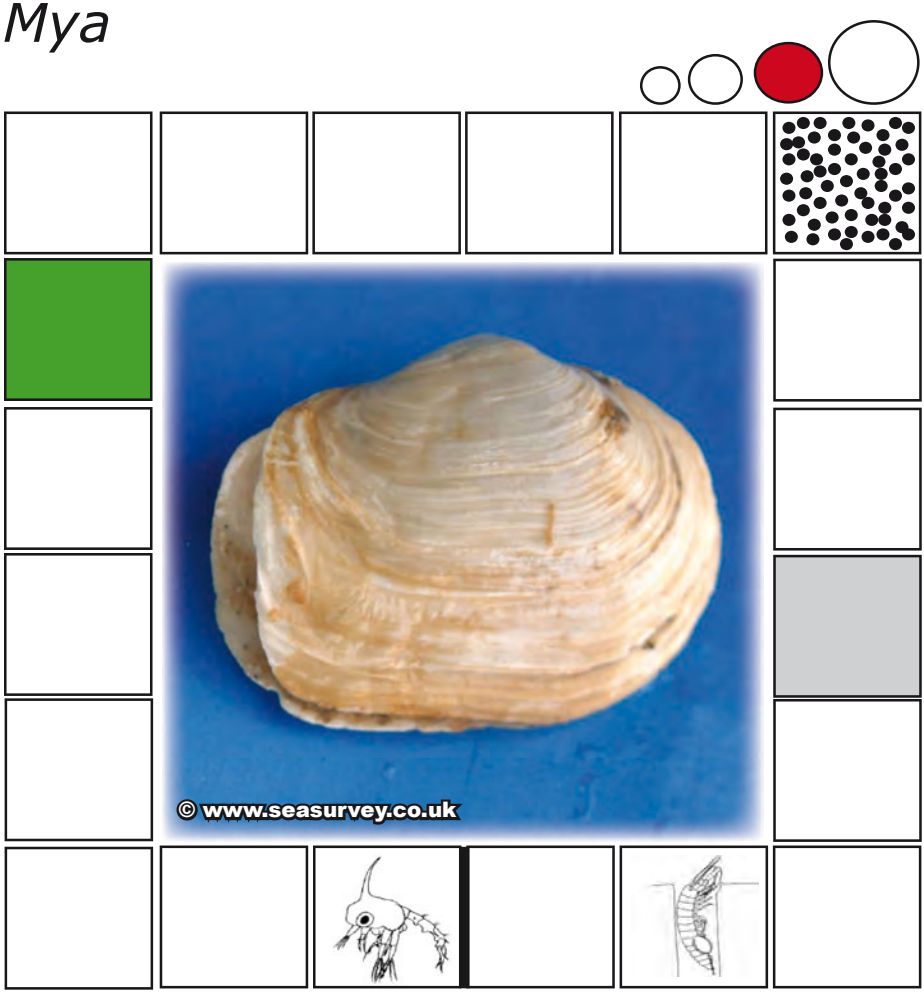


VULNERABLE

Vulnerability: *Moerella* is a genus of small bivalve molluscs belonging to the Family Tellinidae. The shell length is 1-2.5cm & the mollusc lives in shallow burrows in sand & shell gravel where it is a deposit-feeder exploiting detritus & diatoms on the surface of the sediments. It has restricted mobility & is likely to be vulnerable to dredging & to deposition of sediment mobilised by the dredging process.

Recoverability: The life-span of *Moerella* is about 6-10yrs. There is little information on the breeding season, fecundity & larval biology of this genus. Fertilisation is external & is followed by the release of what are probably yolk-filled eggs. This is a relatively long-lived genus & the number of eggs is likely to be fewer than genera that have planktotrophic larvae. Recoverability is likely to be low-intermediate.

Mya

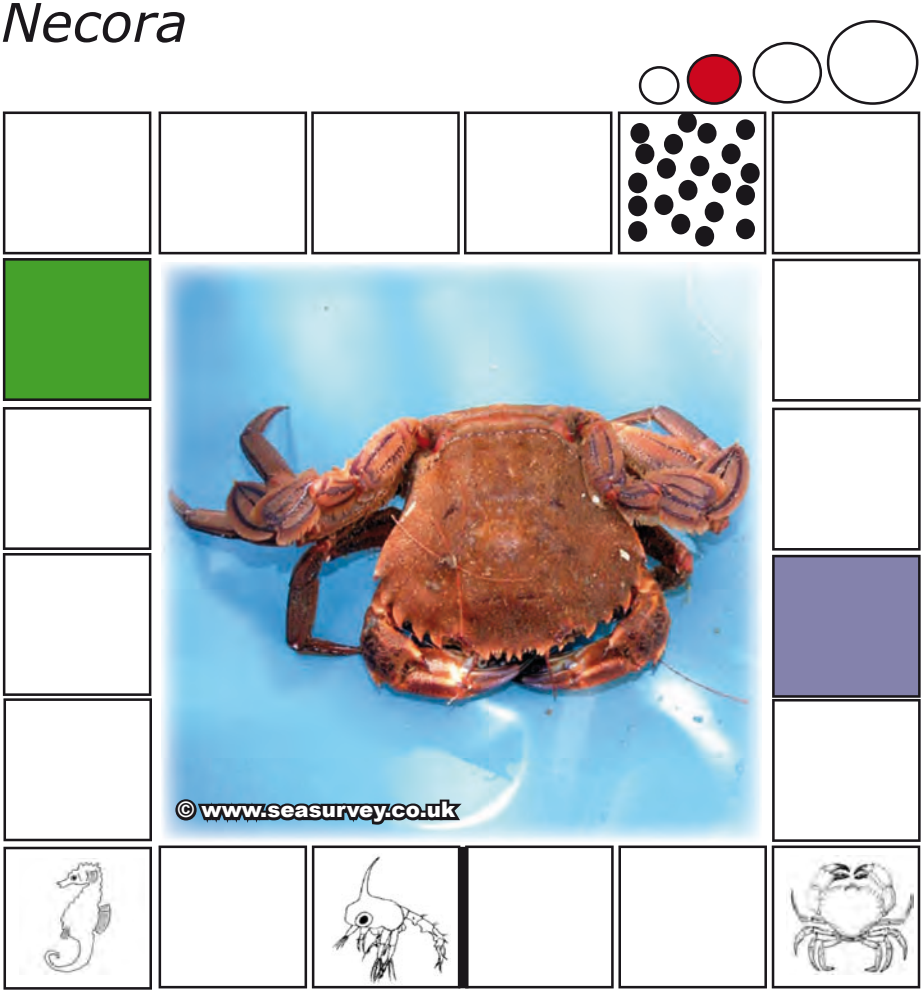


INTERMEDIATE

Vulnerability: *Mya* is a genus of medium-large sized bivalves belonging to the Family Myidae (Clams). The shell length can reach 10-20cm & the clams live in deep burrows in mixed sediments of sand, muddy sand & gravel. They retain a connection with the surface through a long siphon through which water is drawn for gas exchange & filtration of particulate matter from the water column. They have very limited mobility & are unable to re-burrow following disturbance. They are vulnerable to dredging & to deposition of sediments mobilised by the dredging process.

Recoverability: *Mya* has a life-span of 10-20yrs. The genus is hermaphrodite. Large numbers of up to 5 million eggs (depending on the size of the clam) of 0.07-0.08mm diameter are released sporadically from June-April & develop into planktotrophic (veliger) larvae after external fertilisation. After a period of 11-30 days the larvae settle, by which time the estimated dispersion distance is >10km. *Mya* evidently has a high recoverability, although several years would be required for restoration of the biomass by growth of the colonising individuals following disturbance.

Necora



ROBUST

Vulnerability: *Necora* (Velvet swimming crab) is a genus of medium-sized crabs that belong to the Family Portunidae. The carapace width is about 6cm & the crab lives under boulders, stones & in rock crevices where it is a scavenger. It is moderately mobile in search of food, & could evade disturbance by dredging. It is likely to be vulnerable to habitat change if significant deposition of sediment mobilised by the dredging process were to take place.

Recoverability: *Necora* is a relatively long-lived genus with a life-span of 6-10yrs. Sexual maturity is reached at 1yr & the sexes are separate. The females have a high fecundity, releasing as many as 400,000 eggs of about 0.5mm diameter that are fertilised internally by the male. These are released as planktotrophic zoea larvae of about 1.8mm length in April-June after an initial brooding period. These develop into megalopa larvae of about 3mm length that settle to the seabed in July after about 20 weeks in the plankton. The genus has a high recoverability.

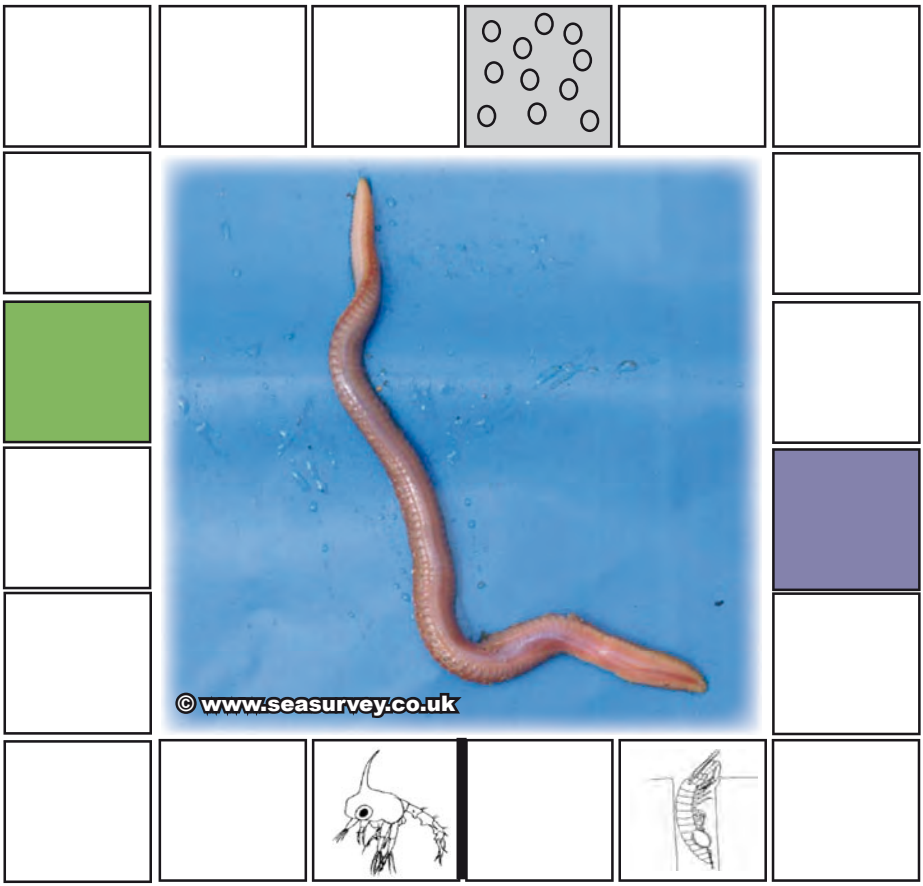
Nephasoma

VULNERABLE

Vulnerability: *Nephasoma* is a small sipunculid 'worm' belonging to the Family Golfingiidae. It reaches a body length of 1-2cm & lives in shallow burrows under stones in sand & muddy substrata & in rock crevices.It is a deposit-feeder exploiting mainly detritus in the sediments. It has some mobility but is likely to be vulnerable to dredging. It may have some capacity to survive small quantities of deposition of material mobilised during the dredging process.

Recoverability: Little is known of the longevity & age at maturity for this genus. Reproduction is from November-January by hermaphrodite adults that produce eggs of 0.2-0.28mm diameter. Development is direct from yolk-filled eggs following external fertilisation & there is no larval phase. This genus probably has low recoverability.

Nephtys

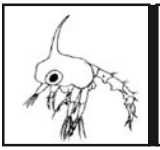


ROBUST

Vulnerability: *Nephtys* is a genus of medium-sized polychaete worms belonging to the Family Nephtyidae (Catworms). It is a free-living worm that reaches 25cm in length & lives burrowed in sands & muddy sands, where it is a carnivore feeding on small invertebrates. It is capable of swimming as well as crawling & burrowing. It is likely to be vulnerable to dredging but can probably accommodate limited sediment deposition from the dredging process.

Recoverability: *Nephtys* is a relatively long-lived polychaete with a life-span of 6 to possibly as much as 9yrs. It matures at 1yr & the females release eggs of 0.11-0.12mm from April through to March. These are fertilised externally & develop into an early lecithotrophic larva & a later planktotrophic larva which spends as much as 12 months in the water column before settling from July-September. The genus has a relatively high reproductive capacity & widespread dispersion during the lengthy larval phase. It is likely to have a high recoverability following disturbance.

Nereis

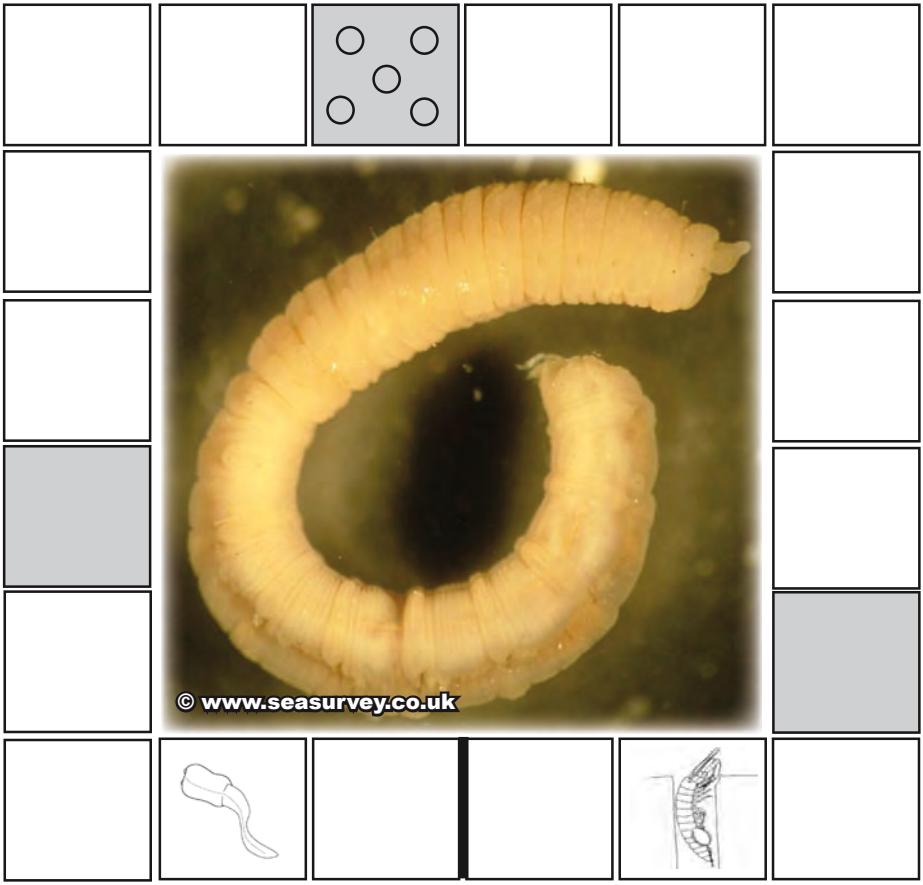


ROBUST

Vulnerability: *Nereis* & related genera are free-living ragworms belonging to the Family Nereidae. There are many species ranging from 2-4cm length up to the King-rag (*Neanthes virens*) that can reach over a metre in length. Most live in mucus-lined burrows in muddy sand, although some species occur under stones & amongst algal holdfasts on rocks. The proboscis is armed with jaws with which the worm feeds on invertebrate prey & probably also detrital material. The genus has limited powers of movement (except in the reproductive season) & is likely to be vulnerable to dredging but may be able to resurface through small quantities of sediments mobilised by the dredging process.

Recoverability: *Nereis* has a single annual episodic spawning after which it dies. The worms develop flattened chaetae & develop into a reproductive epitoke from which large numbers of eggs are released by the ovigerous female either on the sediment surface or in the water column where they are fertilised. After fertilisation, the eggs develop into a planktonic larval phase which lasts from 1-2 months. The genus has a high fecundity & lengthy larval phase & is likely to have a high recoverability.

Notomastus

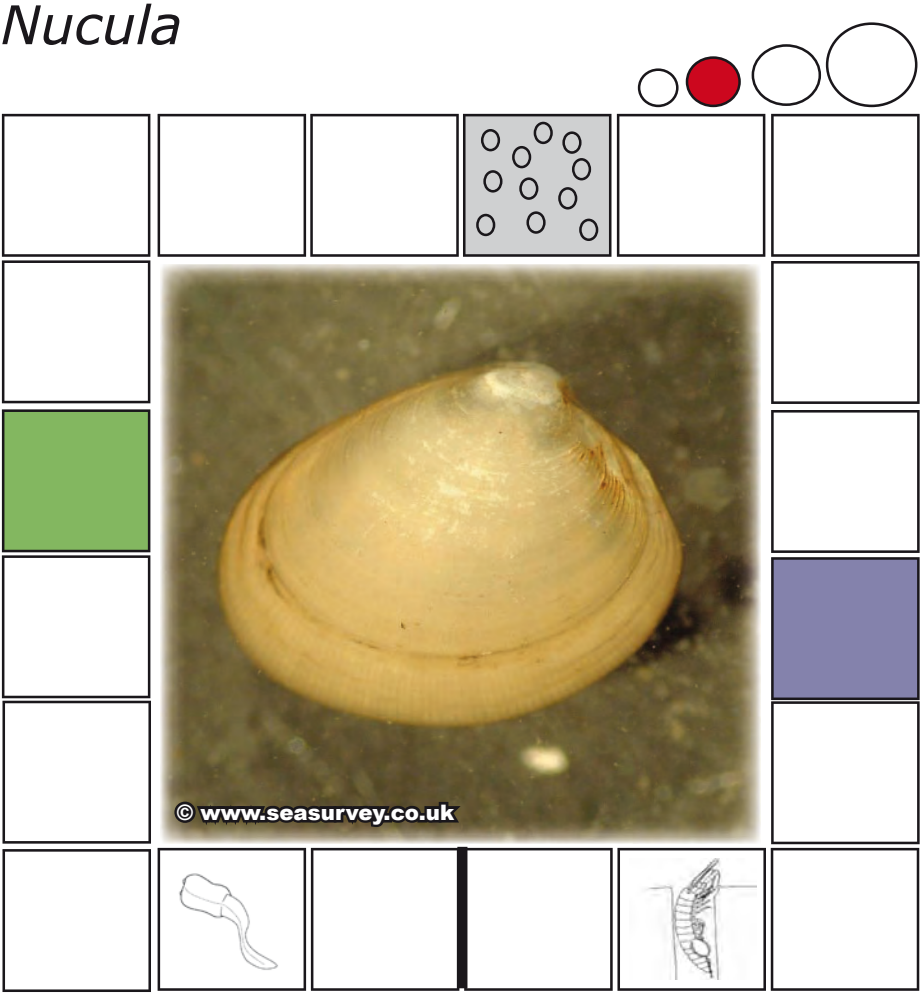


VULNERABLE

Vulnerability: *Notomastus* is a medium-large polychaete worm belonging to the Family Capitellidae. It reaches 15-30cm in length & lives in convoluted burrows in clean or muddy sand where it is a selective deposit feeder exploiting mainly detritus in the sediments. It has some mobility within the burrow, but is vulnerable to dredging & probably to the deposition of sediment mobilised during the dredging process.

Recoverability: Little is known of the longevity, the age at sexual maturity & fecundity of this genus. The sexes are separate & eggs of about 0.15mm are released by the female in April-June. Fertilisation is external & produces a free-swimming lecithotrophic larva. Settlement occurs after a short time of about 10 days in the plankton. Production of yolk-filled eggs generally results in relatively few larvae, & the short planktonic phase suggests limited dispersal potential. Recoverability is assessed as low-intermediate.

Nucula

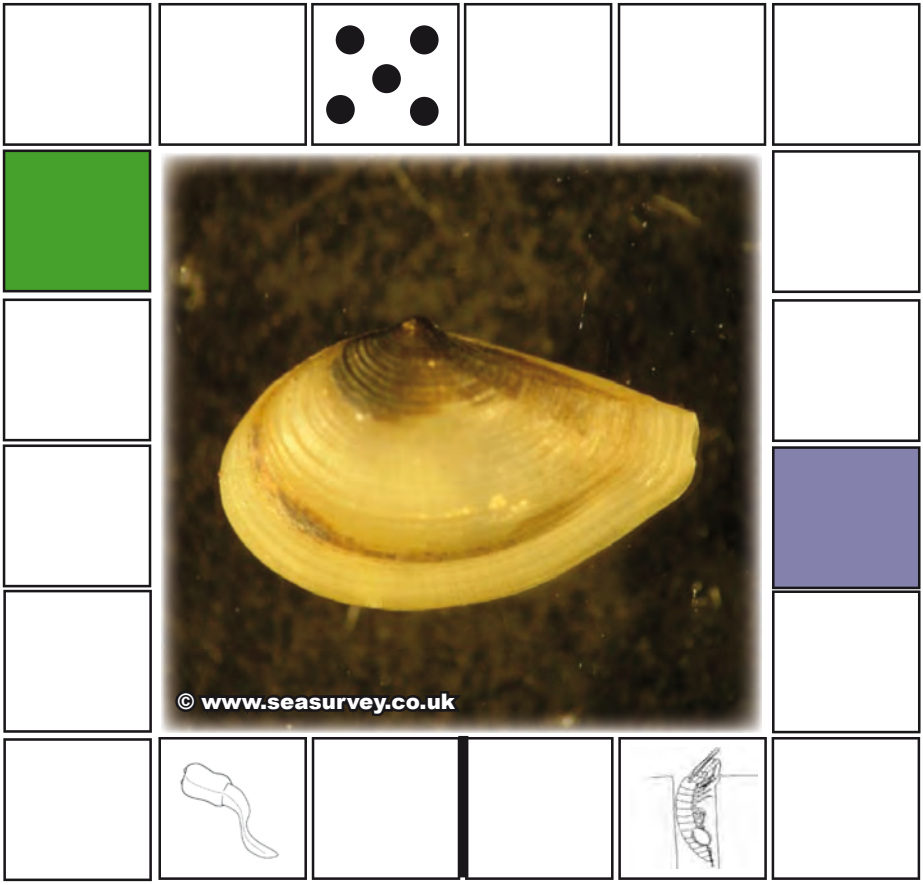


INTERMEDIATE

Vulnerability: *Nucula* is a genus of small bivalve molluscs belonging to the Family Nuculidae (Nut shells). The shell length is 1-2cm & the bivalve lives in muddy sand, in coarse sands & gravel depending on species. It is a selective deposit-feeder exploiting material near the sediment surface. It is a moderately mobile burrower & can be found from a few mm to a few cm deep. It is vulnerable to dredging but is probably tolerant of moderate deposition of sediments mobilised during the dredging process.

Recoverability: *Nucula* has a life-span of about 6-10yrs & reaches sexual maturity after 1-2yrs. The sexes are separate & spawning is mainly in the autumn, although in some areas spawning occurs from June-September. Large numbers of eggs of about 0.1-0.15mm with a high lipid content are produced & these settle within 2-6 days to form locally dense communities on the seabed. This genus has a capacity for dense recolonisation in suitable areas but the restricted dispersal implies a low recoverability from outside the area if the adult breeding population is removed by dredging.

Nuculana

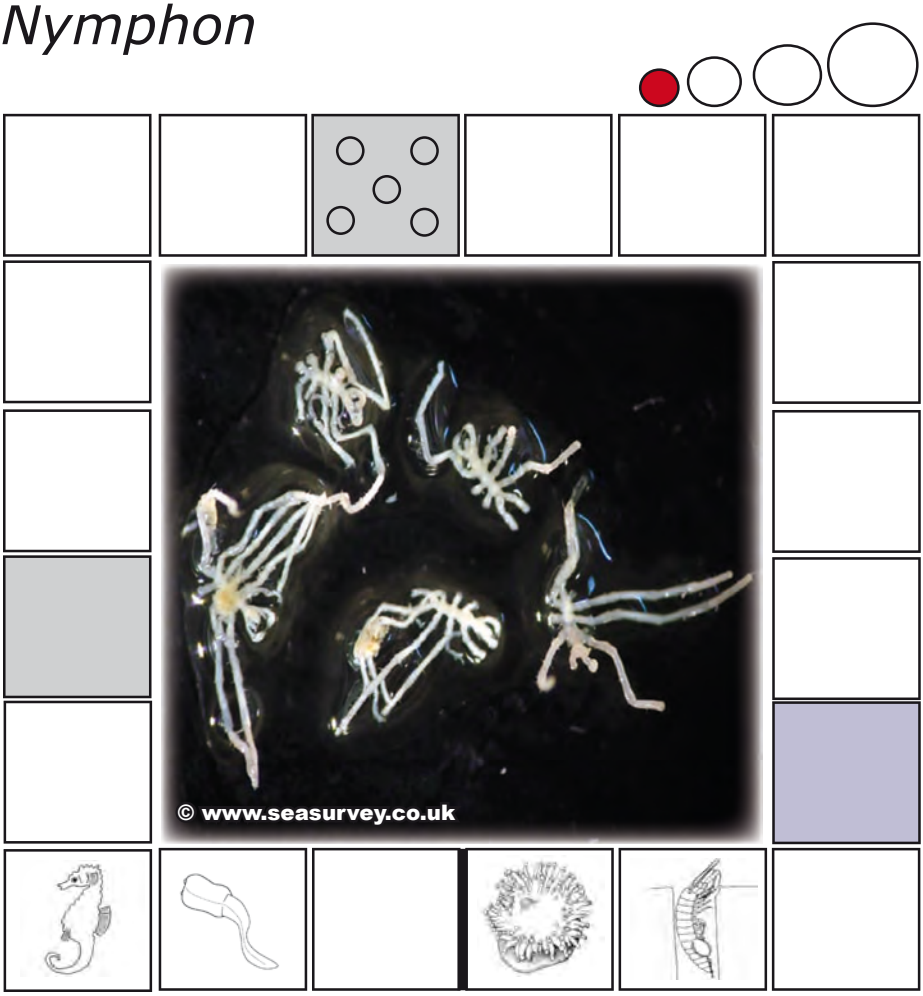


VULNERABLE

Vulnerability: *Nuculana* is a small bivalve mollusc of about 1-2cm in length that lives in muddy sands & gravels. It has very limited mobility & is likely to be vulnerable to dredging & to deposition of sediment mobilised during the dredging process.

Recoverability: The bivalve has a long life-span of about 15yrs. There is a protracted breeding season that extends throughout the year. Relatively small numbers of 175 eggs of about 0.12-0.14mm diameter are fertilised externally. They develop into lecithotrophic larvae that settle in less than 12 hours within 10m of the site of release without a pelagic phase. The low fecundity, low dispersal & slow growth of this bivalve suggest that it has a very low recoverability following disturbance.

Nymphon

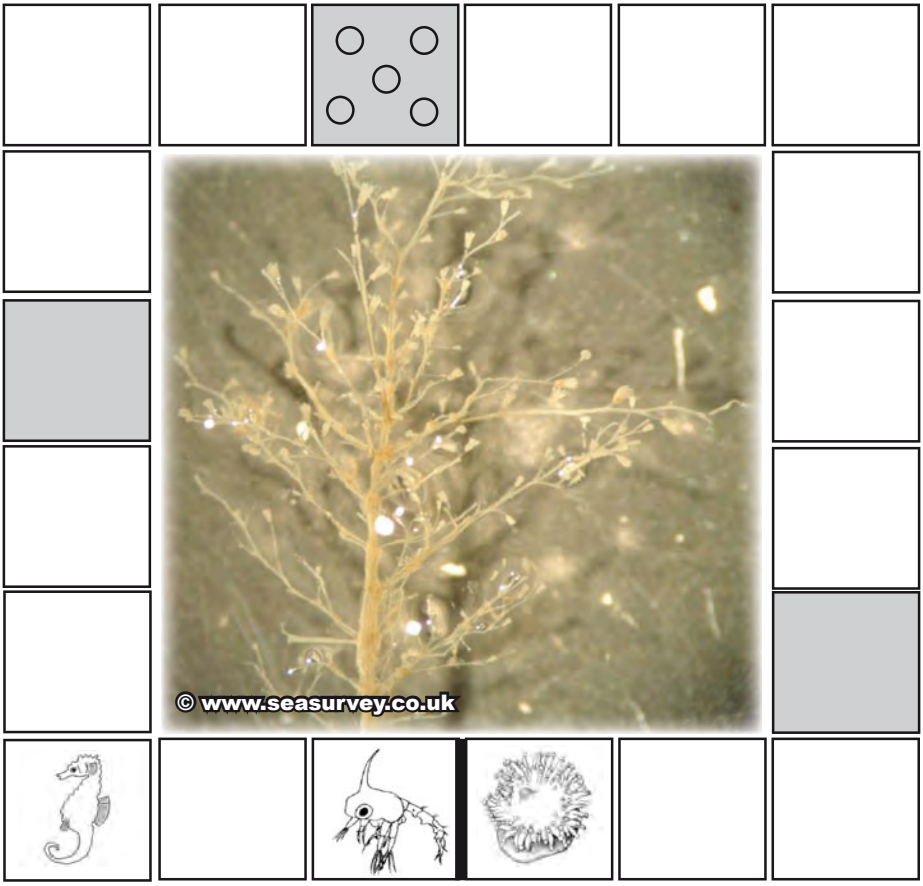


VULNERABLE

Vulnerability: *Nymphon* is a genus of very small sea spiders belonging to the Family Nymphonidae. The size rarely reaches 1cm & the sea spider lives associated with epigrowths such as hydroids & algae. It has very limited mobility & is moreover dependent on sessile epigrowths as a habitat. It is likely to be vulnerable to dredging & to alteration of its habitat if significant deposition of material mobilised by dredging occurs.

Recoverability: There is little information on the life-span of this genus. The sexes are separate & sexual maturity is attained in less that 12 months. There is an annual episodic breeding period from February-March at which time the female releases 30-40 eggs of about 0.12mm diameter. These are fertilised internally & later transferred to the male during the winter migration. Up to 300-400 embryos may be carried as a brood by the male. These are then released in a short planktotrophic larval phase before settlement in April. The fecundity is relatively low & the juvenules are unlikely to disperse far from the site of release. Recolonisation from outside sources following disturbance is likely to be slow & the genus has a low recoverability.

Obelia

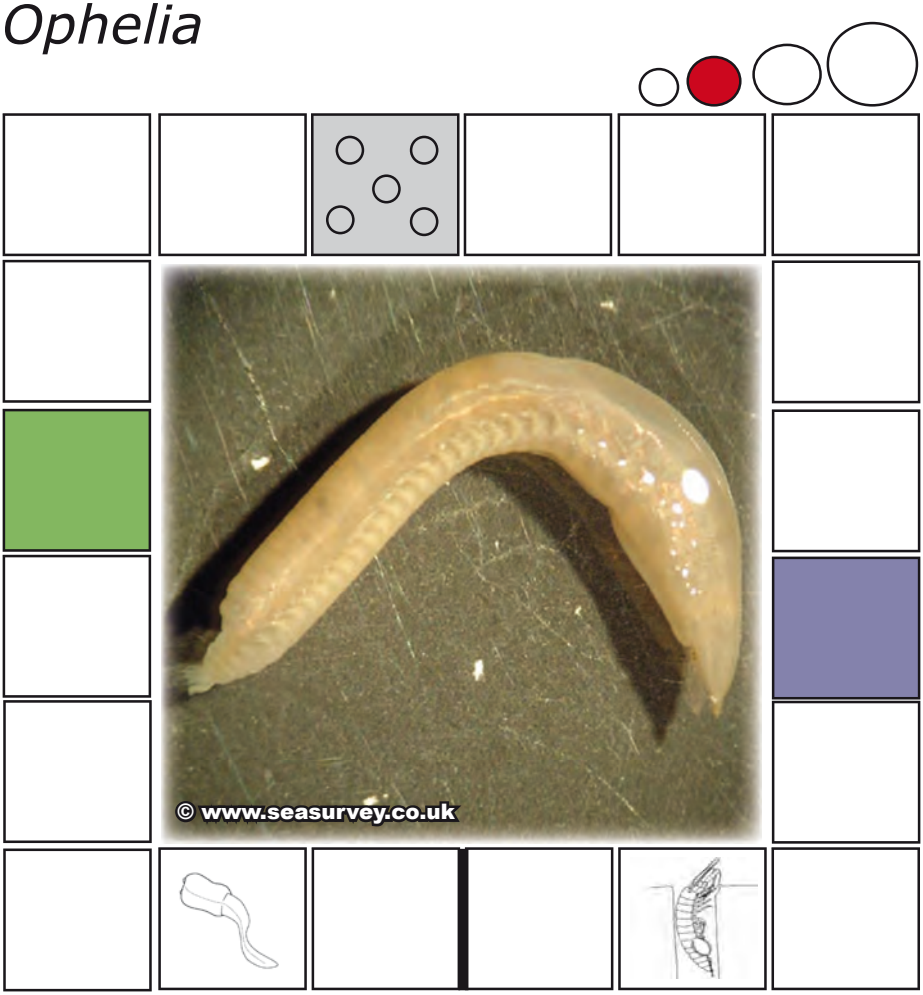


ROBUST

Vulnerability: *Obelia* is a medium-large foliose hydroid belonging to the Family Campanulariidae. Colonies reach 20-50cm in height & are attached to rocks & boulders on the seabed, as well as to stones & shells provided the substratum is stable. The polyps feed by capturing zooplankton from the water column by special cells (nematocysts). The colonies are sessile & are vulnerable to both dredging & probably to deposition of sediment mobilised during the dredging process.

Recoverability: *Obelia* is a relatively long-lived genus with a rapid growth & regeneration ability in the hydroid stage. This stage produces flattened male & female medusae by asexual budding from March-July. The medusoid stage lasts about 7-30 days in the plankton before eggs of about 0.2mm develop in the female. These are fertilised externally by the male & develop into a planula larva of 1-2mm length. This then settles after a period of 5-21 days. The widespread dispersal potential & rapid growth of the colonial phase of this genus suggests that it has a high recoverability following disturbance.

Ophelia



INTERMEDIATE

Vulnerability: *Ophelia* is a small-medium sized free-living polychaete worm belonging to the Family Opheliidae. It & related genera reach 3-10cm in length & burrow in unconsolidated mixed to medium coarse sands where they are deposit-feeders exploiting diatoms & detritus within the sediments. *Ophelia* has moderate mobility within the surface deposits, but is vulnerable to dredging. It normally lives in mobile sands & is likely to be able to accommodate moderate deposition of sand mobilised during the dredging process.

Recoverability: The life-span of *Ophelia* is 6-10yrs, & adults mature at 1-2yrs. The sexes are separate & eggs of 0.13-0.15mm diameter are fertilised externally after spawning in July-August. The duration of the larval stage is 2-10 days with settlement occurring between June-November. Little is known of the fecundity of this genus, but the relatively short planktonic phase & long life-span of the adult suggests a low-intermediate potential for recolonisation & subsequent recovery of biomass.

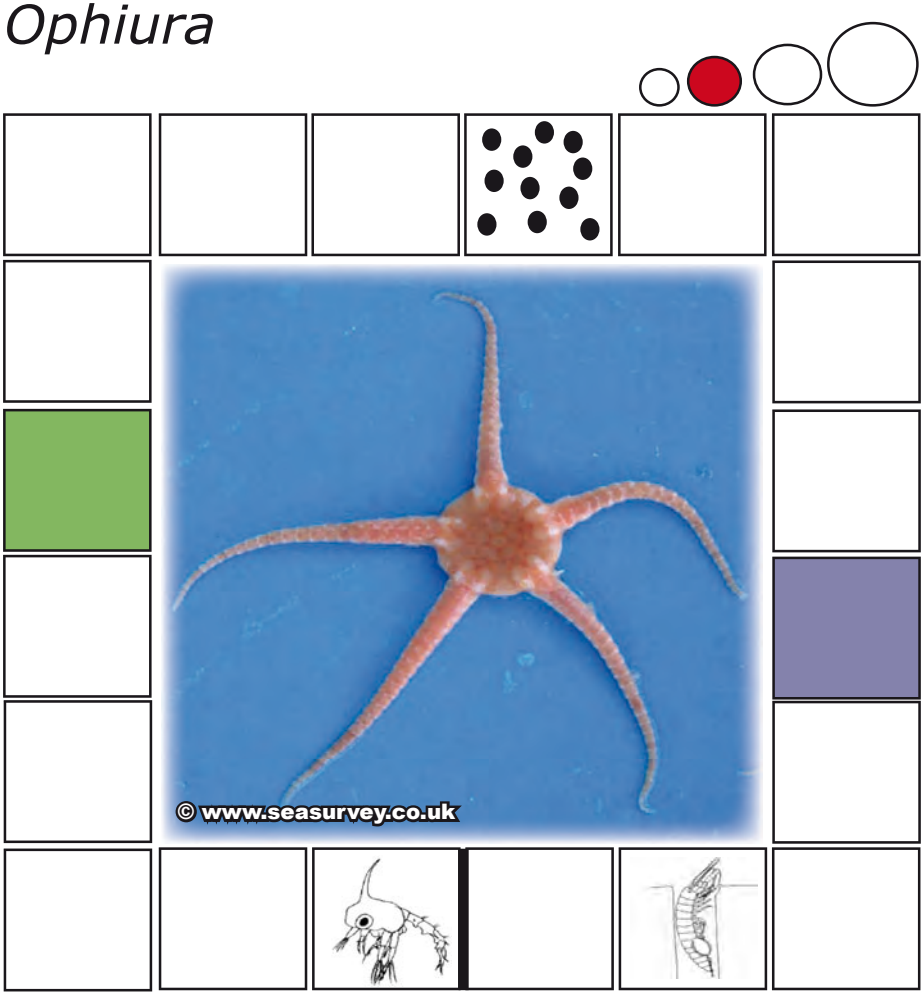
Ophiothrix

ROBUST

Vulnerability: *Ophiothrix* is a medium-sized ophiuroid (brittlestar) belonging to the Family Ophiotrichidae. The size is about 11-20cm (disc width 1-2cm). The brittlestar lives on the surface of hard seabeds including rocks & shelly sand where it feeds on detritus, small invertebrates & phytoplankton on the sediment surface & in the adjacent water column. It has moderate mobility but is vulnerable to dredging & to deposition of sediment mobilised during the dredging process.

Recoverability: *Ophiothrix* lives for about 5yrs & reaches sexual maturity a 1-2yrs. The sexes are separate & spawning results in the release of large numbers of up to 50,000 eggs of about 0.1mm diameter from April-December. These are fertilised externally & develop into a characteristic planktotrophic (ophiopluteus) larva which spends up to 30 days in the water column before metamorphosis & settlement as a juvenile. Recruitment success is heavily dependent on environmental conditions, but can result in dense communities of this genus on the seabed. It has a high potential recoverability following disturbance.

Ophiura

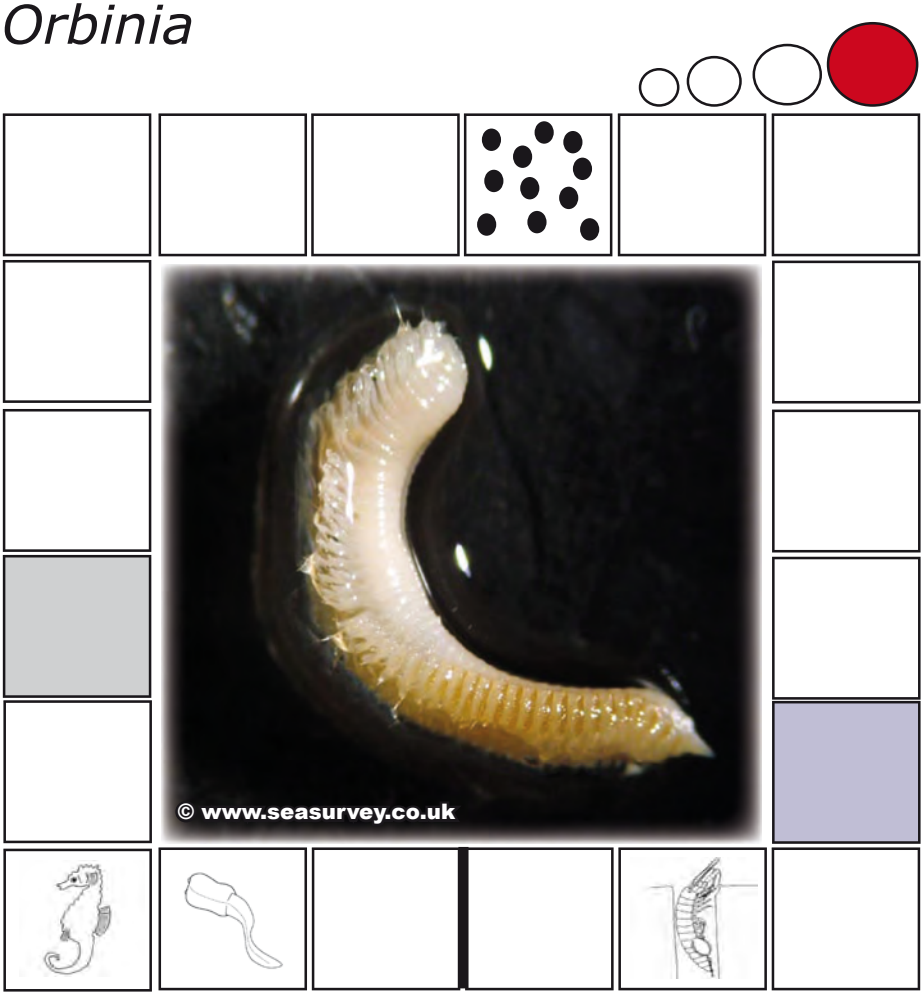


ROBUST

Vulnerability: *Ophiura* is a small-sized ophiuroid (brittlestar) belonging to the Family Ophiuridae. It is 2-10cm (disk width 1-2cm) in size & lives on the surface of mixed sediments, often where there is a significant quantity of mud. It feeds mainly on detritus, phytoplankton & molluscs on the surface of the seabed, although it may also be able to exploit material in the water column. It has moderate mobility but is likely to be vulnerable to dredging & to deposition of more than small quantities of sediment mobilised by the dredging process.

Recoverability: *Ophiura* has a life-span of about 3-6yrs & reaches sexual maturity at 1yr. The sexes are separate & the female produces large numbers of up to 5,000 eggs of about 0.12mm diameter from February-October. These are fertilised externally & develop into planktotrophic (ophiopluteus) larvae that spend as much as 10 months in the plankton. The large numbers of larvae & long planktonic phase leads to a high dispersion & recolonisation potential. Recoverability is further enhanced by the rapid growth & early maturation of this genus which can occur in high densities on the seabed. It has a high recoverability.

Orbinia

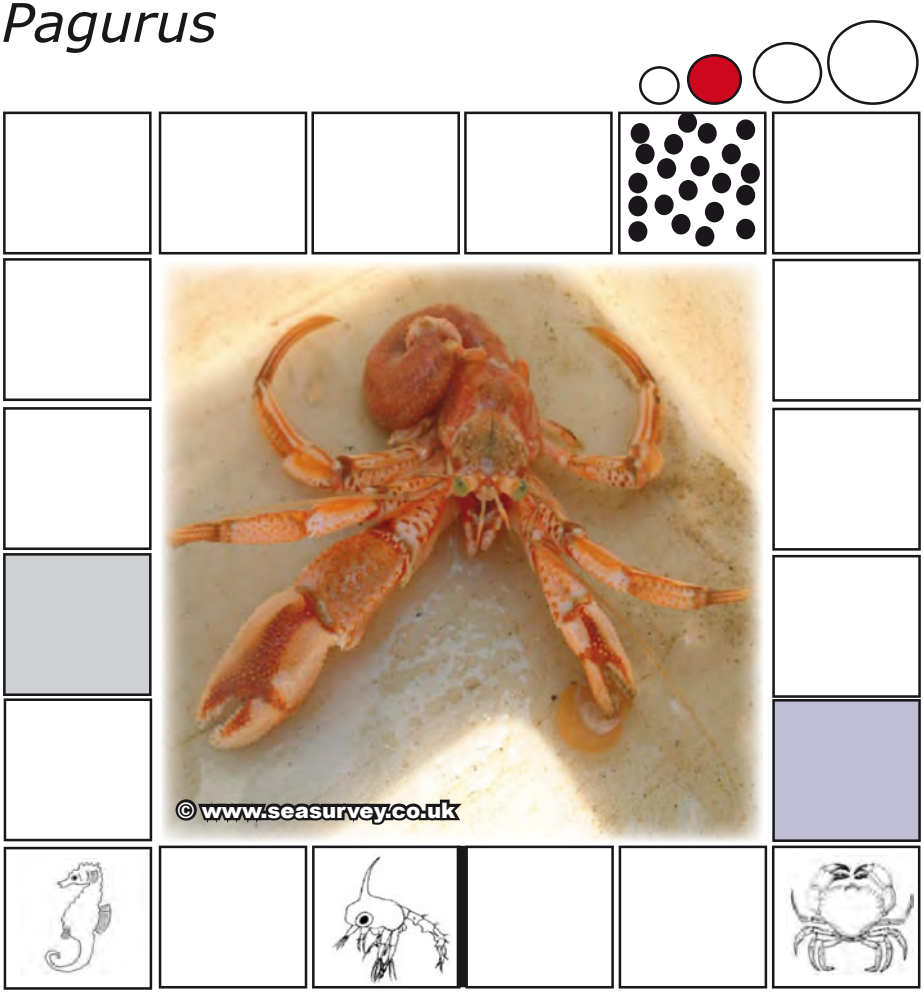


INTERMEDIATE

Vulnerability: *Orbinia* is a medium-large free-living polychaete worm belonging to the Family Orbiniidae. It reaches 20-40cm in length & lives in burrows in sand & muddy-sand where it is a sub-surface deposit-feeder exploiting mainly detritus as a food source. It has moderate mobility but is likely to be vulnerable to dredging. It probably has a capacity to resurface through small deposits of sand mobilised by the dredging process.

Recoverability: There is little information on the longevity or age at maturity for this genus. The sexes are separate & the female produces as many as 5,000 eggs of about 0.3mm diameter in a reproductive season between January-June. The eggs are fertilised externally & are deposited as an egg cocoon before emerging as juveniles that settle between March-July. The large number of eggs allows this genus to achieve locally high densities, but the limited dispersal potential implies that *Orbinia* would have a low recoverability from sources outside the area of disturbance.

Pagurus

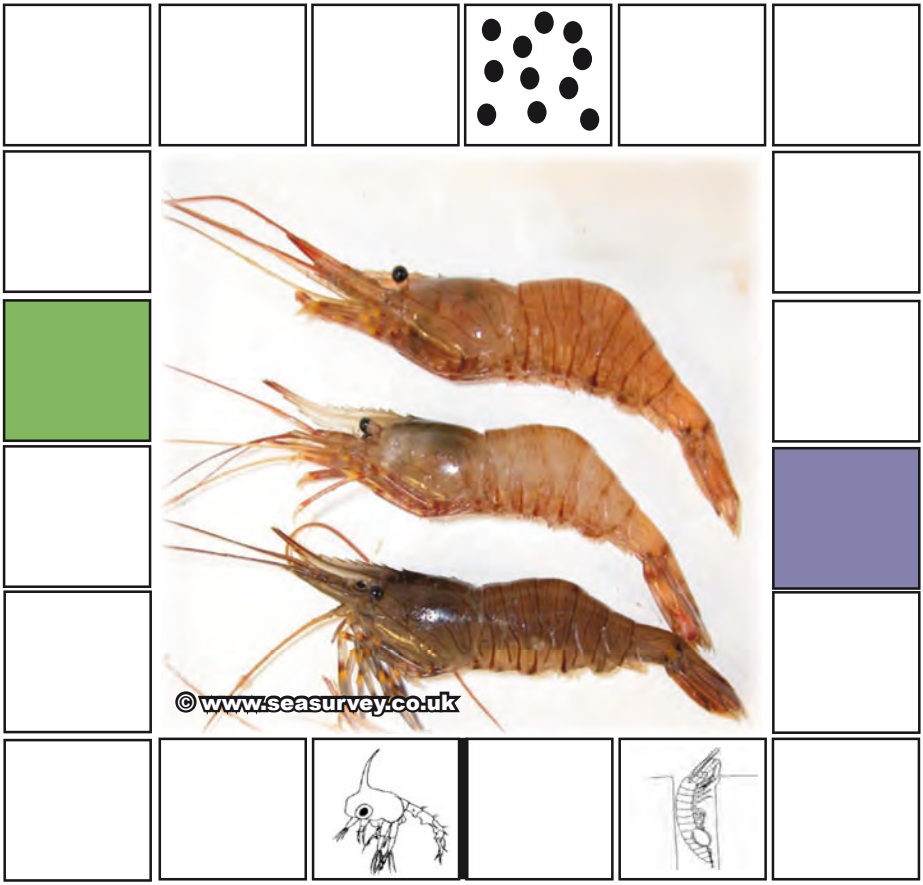


ROBUST

Vulnerability: *Pagurus* is a small-medium sized hermit crab belonging to the Family Paguridae. It reaches a body length of 3-10cm & lives in gastropod shells such as those of the whelk on the surface of a wide range of substrate types from gravel & stones to mud. It is mainly a carrion feeder that exploits material from the sediment surface over a relatively wide area. This genus is mobile & can locate food over considerable distances. It is likely to be vulnerable directly under a draghead, but is also able to migrate into & out of disturbed areas. It has a relatively low vulnerability.

Recoverability: There is little information on the longevity of *Pagurus*. Maturity is reached after only 6 months & the females release large numbers of 12,000-15,000 eggs that are fertilised internally by the male. The eggs are then brooded before being released between November-May as planktotrophic zoea larvae of about 2-3mm length. Thse remain in the plankton for up to 4 weeks. The genus is widespread & common on the seabed & has a high fecundity & larval dispersal potential. It has a high recoverability.

Palaemon



ROBUST

Vulnerability: *Palaemon* (synonym *Leander*) is a medium-sized crustacean (prawn) belonging to the Family Palaemonidae. It is of about 7cm body length & lives on the surface of the seabed amongst rocks & stones, algae & other epigrowths where it is a scavenger. It has some mobility & although it is vulnerable to dredging, it is likely to be able to avoid the impact of deposition of material mobilised by the dredging process. It is likely to be susceptible to habitat loss if deposition were to affect the epigrowths amongst which the prawn lives.

Recoverability: *Palaemon* has a life-span of 3-5yrs & reaches reproductive maturity at 1yr. The sexes are separate & the breeding season varies with species. *P.serratus* breeds from February-November & *P.elegans* from May to August. Fecundity is relatively high. The female produces up to 2,000 eggs of about 0.5-0.6mm diameter. These are fertilised internally & then released as planktotrophic zoea larvae for a period of 1-2 months in the plankton. The genus has a relatively high fecundity, a long planktonic dispersal phase & fast initial growth. It has a high recoverability.

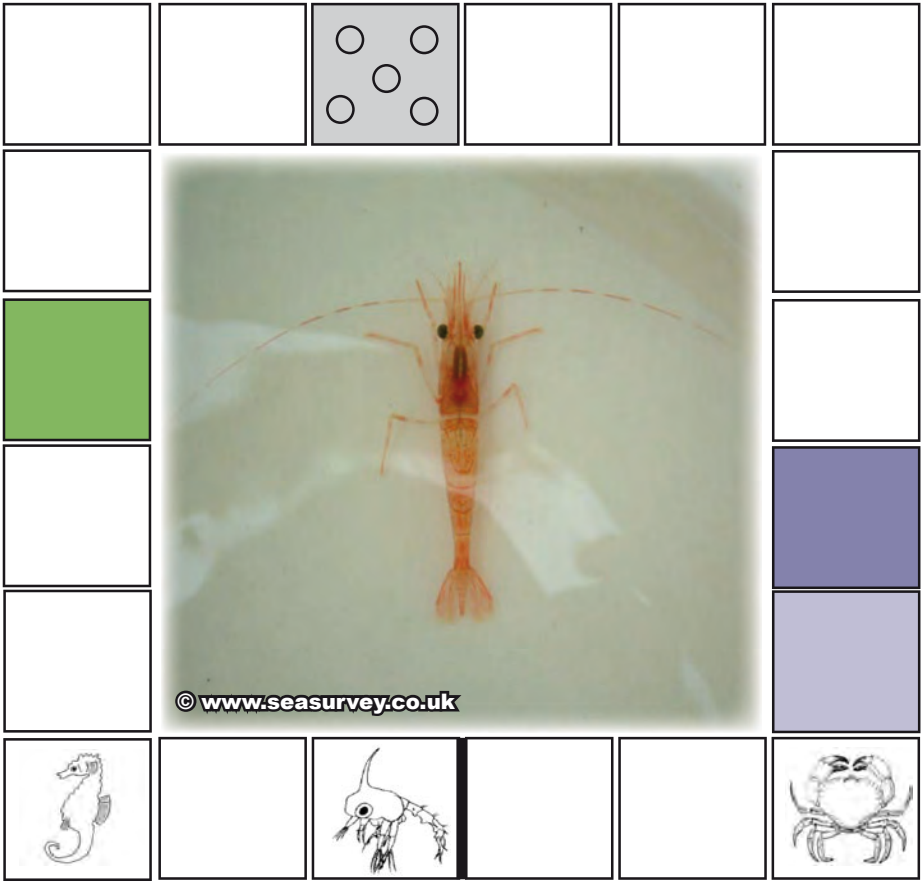
Pandalina

ROBUST

Vulnerability: *Pandalina* is a small-medium sized prawn belonging to the Family Pandalidae. It reaches a body length of about 3-4cm & lives amongst epigrowths on the seabed. It is able to swim & is likely to be able to avoid disturbance from deposition of sediments associated with the dredging process. However it is vulnerable to potential damage to the epigrowths & substrate upon which it depends.

Recoverability: *Pandalina* has a life-span of 1-2yrs & reaches reproductive maturity in about 6-8 months. The sexes are separate & each female produces as many as 600 eggs of about 0.5mm diameter from January-September with 2-3 broods per season. These are fertilised internally by the male & brooded for about 12 weeks by the female. They then hatch at 1-2mm length & spend a further 2 months in the water column as planktotrophic zoea larvae. The fecundity over the reproductive season is high, the larvae are dispersed for up to 10km & subsequent growth to maturity is fast. This genus has a high recoverability.

Pandalus



ROBUST

Vulnerability: *Pandalus* is a genus of medium-sized free-living prawns (Pink shrimp) belonging to the Family Pandalidae. It reaches a length of up to 15cm & lives amongst epigrowths on the seabed. It reaches high densities in the North Sea amongst communities of the Ross worm (*Sabellaria spinulosa*). It is moderately mobile & can swim into the water column, so is likely to be able to avoid disturbance by dredging, although it is vulnerable to the impacts of sediment deposition on its seabed habitat.

Recoverability: *Pandalus* has a life-span of 3-5yrs & reaches reproductive maturity in 3 months in primary females but up to 18 months in individuals that are hermaphrodite. Reproduction is in the spring with the production of eggs of about 0.5mm that are fertilised internally then carried under the abdomen. The eggs emerge as initially lecithotrophic zoea larvae that change to a planktotrophic form after about 6 days. The planktonic zoea stage lasts for as long as 4-6 months & settlement is in March to May. This genus has a widespread dispersal potential of at least 10km & a relatively rapid growth rate to sexual maturity. It has a high recoverability.

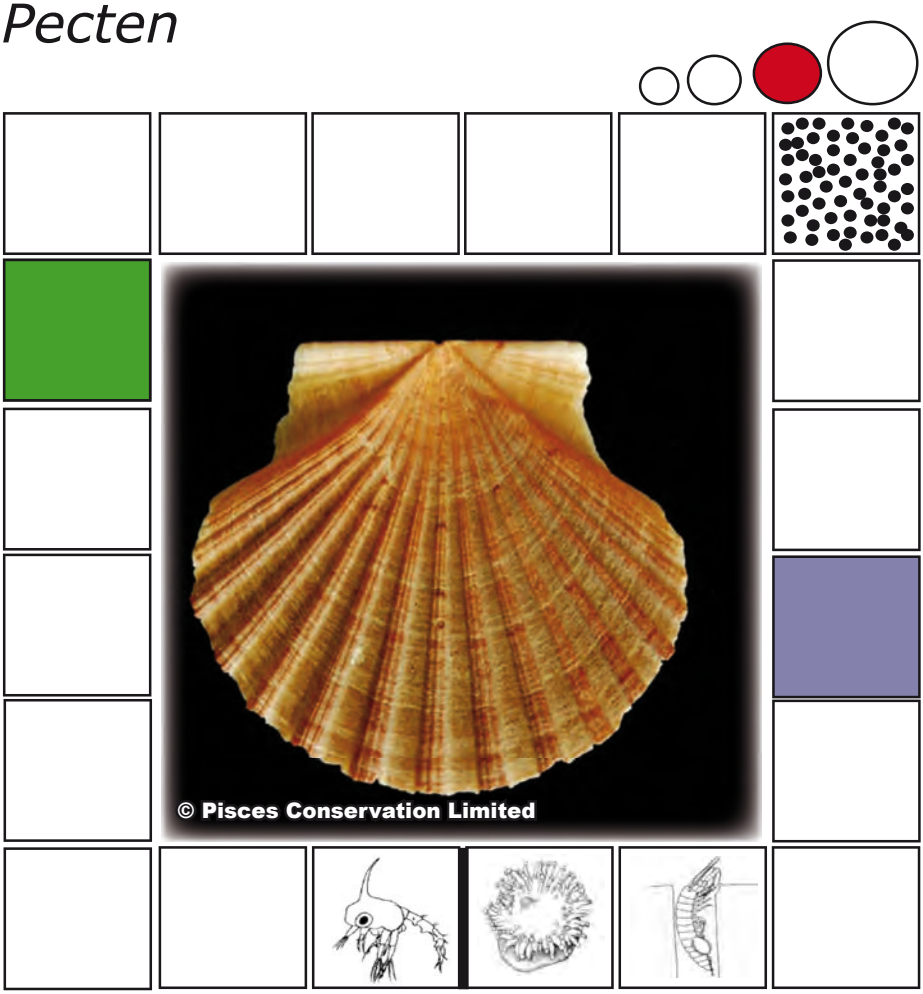
Pasiphaea

INTERMEDIATE

Vulnerability: *Pasiphaea* is a small-medium sized free-living crustacean belonging to the Family Pasiphaeidae (Glass shrimps). It has a body length of about 11cm & lives amongst epigrowths such as hydroids & macrophytes on the seabed. It is likely to be vulnerable to dredging, but it has an ability to swim & may be able to avoid disturbance from deposition of sediments mobilised by the dredging process. The genus may be susceptible to habitat alteration if the epigrowths upon which it lives are disturbed by alteration of the sediment.

Recoverability: There is little information on the life-span & age at reproductive maturity for this genus. The sexes are separate & the breeding season varies with species. The breeding season for *P.multidentata* in UK waters is September-March & the female produces a small number of 10-50 large yolk-filled eggs of as much as 1.8mm in length. These are fertilised internally by the male & are then released as lecithotrophic larvae that later develop into planktotrophic zoeas. The larval period is 11-30 days. This genus has a relatively low fecundity & is unlikely to have a high recoverability.

Pecten



INTERMEDIATE

Vulnerability: *Pecten* is a medium-sized free-living bivalve belonging to the Family Pectinidae (Scallops). It lives on the surface of sand & fine gravel deposits where it feeds by filtering particulate matter including phytoplankton from the water column. It reaches a shell length of up to 20cm. It is fixed to the substratum with byssus threads when young, but becomes free-living & is moderately mobile as an adult by means of swimming movements made by the shell valves. It is likely to be vulnerable to dredging but is likely to be able to tolerate sediment mobilised by the dredging process.

Recoverability: *Pecten* has a life-span of up to 10-20yrs. Sexual maturity is achieved at 1yr. The genus is hermaphrodite & huge quantities of 10-20 million eggs of about 0.65mm are released during two separate spawnings between April-September. Fertilisation is external & leads to the development of a planktotrophic veliger larva that spends about 30 days in the water column. Dispersal is thought to be up to 10km, but in some cases has been reported to be as much as 40km. This genus has a high rate of recolonisation, but restoration of the biomass by growth of the colonising individuals is likely to take up 10-20yrs. Recoverability is assessed as strong.

Pholoe

ROBUST

Vulnerability: *Pholoe* is a small free-living phyllodocid polychaete worm belonging to the Family Pholoidae. It lives on the seabed under rocks, shells & gravel & reaches about 1cm in length. It is a carnivore feeding off small invertebrates on the surface of the sediment. It has some mobility but is likely to be vulnerable to both dredging & the deposition of sediment mobilised during the dredging process.

Recoverability: *Pholoe* has a life-span of about 4yrs & reaches sexual maturity at 3yrs Large numbers of up to 25,000 eggs of 0.08-0.15mm diameter are spawned between March-April & are fertilised externally. The planktotrophic larvae spend about 3 weeks in the plankton before settling as juveniles. The large number of eggs & the planktonic larval phase suggest that this genus has a potential for rapid recolonisation, although it is likely to take up to 3yrs after colonisation before the biomass is restored by growth of the colonising individuals to maturity. Recoverability strong.

Pilumnus

ROBUST

Vulnerability: *Pilumnus* is a small crab (Hairy crab) of about 1-1.5cm in length that lives on rocky & stony seabed habitats where it is a scavenger taking a wide variety of food items. It has some mobility but is vulnerable to dredging & to alteration of substrate composition from deposition of sand mobilised during the dredging process.

Recoverability: There is little information on the longevity, age at maturity or fecundity of this genus. Reproduction is from April-August & fertilisation is internal, after which the fertilised eggs are brooded by the female before release as planktotrophic (zoea) larvae of about 1.8mm length. These spend about 8 weeks in the plankton before settling as megalopas & development into juveniles between August & September. The genus has a strong recoverability based on the vast numbers that can occur in inshore plankton & the widespread dispersal achievable in 8 weeks as a planktonic larva.

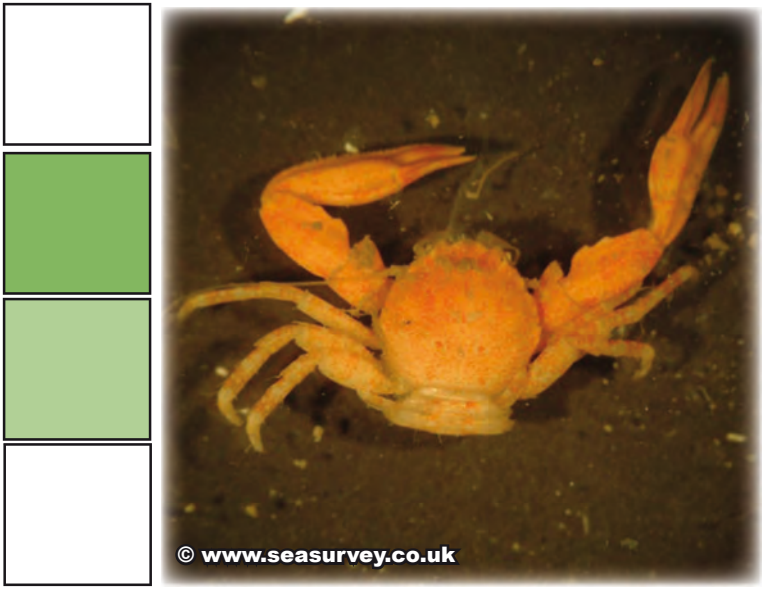
Pionosyllis

VULNERABLE

Vulnerability: *Pionosyllis* is a very small free-living polychaete worm belonging to the Family Syllidae. It reaches <1cm in length & is to be found amongst epigrowths such as hydroids where it preys on small invertebrates. It is vulnerable to both dredging & the deposition of material mobilised by the dredging process which may affect the substrate upon which the worm depends.

Recoverability: Little is known of the life-span, age at maturity & fecundity of this genus. The worms are hermaphrodite & breeding is from February-March. There is a very short planktonic phase. The genus is likely to have a limited dispersal although growth to adult size is probably achieved in <1yr. Recoverability is assessed as weak.

Pisidia

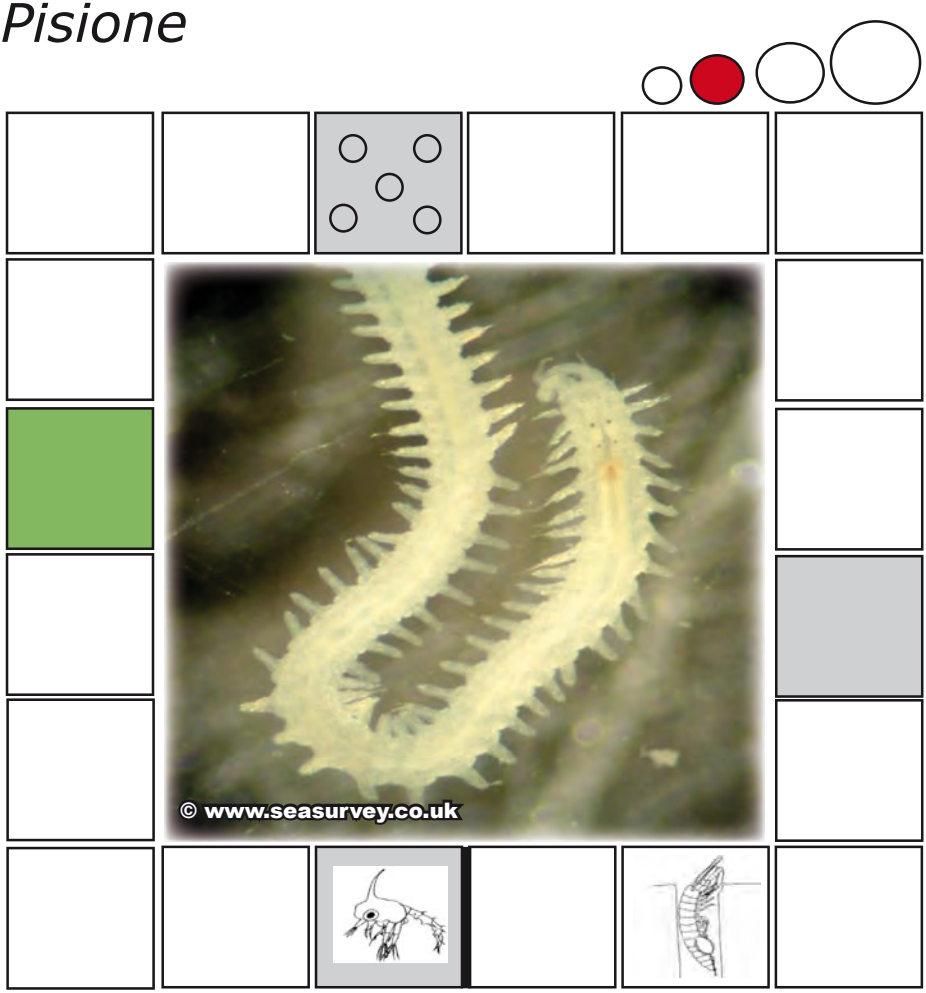


ROBUST

Vulnerability: *Pisidia* is a genus of very small crabs (Porcelain crabs) belonging to the Family Porcellanidae. They rarely reach 1cm in length & are typically crevice-dwelling crabs that live amongst rocks, gravel & epigrowths including *Sabellaria* (Ross-worm) communities in the eastern English Channel & Southern North Sea. The crabs are suspension-feeders exploiting detritus & micro-organisms in the water column. They have some limited mobility but are likely to be vulnerable to both dredging & to the deposition of material mobilised by the dredging process.

Recoverability: *Pisidia* lives for 2-3yrs & matures at 1yr. The sexes are separate & the female produces 150-1000 eggs of 0.4-0.6mm diameter between March-September. After fertilisation, the eggs are brooded & then released as planktotrophic zoea larvae with characteristically long spines on the carapace. Settlement occurs after about 30 days in the plankton. The larvae are widespread & relatively common in the plankton & this genus evidently has a strong potential for recolonisation & recovery.

Pisione

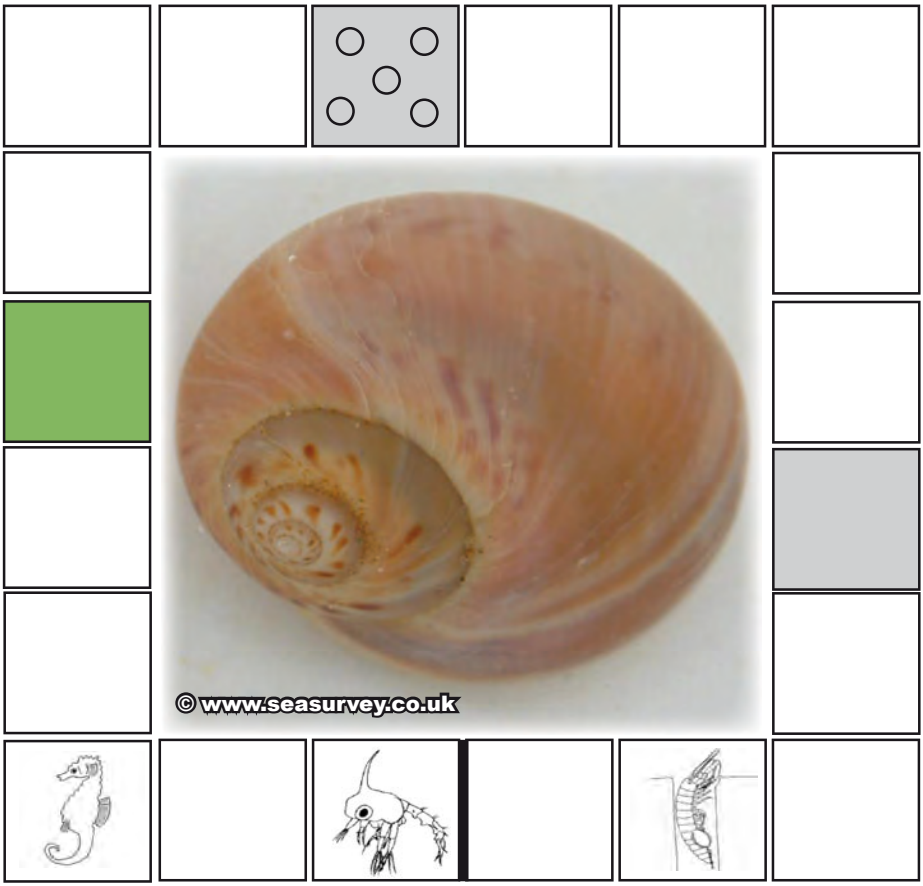


INTERMEDIATE

Vulnerability: *Pisione* is a small free-living phyllodocid polychaete belonging to the Family Pisionidae. It reaches a body length of only 1.5cm & lives burrowed in coarse sand where it is a carnivore feeding on small invertebrates. It has some mobility & is vulnerable to dredging but may be able to accommodate deposition of small quantities of sand mobilised by the dredging process.

Recoverability: *Pisione* lives for about 3yrs & is likely to reach maturity after 1yr. Reproduction is from August-September & fertilisation is internal after which planktonic larvae are released into the water column. There is very little information on the length of the larval phase. It is probable that this genus has an intermediate recoverability based on the presence of a pelagic dispersal phase, but more information is required on fecundity & larval biology to have confidence in this assessment.

Polinices



ROBUST

Vulnerability: *Polinices* (synonym *Natica*) is a genus of small gastropod molluscs belonging to the Family Naticidae (Necklace shells). It reaches a size of up to 2cm & lives in clean sands where it preys on bivalves after boring through one of the shell valves. It is moderately mobile in the sand but is likely to be vulnerable to dredging. It probably has the ability to resurface through a moderate thickness of sediment mobilised & deposited during the dredging process.

Recoverability: *Polinices* has a probable life-span of 5yrs & sexual maturity is related to body size - generally at 8-10mm shell length. Fecundity is also strongly related to the size & age of the female. There is an annual protracted breeding season that peaks in July & August & fertilisation is internal. The eggs are produced as an egg collar & hatch into planktotrophic veliger larvae of up to 0.8mm length that spend 40-50 days in the water column. The genus has a moderate fecundity in larger females, & a long larval stage. Recoverability is likely to be intermediate-high.

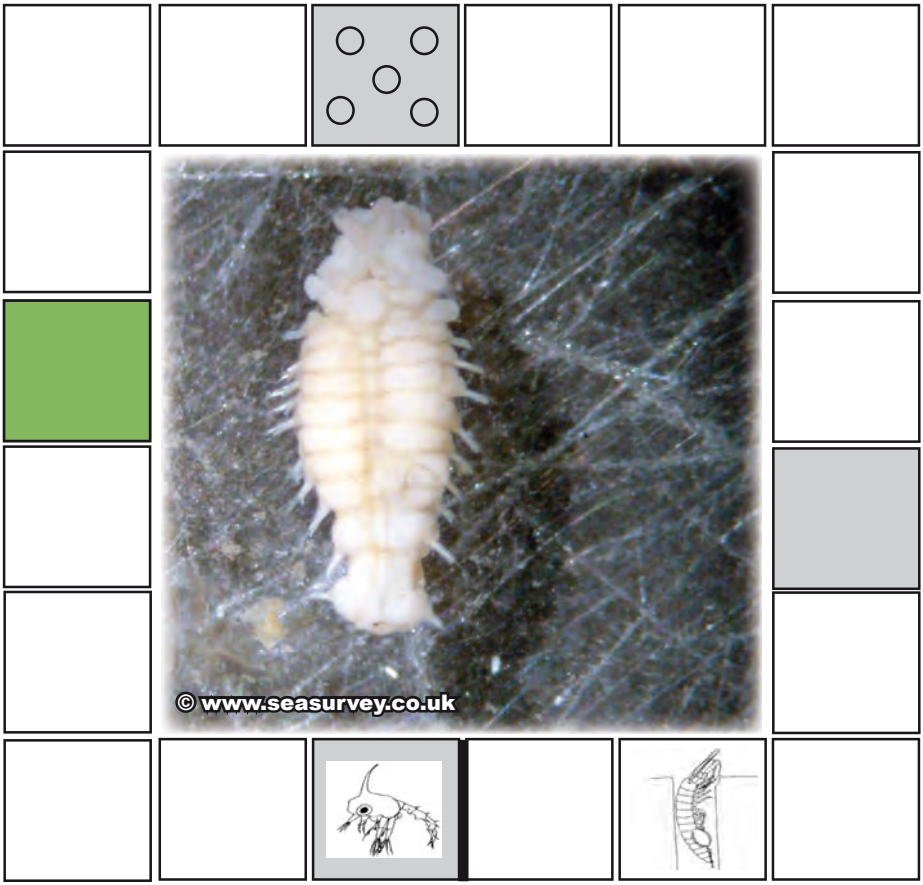
Polycarpa

VULNERABLE

Vulnerability: *Polycarpa* is a genus of small-medium sized solitary ascidians (Sea squirts) belonging to the Family Styelidae. The ascidian reaches a height of about 3-8cm & is attached to boulders, rocks & epigrowths on the seabed where it feeds by filtering particulate matter from the water column. It is vulnerable to dredging, to deposition of material mobilised by the dredging process & to clogging of the filtration mechanism by excessive particulate loads in the water column. It is also likely to be vulnerable to modification of the habitat of rock & epigrowths on which it depends for recolonisation & attachment.

Recoverability: *Polycarpa* probably has a life-span of 3-5yrs. The genus is hermaphrodite & reproductive maturity is reached in 1yr. As many as 20,000 yolk-filled eggs of 0.15-240mm diameter are fertilised externally in an annual episodic breeding season between April-November. The lecithotrophic tadpole larvae spend less than 1 day in the water column before settlement. This genus has a high fecundity but a larval dispersal potential of only 10-100m. The seabed is likely to be recolonised only very slowly from sources outside a site of disturbance. Recoverability low.

Polycirrus

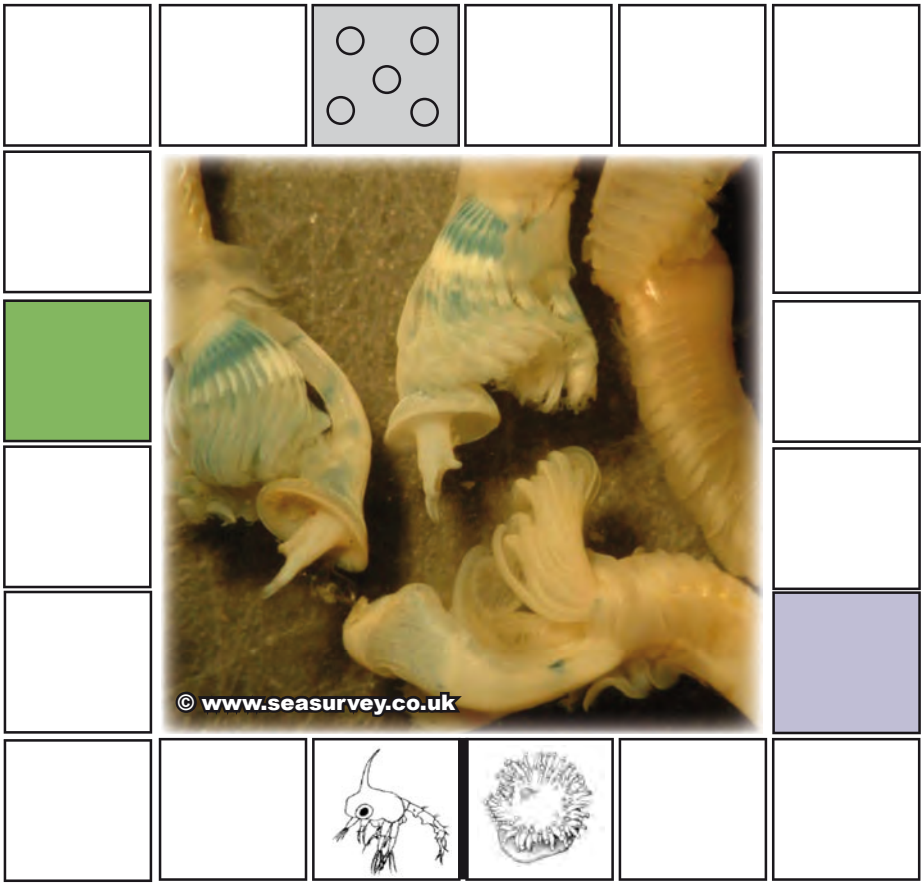


VULNERABLE

Vulnerability: *Polycirrus* is a small-medium sized terebellid polychaete worm belonging to the Family Terebellidae. It reaches a body length of 3-10cm & lives in a temporary mucous tube amongst the holdfasts of algae, epigrowths, serpulid tubes & old shells. It feeds by gathering detritus from the sediment surface with a crown of tentacles. Apart from movement within the tube, the worm has very little mobility. It is vulnerable to dredging & to deposition of material mobilised by the dredging process.

Recoverability: *Polycirrus* has a life-span of about 5-10yrs & produces eggs of 0.175-0.2mm diameter that are fertilised externally. There is little information on the fecundity or larval biology of this genus. It probably has a low recoverability based on the relatively long life-span.

Pomatoceros

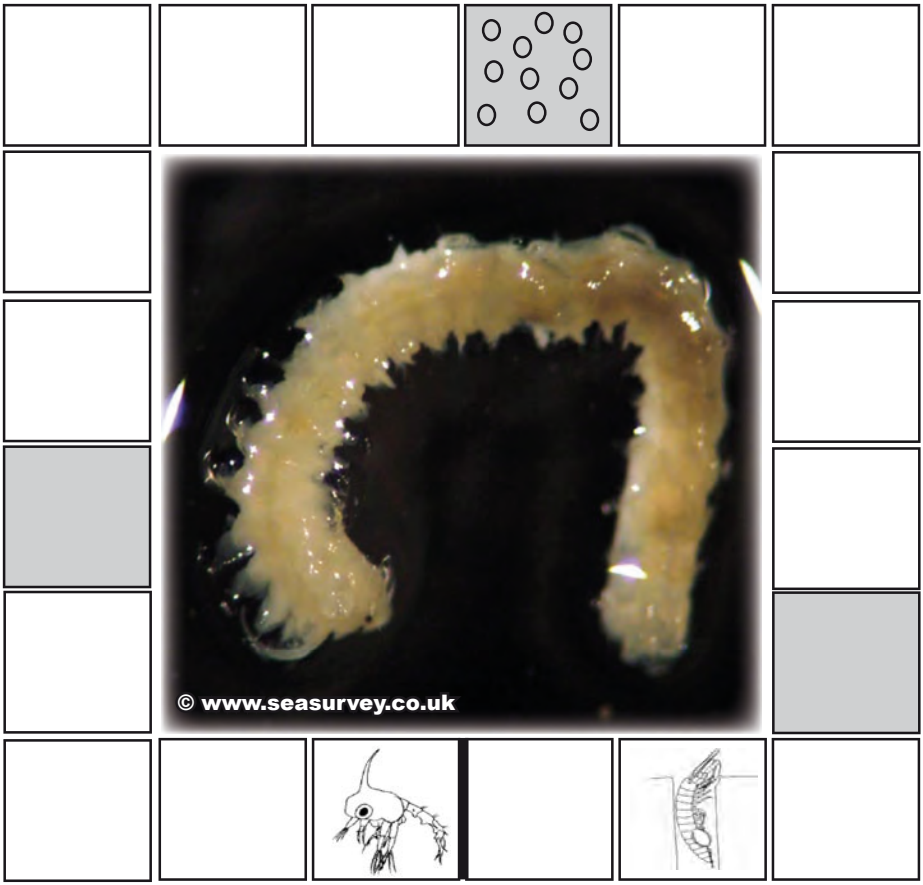


ROBUST

Vulnerability: *Pomatoceros* is a small polychaete worm belonging to the Family Serpulidae (Keel worms). It is commonly 1.5-2.5cm in length & lives in a calcareous tube that is attached to substrate of rocks, shells & algae. It feeds by filtration of particulate matter through a crown of tentacles that can be withdrawn into the tube which can be plugged by a modified tentacle. It is a sessile genus confined to hard substrata, shells & stones. It is vulnerable to dredging & to deposition of material mobilised during the dredging process.

Recoverability: *Pomatoceros* lives for up to 4yrs & matures at 4 months. The worm is hermaphrodite but the male & female gametes are separate at any one time. Spawning is at a maximum from March-April although breeding can occur throughout the year. Fertilisation is external & planktotrophic larvae then spend 3 weeks in the water column in the summer or as much as 2 months in the winter. The early maturation & long larval phase suggests that this genus has a strong recoverability potential.

Prionospio

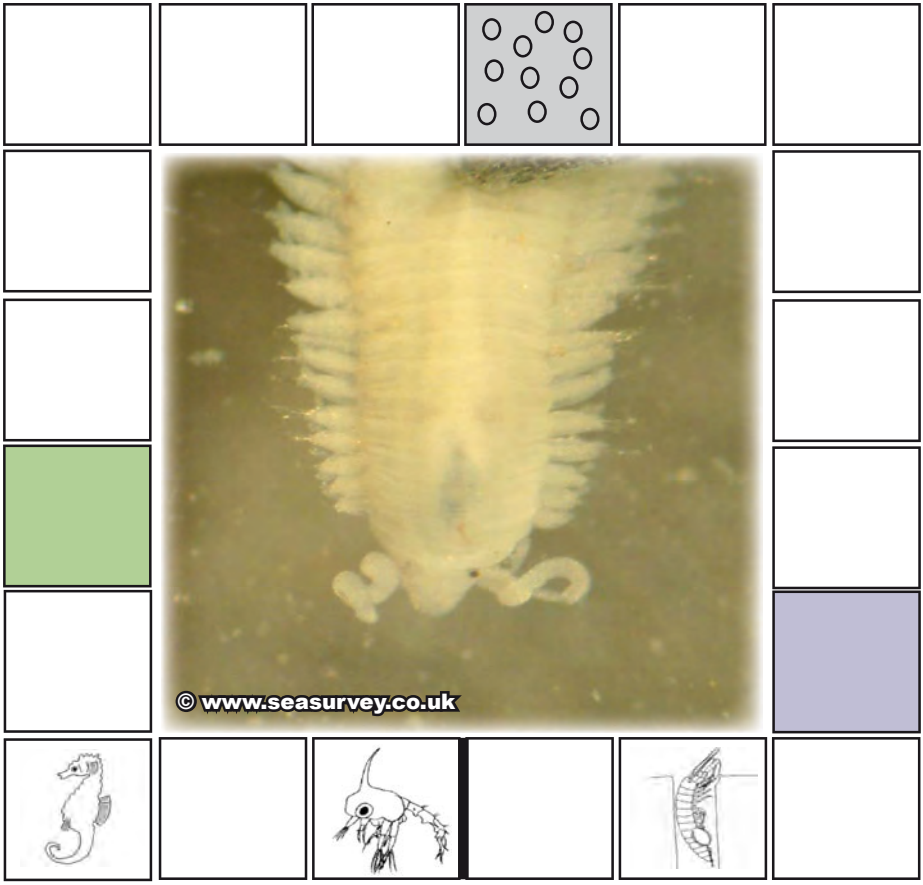


INTERMEDIATE

Vulnerability: *Prionospio* is a small-medium sized polychaete worm belonging to the Family Spionidae. The adult worm reaches a body length of 2-5cm (occasionally up to 9cm) & lives in a thin hyaline tube in sandy & muddy substrates. It is a surface deposit-feeder exploiting detritus & diatoms. It has limited mobility except within the tube & is vulnerable to disturbance by dredging & deposition of material mobilised by the dredging process.

Recoverability: Little is known of the longevity, age at maturity or fecundity of this genus. The sexes are separate & breeding takes place from March-September during which eggs of 0.1-0.18mm are released by the female reproductive (epitoke) stage. The eggs are fertilised externally & develop into planktotrophic larvae that spend about 6 weeks in the plankton. The fecundity is unknown, but is probably high & the long larval phase facilitates dispersal. This genus has an intermediate recoverability.

Protodorvillea

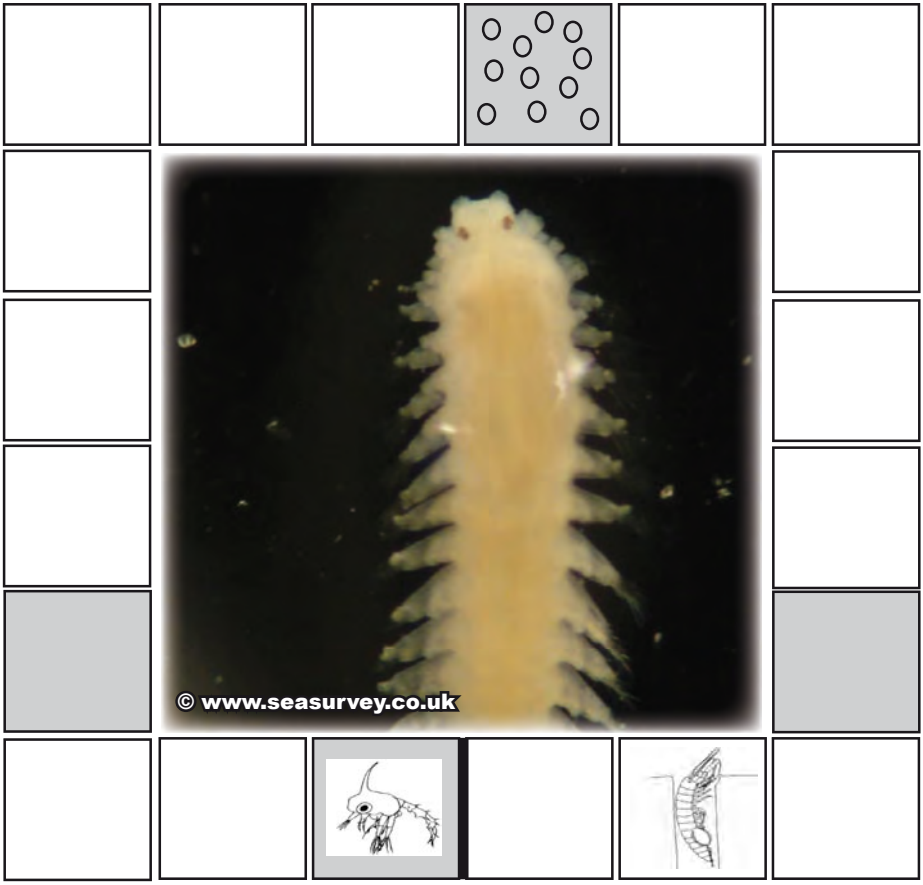


ROBUST

Vulnerability: *Protodorvillea* is a small free-living polychaete worm belonging to the Family Dorvilleidae. It reaches 1-3cm in body length & lives in a soft mucous tube under stones, in empty serpulid tubes & in shallow burrows under the surface of muddy sand. It is a carnivore that feeds on small invertebrates at the sediment surface. It has limited mobility & is likely to be vulnerable to dredging & to deposition of sediment mobilised by the dredging process.

Recoverability: The life-span of this genus is about 1yr & sexual maturity is at about 4-6 months. There is little information on the breeding season or fecundity. After fertilisation, the embryos are brooded before release as planktotrophic larvae & juveniles. The short life-span, relatively rapid growth rate & larval dispersal phase suggests that this genus has a high recoverability.

Psamathe

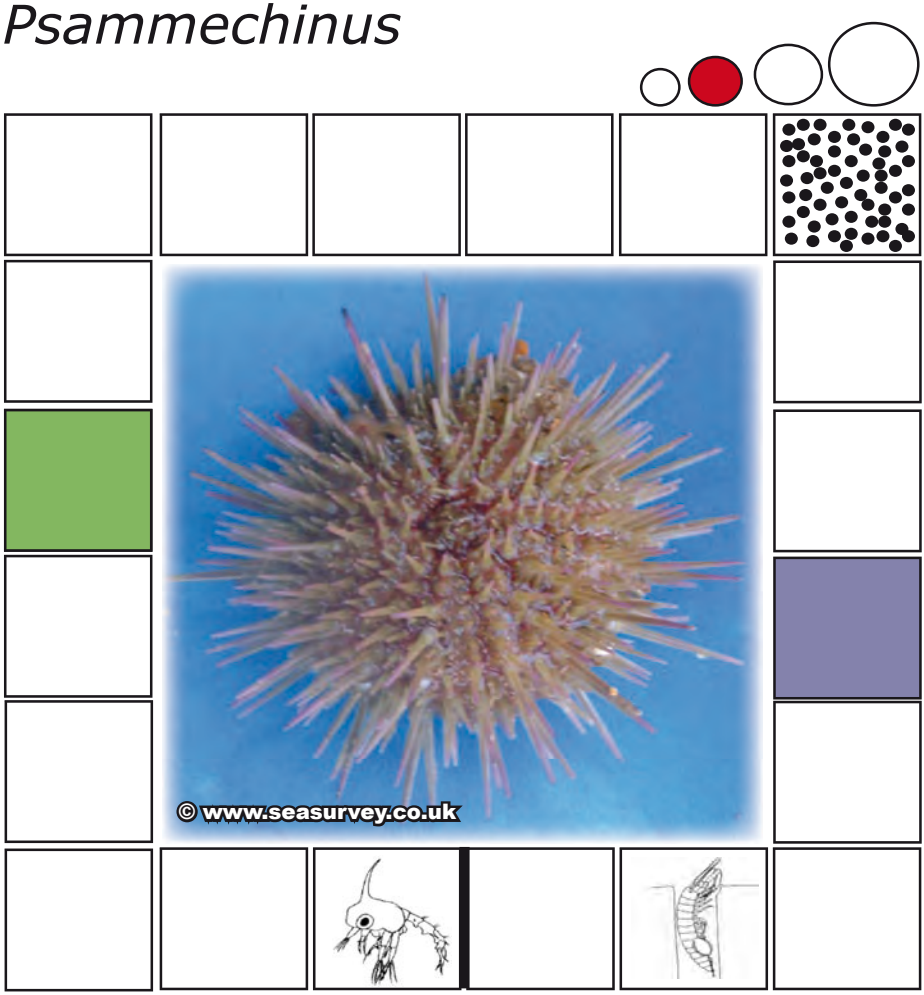


ROBUST

Vulnerability*: Psamathe* (synonym *Kefersteinia*) is a small-medium sized polychaete worm belonging to the Family Hesionidae. It reaches a body length of about 3-8cm & lives in rock crevices, under stones, amongst shells & in the holdfasts of macrophytes. It is vulnerable to dredging & to deposition of sediment mobilised by the dredging process.

Recoverability: There is little information on the longevity or reproductive biology of this genus. Breeding takes place following swarming in the water column between May & June, & eggs of about 0.1mm are fertilised externally in the water column. It is probable that *Psamathe* has a relatively high fecundity & that the larvae are widely dispersed following spawning, but more information is needed before the recoverability can be assessed.

Psammechinus

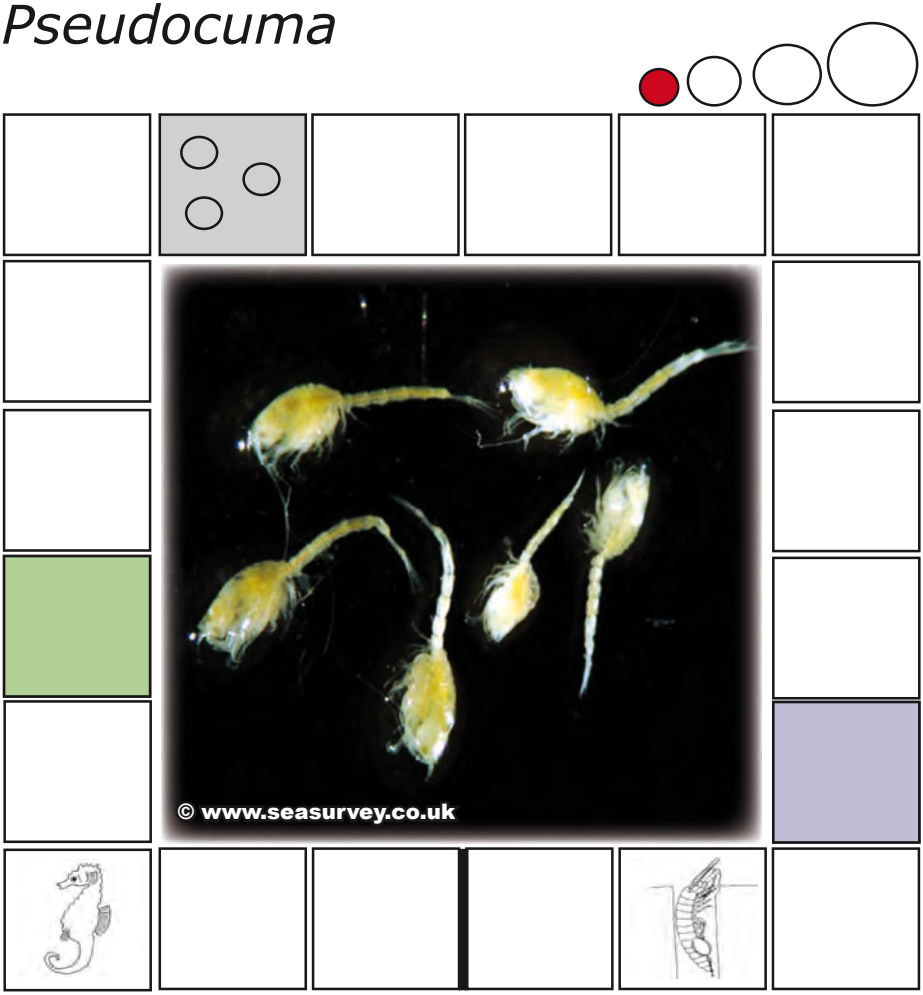


ROBUST

Vulnerability: *Psammechinus* is a small-medium sized sea urchin (Echinoid) belonging to the Family Parechinidae. It reaches a size of 5cm & lives on & under stones, rocks & on macrophytes to which it is attached by tube feet. It feeds on small macrofauna, plant material & detritus. It has limited mobility & is intolerant of mobile sands. It is likely to be vulnerable to dredging & to deposition of material mobilised by the dredging process.

Recoverability: *Psammechinus* has a life-span of as much as 10yrs & reaches maturity at 1yr. The sexes are separate & the females spawn up to 2.5 million eggs from June-August. These are fertilised externally & develop into a planktotrophic echinopluteus larva of 0.5-1.0mm length that spends 2-3 weeks in the plankton before settlement. The high fecundity & larval dispersal phase results in a high potential for recovery by this genus.

Pseudocuma



ROBUST

Vulnerability: *Pseudocuma* is a small free-living cumacean crustacean belonging to the Family Pseudocumatidae. It reaches a body length of 0.3-0.5cm & lives in sand & muddy sand from which it makes forays into the water column & feeds on micro-organisms & detritus. It has some mobility & whilst it is vulnerable to dredging, it is likely to be able to accommodate deposition of material mobilised by the dredging process.

Recoverability: *Pseudocuma* has a life-span of 1yr & matures at 5 months. The sexes are separate & breeding is continuous. The female produces eggs of 0.15mm diameter that are fertilised internally & are then brooded for from 1-3 months. The short life-span, rapid growth rate & continuous breeding suggests that this genus has a high recoverability.

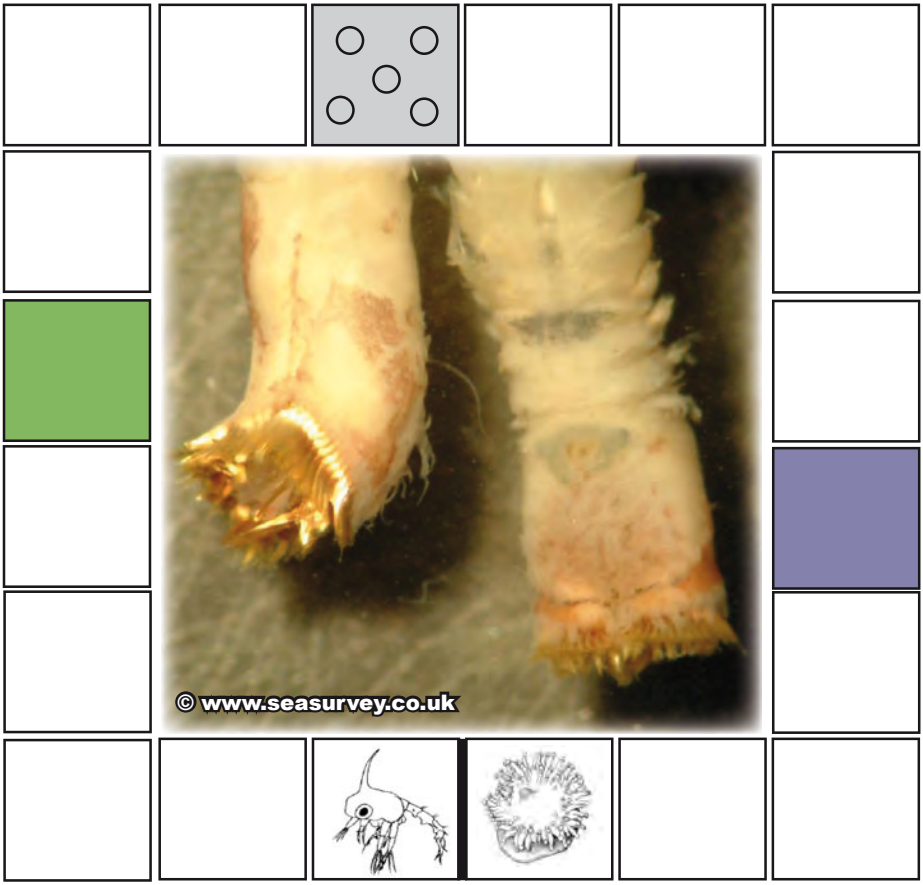
Pseudomystides

ROBUST

Vulnerability: *Pseudomystides* is a small polychaete worm belonging to the Family Phyllodocidae. It reaches a body length of 0.6-1cm & is a free-living genus that burrows in shell & coarse sand/ gravel substrates where it preys on small invertebrates. It has moderate mobility within the surface sediments. Although it is vulnerable to dredging, it probably has a capacity to migrate up through sediment mobilised by the dredging process.

Recoverability: Little is known of the longevity, age at maturity, fecundity or egg size of this genus. It probably has a longevity of 1-2yrs. The sexes are separate & breeding takes place in May when external fertilisation leads to the development of a planktotrophic larva that spends about 8 weeks in the plankton before settling to the seabed from June-August. It is probable that fecundity is relatively high & the long planktonic larval phase gives significant potential for dispersal. This genus has a high capacity for recolonisation & it is likely that restoration of the biomass is achieved rapidly.

Sabellaria

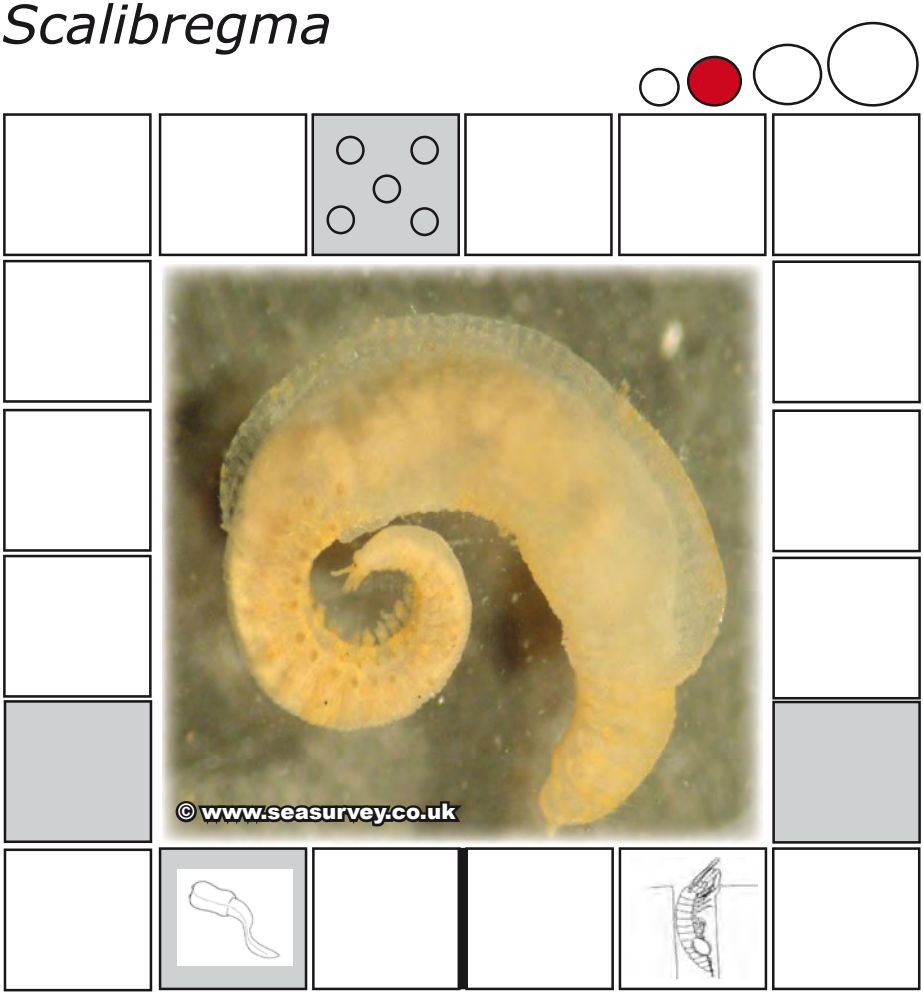


ROBUST

Vulnerability: *Sabellaria* is a small tube-dwelling terebellid polychaete worm belonging to the Family Sabellariidae. It is known as Ross worm & can form dense aggregations that develop into reef-like concretions where there is a suitable substratum. The worms rarely exceed 2-3cm in length & filter particulate matter from the water column. A feature of *Sabellaria* communities is that that they form a complex habitat that provides shelter for a variety of invertebrates which in turn may be of importance as a food resource for fish. The worms are sessile & are vulnerable to dredging. Recent studies suggest that the worm is tolerant of sediment mobilised by dredging & appears to require significant sediment movement for successful tube formation.

Recoverability: The life-span of *Sabellaria* can be as much as 9yrs although it is probably normally 3-5yrs. Reproduction is over a protracted period from January-March. Eggs of about 0.1mm are fertilised externally & develop into a planktotrophic larva that spends from 6-8 weeks in the plankton. Settlement is mainly in March-April. The long breeding period, long larval phase & relatively rapid initial growth in the first year after settlement results in a genus that has high recoverability.

Scalibregma

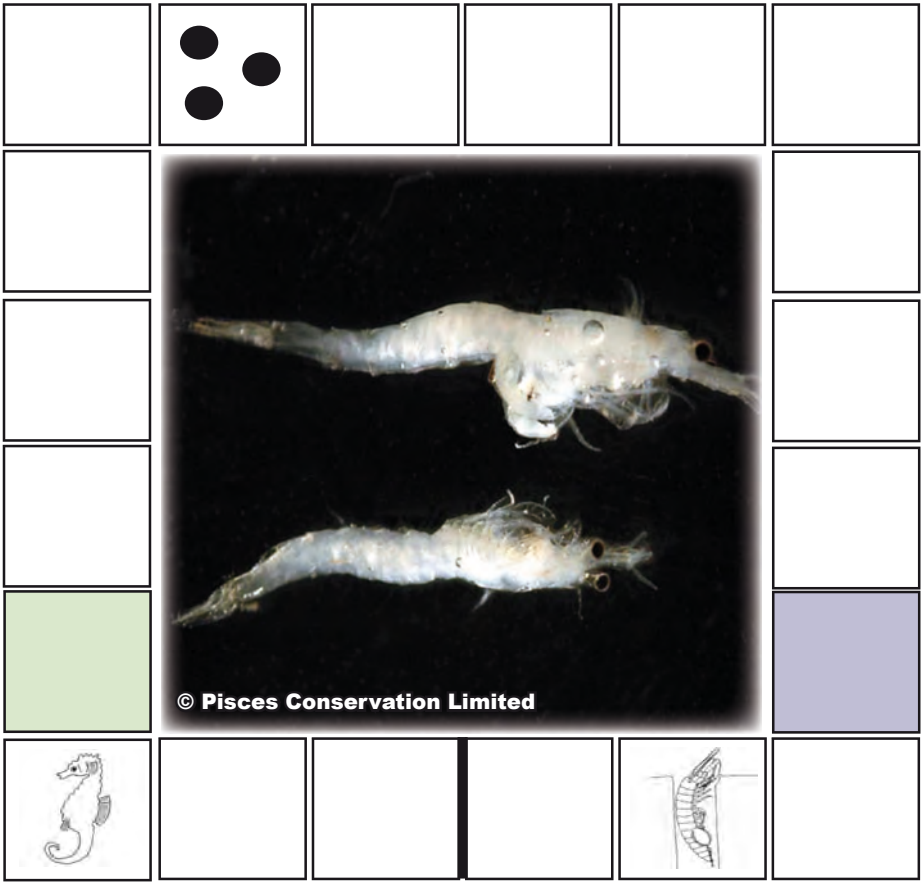


VULNERABLE

Vulnerability: *Scalibregma* is a small-medium sized polychaete worm belonging to the Family Scalibregmatidae (Sludge worms). It reaches about 6cm in length & burrows in sand & muddy gravel where it is s sub-surface deposit feeder exploiting detritus. It has some mobility but is likely to be vulnerable to dredging & to deposition of sediment mobilised by the dredging process.

Recoverability: Little is known of the longevity, egg size or fecundity of this genus. The sexes are separate & there is one spawning between October-December after which the adults die. The reproductive epitoke stage is pelagic for a short time but there is no true larval stage. The genus is likely to have a low dispersal & recoverability.

Schistomysis

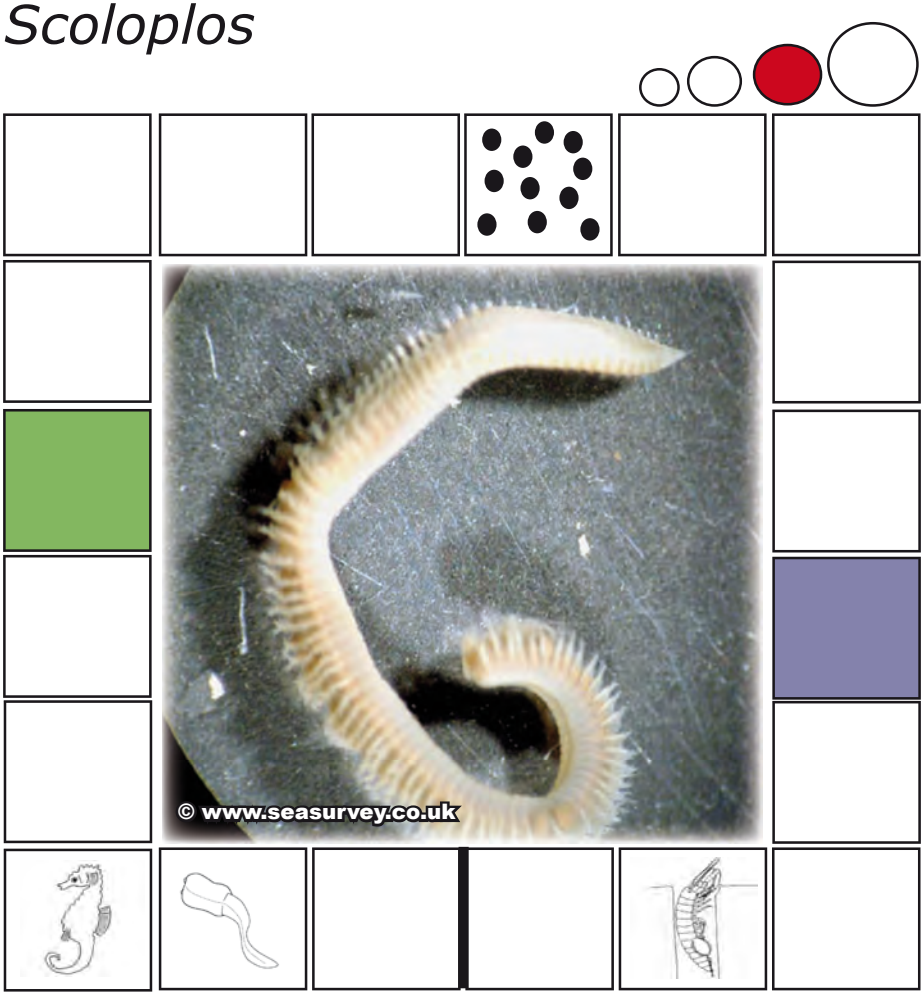


VULNERABLE

Vulnerability: *Schistomysis* is a small crustacean shrimp belonging to the Family Mysidae. The body length rarely exceeds 1.5cm & lives amongst epigrowths extending into shallow water & estuaries where it may be locally common. It is likely to be vulnerable to dredging & although it can swim into the water column it may be susceptible alteration in habitat from the deposition of sediment mobilised by the dredging process.

Recoverability: *Schistomysis* is a short-lived genus with a life-span of <1yr. The sexes are separate & breeding varies with species. *S.spiritus* breeds twice per year in March & July whereas *S.ornata* breeds throughout the year. The fecundity is rather low. The female produces 10-30 eggs of 0.55mm diameter which are fertilised internally & then brooded before release & settlement close to the adult female. This genus has a low fecundity & low dispersal potential of <10m. It has a low recoverability.

Scoloplos

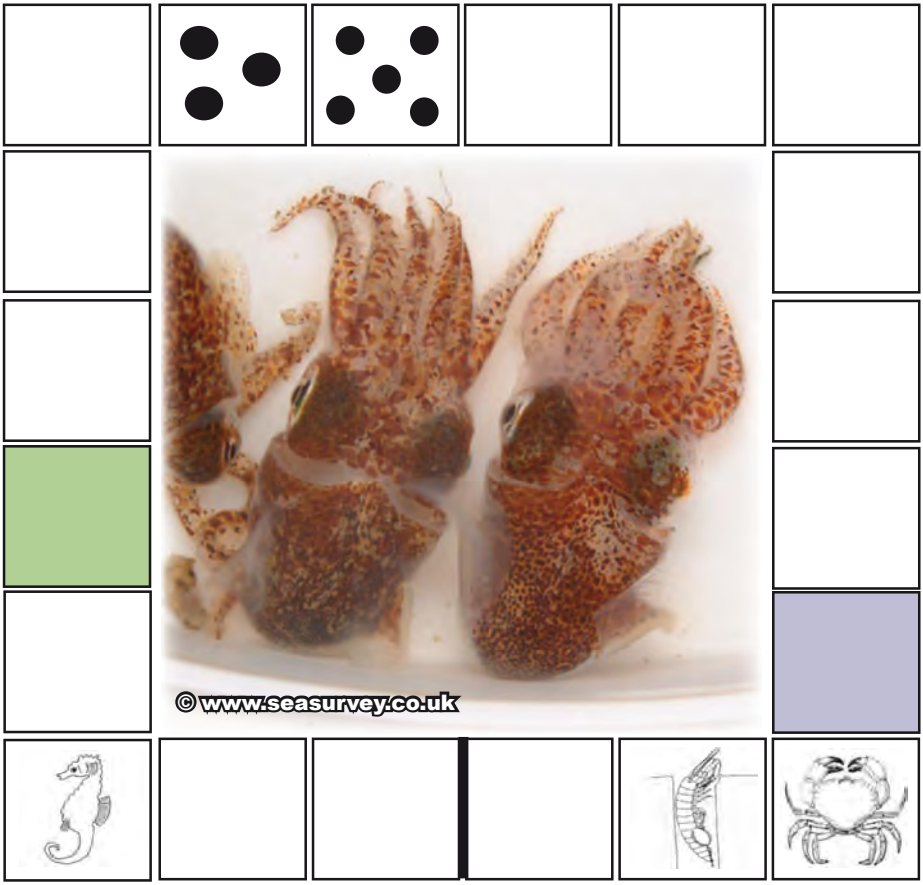


INTERMEDIATE

Vulnerability: *Scoloplos* is a genus of medium-sized free-living polychaete worms belonging to the Family Orbiniidae. It is 5-20cm long & burrows in sand & muddy sand where it feeds on sub-surface detritus. It has some mobility within the deposits but is likely to be vulnerable to dredging & to deposition of sediment mobilised by the dredging process.

Recoverability: The adult worm has a life-span of about 4yrs & reaches maturity at 2yrs. The sexes are separate & as many as 100-5000 eggs of about 0.25mm are fertilised externally between February-April. The eggs are attached to the seabed in a gelatinous mass & emerge after 3 weeks & burrow near the site of release. There may be a very short lecithotrophic pelagic phase in subtidal populations but dispersal is very limited. This genus has a low dispersal potential.

Sepiola

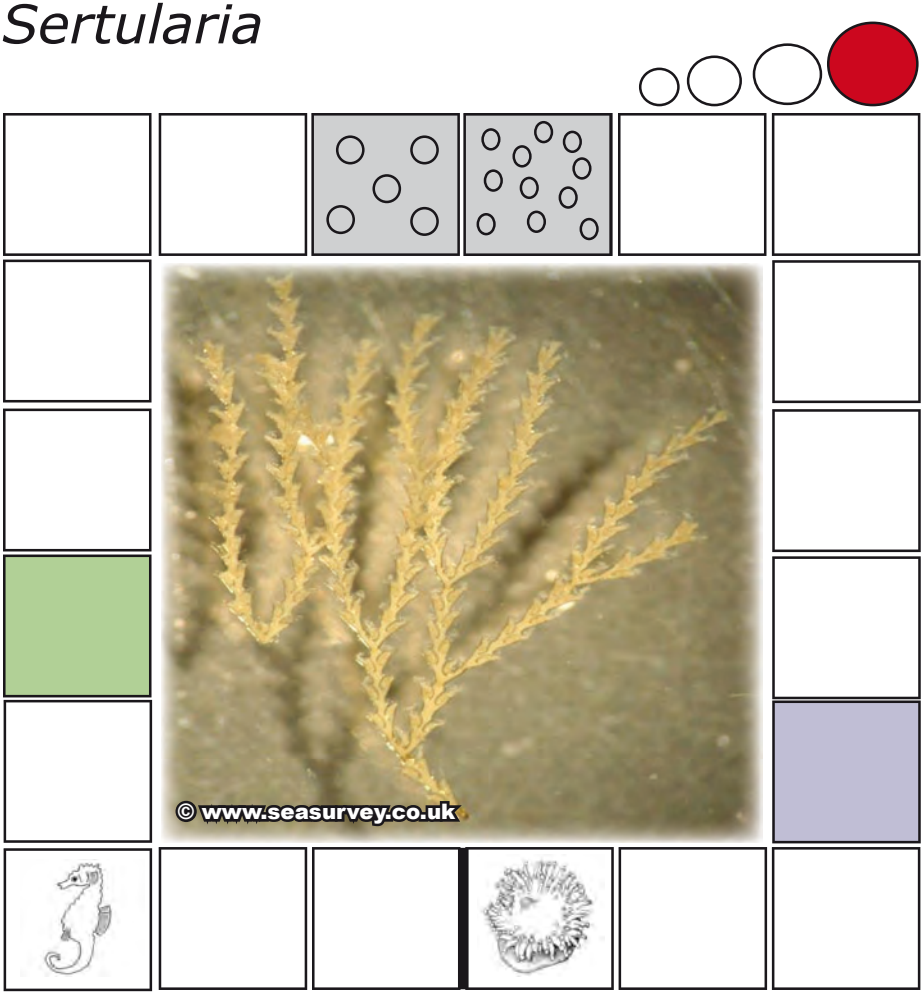


VULNERABLE

Vulnerability: *Sepiola* is a small free-living cephalopod mollusc belonging to the Family Sepiolidae (Bobtail squid or Little cuttlefish). It reaches a body size of generally <2cm & lives amongst epigrowths on the seabed where it preys on small invertebrates. It is able to swim but likely to be vulnerable to dredging & to habitat loss if there is significant deposition of sediment associated with the dredging process.

Recoverability: The life-span is 1-2yrs & sexual maturity is attained in <1yr. The sexes are separate & both breeding season & fecundity varies with species. Some species produce about 60 eggs whilst others produce up to 200 per female in the spawning episodes. The eggs are large, with a diameter of 2.5-5mm, & after internal fertilisation they develop directly into young squid after 5-10 days. The fecundity is relatively low & the dispersal potential is low. This genus has a low recoverability although growth of recolonised individuals is relatively fast.

Sertularia

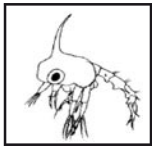


VULNERABLE

Vulnerability: *Sertularia* is a relatively large hydroid belonging to the Family Sertulariidae. The colonies reach 10-60cm in height & are attached to rocky reefs, larger rocks & stones where they feed by capturing zooplankton with special cells (nematocysts). The colonial stage is sessile & is vulnerable to dredging & to deposition of sediment mobilised by the dredging process.

Recoverability: Colonies of *Sertularia* have a life-span of >1yr & mature at about 11 months. The sexes of the polyps are separate & eggs are fertilised externally before being brooded for about 4 weeks. Breeding is throughout the year, but dispersal is probably very limited. This genus has a low recoverability although growth following initial colonisation is relatively fast over the first year.

Spatangus

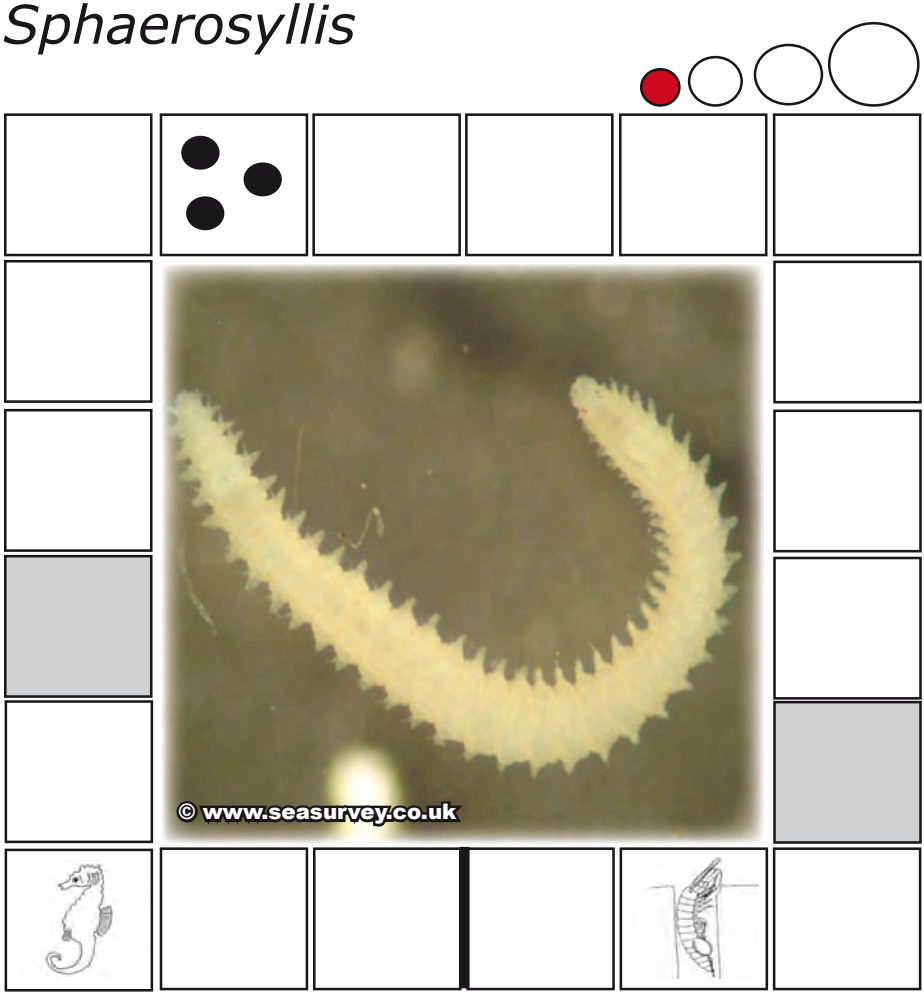


INTERMEDIATE

Vulnerability: *Spatangus* is a medium-sized heart urchin belonging to the Family Spatangidae. It reaches 12cm in length & lives buried in coarse sands & gravel where it feeds on sub-surface detritus. It retains connection with the sediment surface for gas exchange, & is therefore confined to relatively shallow burrows. It has some ability to move within the sediments but is vulnerable to dredging & to deposition of large quantities of sediment, but may be able to resurface through relatively thin layers of deposits.

Recoverability: There is insufficient information to assess life-span, age at maturity or fecundity of this genus. The sexes are separate & fertilisation is external following spawning in May-July. The fertilised eggs develop into planktotrophic echinopluteus larvae of about 6mm length which spend about 3 weeks in the plankton after which the post-larvae settle as juveniles. The dispersion potential is relatively high, & it is likely that fecundity is also high. Despite the lack of information for this genus, it is likely that the recoverability is moderate-high.

Sphaerosyllis

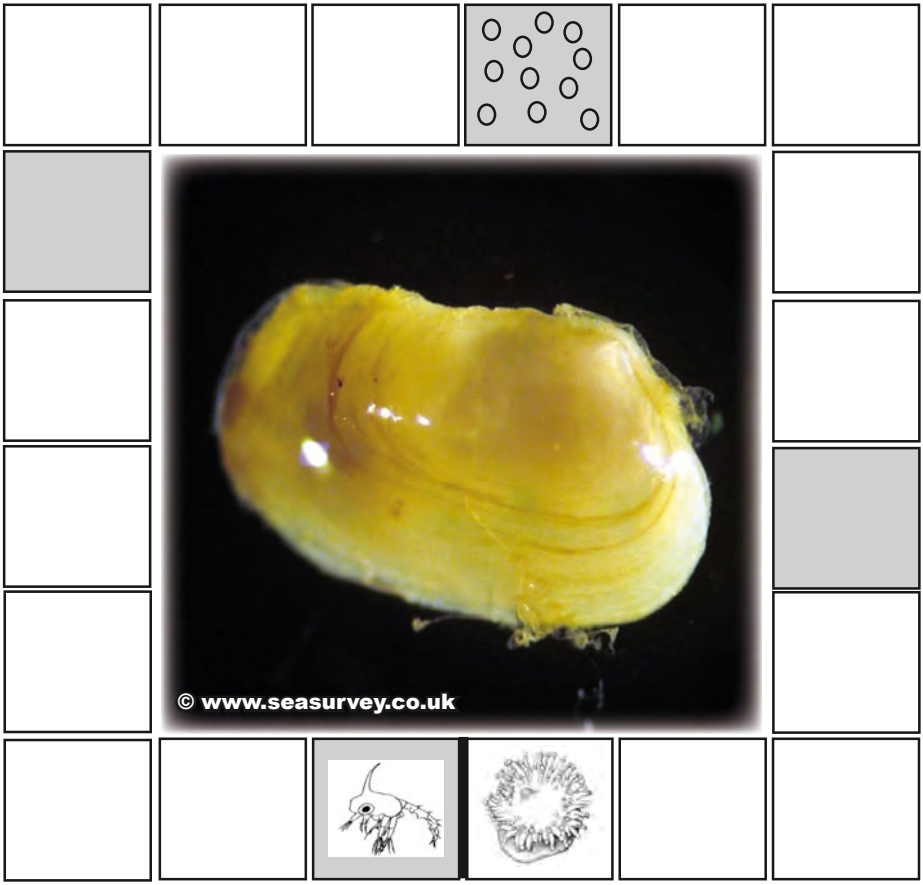


VULNERABLE

Vulnerability: *Sphaerosyllis* is a very small free-living polychaete worm belonging to the Family Syllidae. The body length is only 0.3-0.6cm. The worm lives on epigrowths, amongst shells & gravel where it preys on small invertebrates. It has some mobility but is vulnerable to dredging & to deposition of sediments mobilised by the dredging process.

Recoverability: Little is known of the longevity or age at maturity of this genus, but the life-span is likely to be <2yrs. The sexes are separate & about 40 eggs of about 0.11mm are released in May-June. These are fertilised externally & then brooded by the female for 2-3 weeks. There is no planktonic phase, so this genus is restricted to colonisation of local habitats. The low fecundity & absence of a larval dispersal phase suggests that recoverability is low following disturbance.

Sphenia

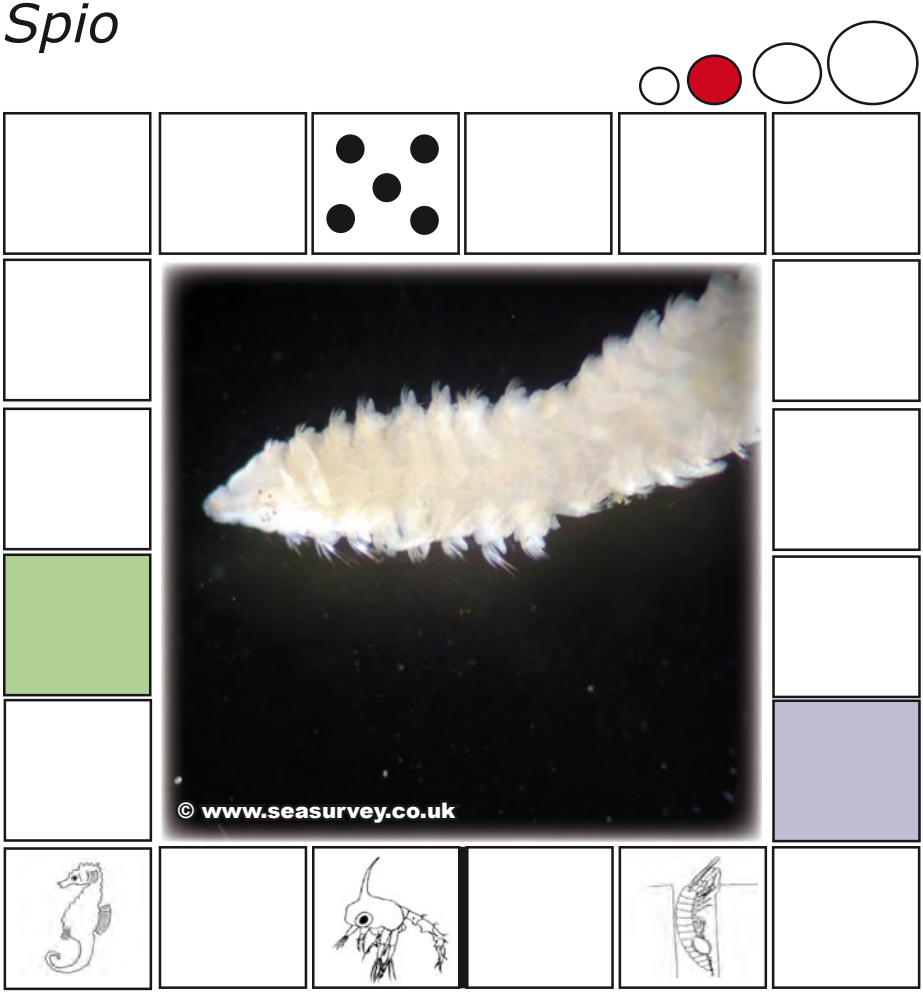


VULNERABLE

Vulnerability: *Sphenia* is a small bivalve belonging to the Family Myidae. It reaches a shell length of 2cm & lives in rock crevices & in the holdfasts of larger algae where it is attached by byssus threads. It is a suspension-feeder exploiting particulate matter including phytoplankton & detritus in the water column. It is sessile & is vulnerable to dredging & to deposition of sediment mobilised by the dredging process.

Recoverability: *Sphenia* is likely to be a slow-growing genus with a life-span of about 12yrs. The sexes are separate but little is known of the fecundity or reproductive biology of this genus. The larvae are probably planktotrophic but there is insufficient information to assess the dispersal potential. Based on the slow growth rate of this genus, the recoverability is assessed as low.

Spio

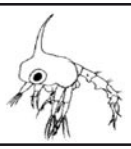


ROBUST

Vulnerability: *Spio* is a small polychaete belonging to the Family Spionidae. It is usually 2-5cm in body length & lives in burrows in sand where it feeds as a surface deposit-feeder on detritus & diatoms. It has some mobility within the sediments, but is likely to be vulnerable to dredging & to the deposition of sediment mobilised by the dredging process.

Recoverability: *Spio* is a short-lived genus with a life-span of about 1yr. Sexual maturity is achieved at 2-3 months. The sexes are separate & approximately 250 eggs of 0.13-0.15mm are fertilised externally during two reproductive periods (April-June & August-September). The embryos are brooded in the tube & then released as lecithotrophic larvae that spend about 4 weeks in the plankton. Settlement is from June-August. The dispersal potential is high & the relatively short generation time & rapid growth rate suggests that restoration of the biomass is achieved soon after settlement. This genus has a high recoverability.

Spiophanes

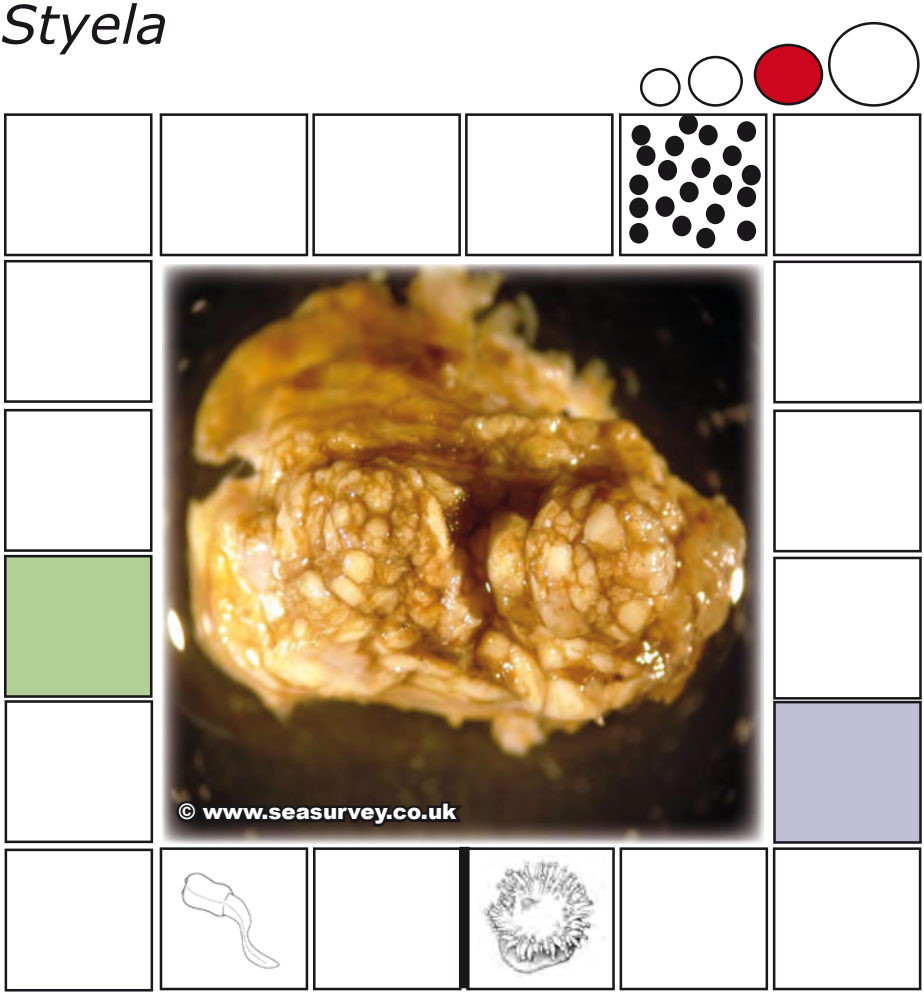


INTERMEDIATE

Vulnerability: *Spiophanes* is a medium-sized polychaete belonging to the Family Spionidae. It reaches a body length of 3-10cm & lives in a rigid sand tube in substrates of muddy sand. It is a surface deposit-feeder exploiting diatoms & detritus from the surface of the sediment. It can move within the confines of the tube but is otherwise of very limited mobility. It is vulnerable to dredging & to the deposition of sediment mobilised by the dredging process.

Recoverability: *Spiophanes* has a life-span of 1yr at which time it reaches sexual maturity. The sexes are separate & there is one reproductive phase which occurs from March-October. About 30-40 eggs of 0.3mm diameter are produced by each female & after external fertilisation these develop into planktotrophic larvae that spend about 6 weeks in the plankton. The fecundity is relatively low, but the dispersal potential is high & the growth rate is fast after settlement of the post-larvae. This genus has an intermediate recoverability.

Styela

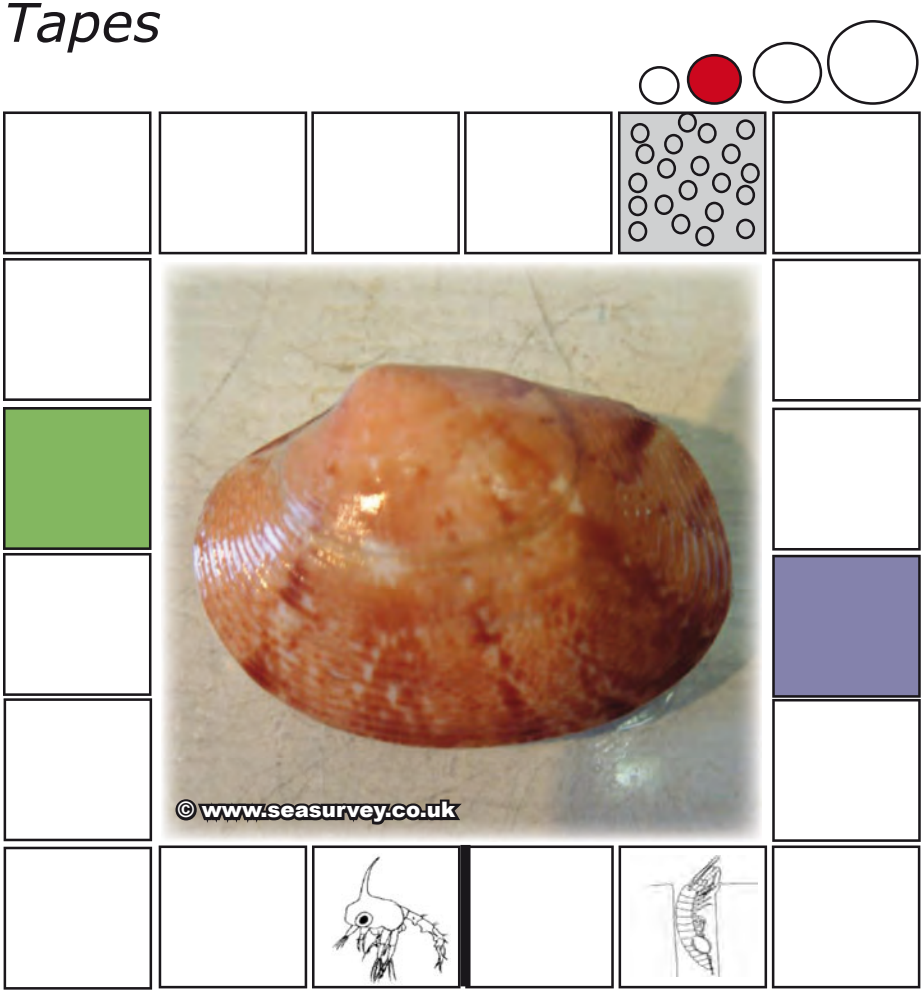


VULNERABLE

Vulnerability: *Styela* is a large ascidian (Sea squirt) belonging to the Family Styelidae. It reaches a height of up to 15cm & is attached to substrata of rocks & boulders on the seabed where it feeds by filtering particulate matter from the water column. It is vulnerable to dredging & to deposition of sediment mobilised by the dredging process.

Recoverability: *Styela* has a life-span of 1-2yrs & reaches reproductive maturity in <1yr. The genus is hermaphrodite & has an annual episodic breeding phase from April to November as which as many as 20,000 eggs of about 0.15mm are released & fertilised externally in the water column. The lecithotrophic larvae stage is very short, lasting <1 day & is followed by settlement close to the site of spawning. Although this genus has a high fecundity, dispersal potential is estimated to be <100m. It is unlikely that the seabed would be colonised rapidly from outside the area following disturbance. The genus has a low recoverability.

Tapes



INTERMEDIATE

Vulnerability: *Tapes* is a genus of medium-sized bivalve molluscs belonging to the Family Veneridae (Carpet shells). The shell length rarely exceeds 10cm & the mollusc lives in shallow burrows in sands & muddy sands where it is a suspension-feeder exploiting particulate matter in the water column. It is vulnerable to dredging but may be able to resurface from moderate amounts of sediment deposited during the dredging process.

Recoverability: *Tapes* has a life span of about 5-8yrs, depending on species, & reaches reproductive maturity at 1yr. The sexes are separate & the female produces eggs of about 0.4mm diameter at an annual breeding season between July-August. There is no information on the fecundity of this genus but the eggs are fertilised externally & the lecithotrophic veliger larvae are released into the plankton for a period of about 1 month in the water column. Settlement is mainly from July-September. This genus probably has a relatively high fecundity & has a lengthy planktonic larval phase. It probably has a high dispersal potential, but restoration of the biomass by growth of the colonising individuals is likely to take several years.

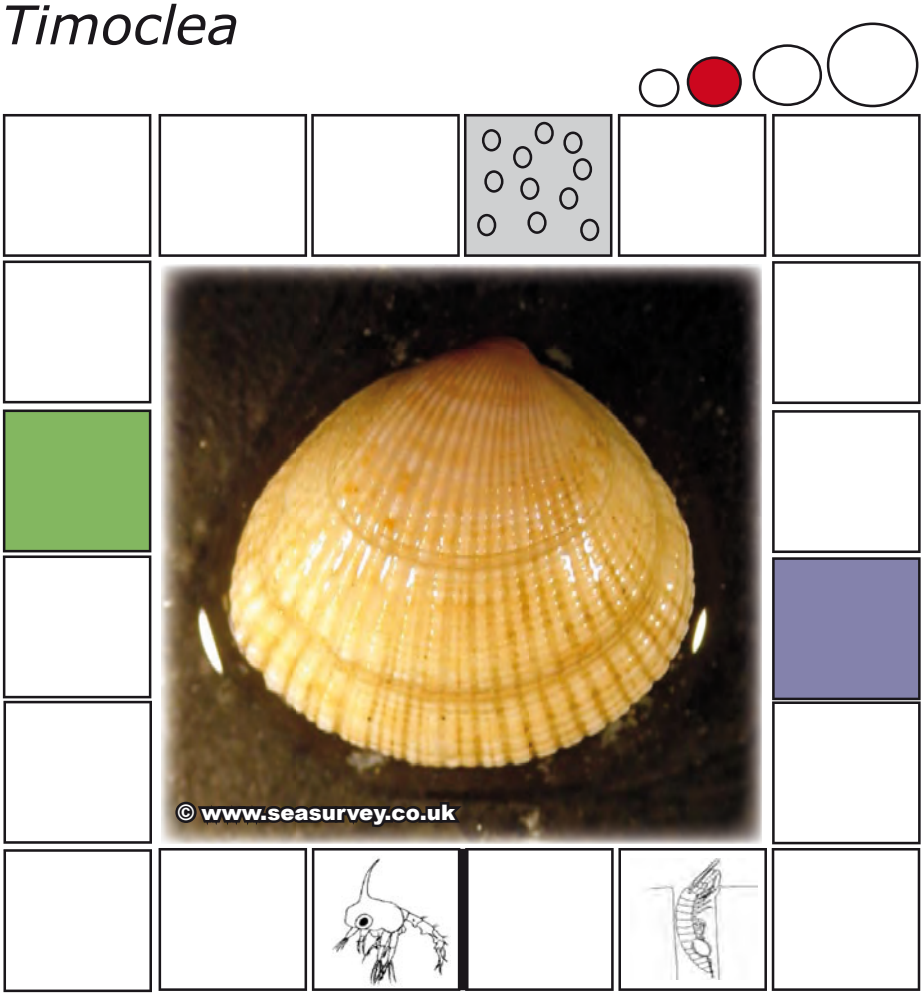
Thracia

VULNERABLE

Vulnerability: *Thracia* is a small-medium sized bivalve mollusc belonging to the Family Thraciidae. The shell length is 3-9cm & the mollusc is a deep-burrowing form that lives in sand, gravel & mud where it lives as a suspension-feeder on phytoplankton & detritus in the water column. It has very limited mobility & is vulnerable to dredging & deposition of sediment mobilised by the dredging process.

Recoverability: *Thracia* is a relatively long-lived bivalve with an estimated life-span of 12yrs. There is little information on the reproductive biology. It is hermaphrodite breeding from June-September. It is not possible to estimate the dispersal potential, but the genus is long-lived & slow-growing & probably has a relatively low recoverability following disturbance.

Timoclea

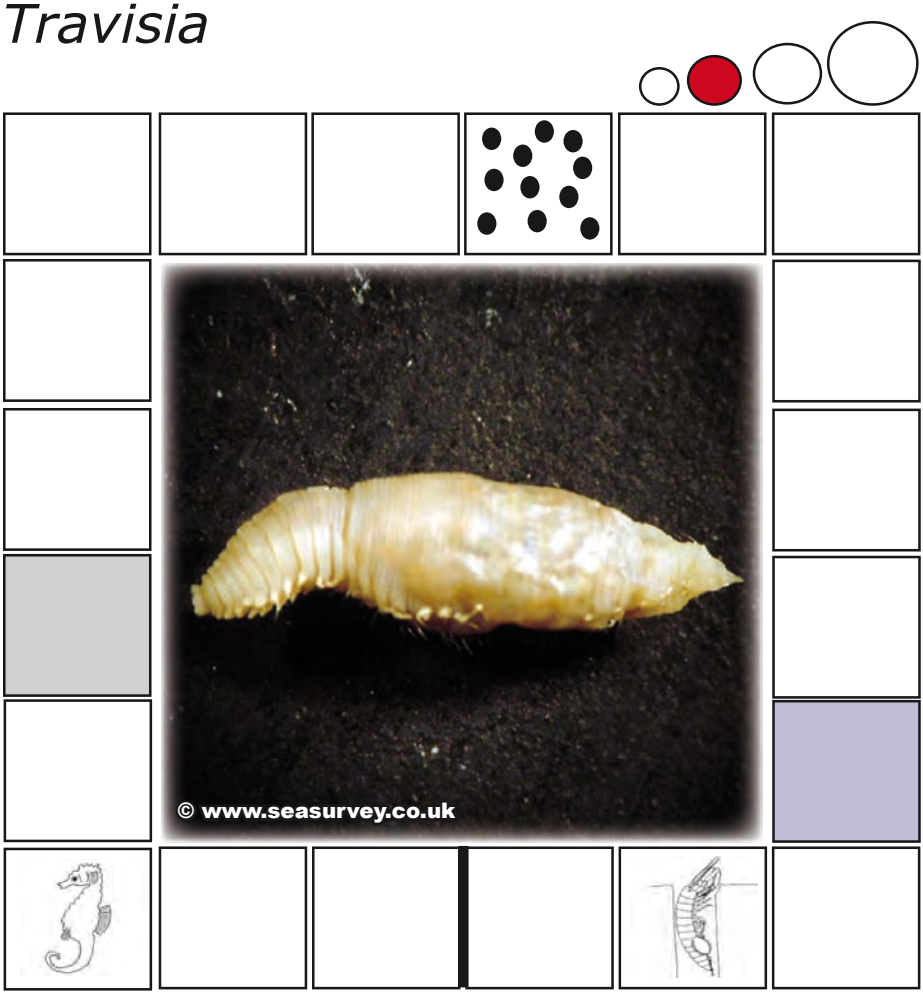


INTERMEDIATE

Vulnerability: *Timoclea* is a small bivalve mollusc belonging to the Family Veneridae. It reaches a shell length of about 2cm & lives in mixed sands & gravels. It is vulnerable to dredging, but may be able to resurface through small amounts of sediment deposited during the dredging process.

Recoverability: *Timoclea* has a life span of about 4-6yrs & reaches reproductive maturity at 1yr. The sexes are separate & there is an annual episodic breeding event between March-September at which eggs of about 0.05mm are released into the water column & fertilised externally. Little is known of the fecundity of this genus but the fertilised eggs develop into lecithotrophic veliger larvae that settle to the seabed after a period of about 30 days in the plankton. This genus probably has a relatively high dispersal potential based on the length of the larval phase. Restoration of the biomass by growth of the colonising individuals is likely to take several years.

Travisia

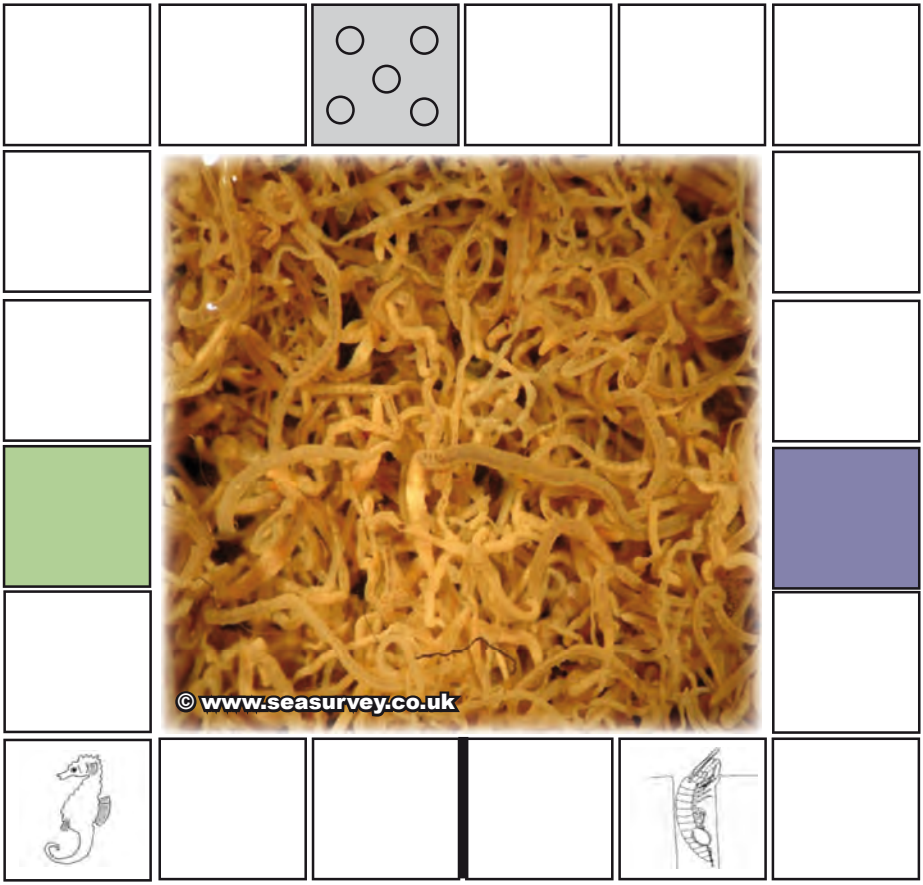


INTERMEDIATE

Vulnerability: *Travisia* is a small-medium sized polychaete worm belonging to the Family Opheliidae. The body length is 2-7cm & the worm burrows in fine sand especially in areas of strong currents. It is a selective deposit-feeder exploiting detritus in the sediments. It has some mobility within the sediments, but is vulnerable to dredging & deposition of sediment mobilised by the dredging process.

Recoverability: There is little information on the longevity of this worm although it reaches sexual maturity at 7-12 months. The sexes are separate & the breeding season is from November-February. The fecundity is high, at least 5000 eggs of 0.28-0.3mm being released by the female. These are fertilised externally & develop directly after about 10 days on the seabed. This genus has a high fecundity but very limited dispersal potential, so it is unlikely that disturbed sites would be recolonised rapidly from distant sites. It is of intermediate recoverability following disturbance.

Tubificoides



VULNERABLE

Vulnerability: *Tubificoides* is a small-medium sized oligochaete worm belonging to the Family Tubificidae. The body length is generally 1-5cm & the worm burrows in muddy & sandy substrata where it is a sub-surface deposit-feeder. It has limited mobility & is vulnerable to dredging & the deposition of sediment mobilised by the dredging process.

Recoverability: The longevity of *Tubificoides* is 2yrs at which point the worm is sexually mature. It is hermaphrodite & reproduces throughout the year. Fertilisation is internal & the larvae are hatched after about 15 days in a cocoon. The worm can form dense communities, but the dispersal potential is very low. This genus has a low recoverability.

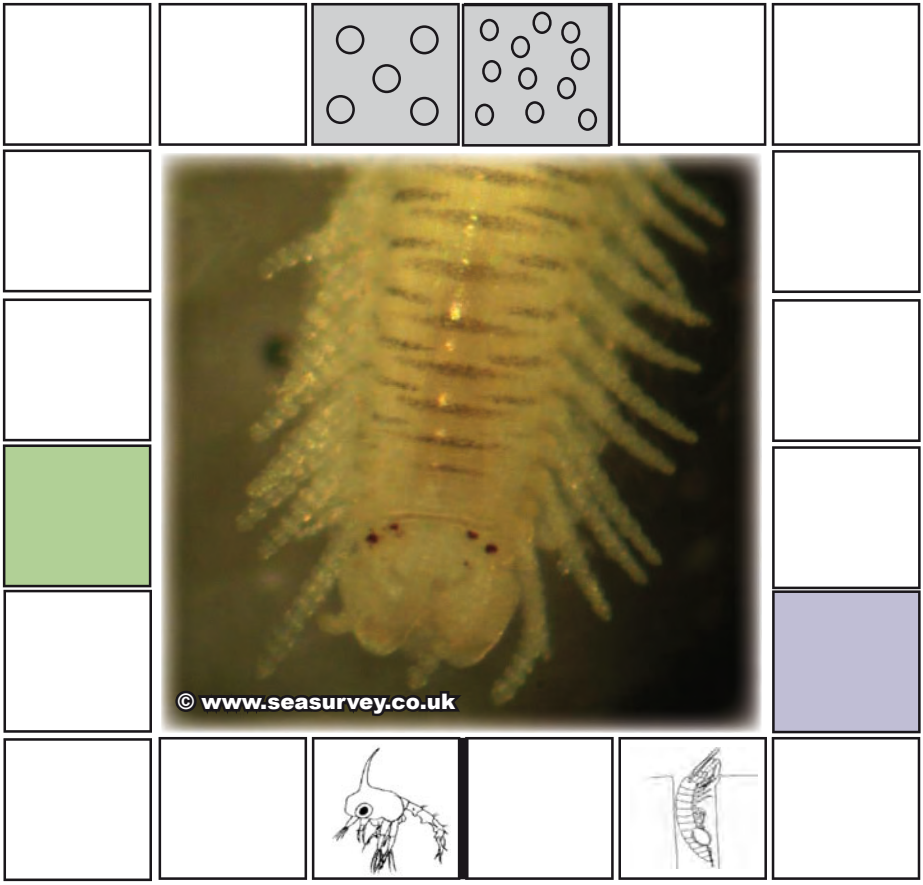
Tubularia

VULNERABLE

Vulnerability: *Tubularia* is an athecate hydroid belonging to the Family Tubulariidae. The stolon tubes grow to a height of 5-20cm & are attached to rocks & stones. As with other hydroids, the polyps feed on zooplankton that is captured by special cells (nematocysts). The colonies are vulnerable to dredging & to the deposition of sediment mobilised by the dredging process.

Recoverability: The life-span of this hydroid is about 1yr & the age at maturity is 6-8 weeks. The sexes are separate & the polyps reproduce throughout the year, with a maximum from April-June. The eggs are fertilised externally & the larvae are brooded; there is no planktonic phase. This genus has a low recoverability.

Typosyllis

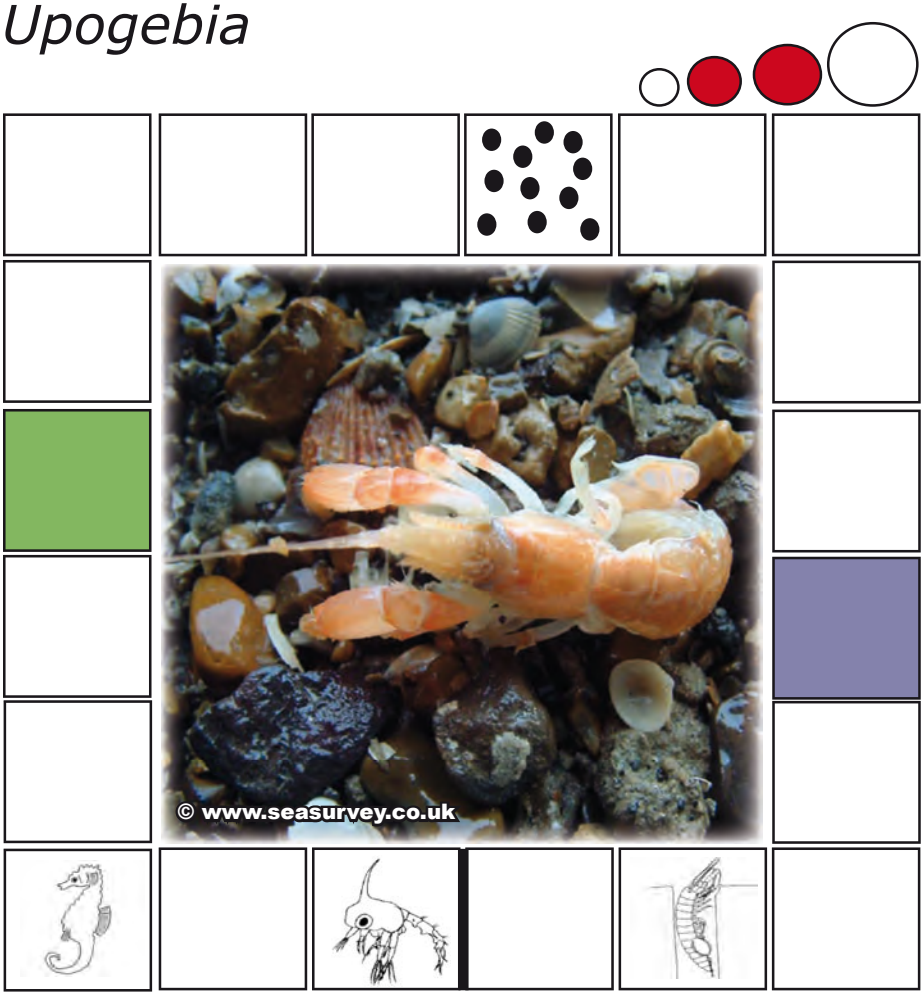


ROBUST

Vulnerability: *Typosyllis* is a small-medium sized free-living polychaete worm belonging to the Family Syllidae. The body length is 1-5cm & the worm lives under stones & amongst epigrowths where it preys on small invertebrates at the sediment-water interface. It has limited mobility & is vulnerable to dredging & deposition of sediment mobilised during the dredging process.

Recoverability: The life-span of *Typosyllis* is about 1yr & sexual maturity is achieved just before the end of the life-span. The sexes are separate & fertilisation is external after the reproductive part of the female moves up into the water column. The fertilised eggs then develop into planktotrophic larvae. The genus has a relatively high dispersal potential, & restoration of the biomass is achieved within 1yr. It may also have the capacity to reproduce asexually. This genus therefore has a high recoverability both in terms of recolonisation & growth.

Upogebia



ROBUST

Vulnerability: *Upogebia* is a medium-sized decapod crustacean belonging to the Family Upogebiidae (Mud Shrimp). The body length is commonly 4-15cm & the animal lives in a permanent deep burrow of up to 65cm in sand & muddy sand. It draws water through the burrow & is a suspension-feeder exploiting diatoms, flagellates & detritus in the inhalant water stream. It has very limited mobility & is vulnerable to dredging & deposition of sediment mobilised by the dredging process.

Recoverability. *Upogebia* has a life-span of about 3yrs & matures at 1yr. Thereafter there are annual breeding seasons from May-September. The sexes are separate & as many as 5000 eggs of about 0.56mm are produced by the females. Fertilisation is probably internal & the eggs are initially brooded for 8 weeks by the female, then released as planktotrophic zoea larvae for about 4 weeks. Settlement is mainly from July-September. This genus has a high fecundity & a lengthy planktonic phase. The dispersal potential is high & the large number of larvae suggests that this genus has a high potential for recovery.

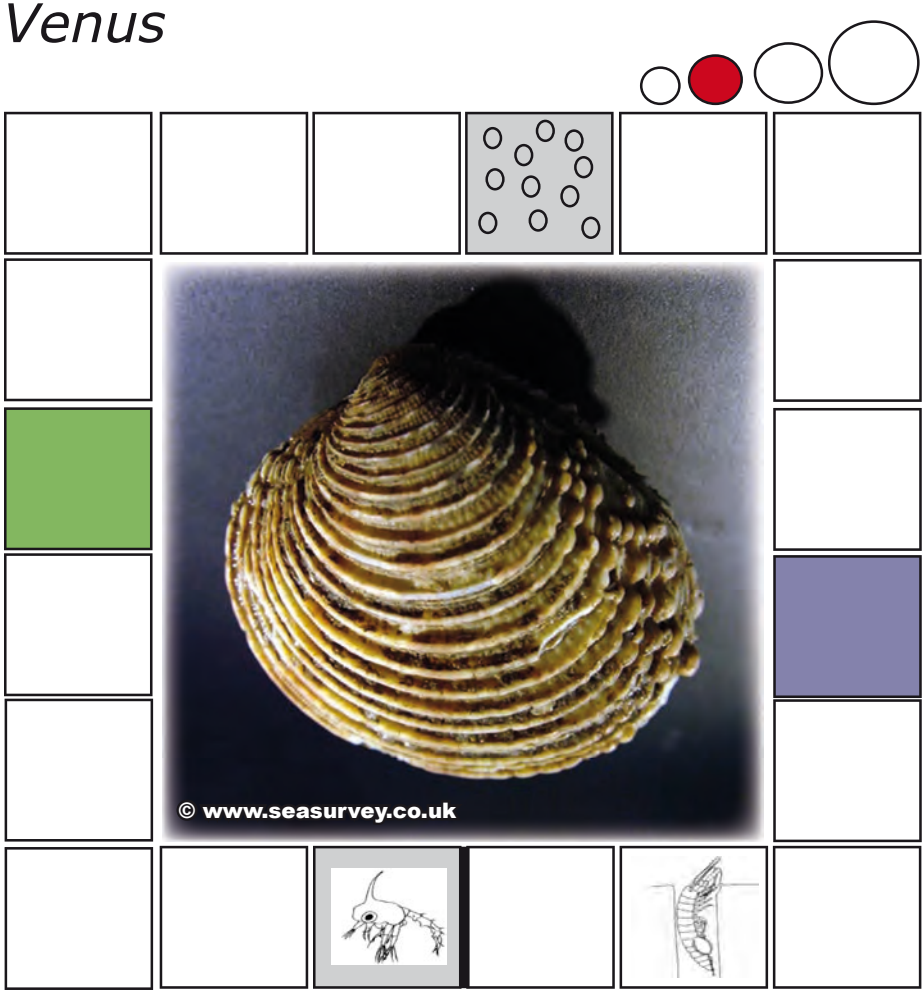
Urothoe

INTERMEDIATE

Vulnerability: *Urothoe* is a very small amphipod crustacean belonging to the Family Urothoidae. The body length is 0.5-0.8cm & the animal lives on the surface & in shallow burrows in muddy sand & gravel deposits. It has moderate mobility & can swim into the water column. It is vulnerable to dredging but is likely to be able to accommodate deposition of sediment mobilised by the dredging process.

Recoverability: The longevity of *Urothoe* is 1yr, & sexual maturity is achieved at 5 months. The sexes are separate & breeding is between April-October. About 15 eggs are formed per brood in a large number of reproductions that occur over a 15-day cycle during the breeding season. Fertilisation is internal. This genus has a relatively high fecundity & subsequent growth rate but a very limited dispersal potential.

Venus

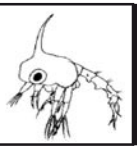


INTERMEDIATE

Vulnerability: *Venus* is a genus of small-medium sized bivalve molluscs belonging to the Family Veneridae (Carpet shells). There are many related genera including *Venerupis* & *Tapes*. It has a shell length of up to 8cm & lives in shallow burrows in sand & gravel. It is vulnerable to dredging but may be able to resurface through relatively small amounts of mobilised sediment deposited during the dredging process.

Recoverability: *Venus* has a life-span of 5-8yrs & reaches reproductive maturity at 1yr. The sexes are separate & reproduction is over a protracted period between July-October. Fertilisation is external in the water column & the fertilised eggs develop into lecithotrophic veliger larvae of about 0.22mm length. Little is known of the fecundity or length of larval phase. It is probable that this genus has a relatively high fecundity & dispersal potential, but more information is needed before the recoverability can be properly assessed.

Verruca



ROBUST

Vulnerability: *Verruca* is a genus of small cirripede crustaceans (Barnacles) belonging to the Family Verrucidae. The barnacle reaches a shell width of about 1cm & is attached to the surface of stones, boulders & shells on the seabed. It feeds by capturing small zooplankton from the water column by means of setose limbs. It is sessile & vulnerable to both dredging & the deposition of sediment mobilised during the dredging process. It is also susceptible to habitat damage if settlement on the surface of stones & boulders is prevented by deposition of sediment.

Recoverability: The life-span for this genus is unknown, but is probably about 3yrs with reproductive maturity occurring in <1yr when the barnacle reaches >2mm. *Verruca* is hermaphrodite with an annual episodic breeding season in February when eggs of about 0.07-0.08mm are fertilised internally by adjacent males. Fecundity is size-related, about 50 eggs being typically produced per adult. These develop into planktotrophic (nauplius) larvae that spend several months in the plankton before settlement in the late summer. The genus has a relatively low fecundity, high dispersal potential & rapid growth to maturity. It has an intermediate-high recoverability.

GLOSSARY OF TERMS

Note that this glossary is more comprehensive than the Marine Macrofauna Genus Trait Handbook might require. It does however cover a number of terms which appear in associated documents.

All-in cargo - a cargo taken aboard a dredger without alteration of the Gravel: sand ratio by screening

Aggregate - the collective term for sand, gravel and crushed rock.

Aggregate extraction - the removal of marine aggregate from the seabed by means of a dredger

Amphipoda - a group of small crustaceans recognised by their laterally compressed bodies

Anchor dredge - a non-quantitative dredge used to sample organisms from the seabed

Annelida - segmented worms

Anthropogenic - under human influence

Ascidians - soft-bodied animals that include sea-squirts. Generally attached to rocks.

Barnacles - small crustaceans encased in a calcareous shell, usually attached to shells and rocks on the seabed

Bathymetry - the topography of the seabed

Beach-feed - material that is placed on beaches to supplement the sand, pebbles and rocks

Beam trawl - a trawl that is held open with a beam – commonly used for collection of fish and shellfish on the surface of the seabed and in the near-surface sediments

Bedform - sand sheets, ribbons and sand waves on the seabed

Benthic ecology - the nature and distribution of organisms on the seabed

Benthic fauna - animals that live on the seabed

Benthos - the community of animals and plants that live on the seabed

Biodiversity - the range of species that comprise a particular community or habitat

Biogenic reefs/concretions - aggregates of species that together form a hard substrate

Biological Traits - characteristics of an organism that control its vulnerability to disturbance and ability to recolonise and grow

Biomass - the mass (weight) of organisms in a community

Biotope - a distinctive community of interdependent organisms that characterise a particular habitat type

Bipinnaria larva - the early planktonic larval stage of a starfish

Bivalve mollusc - a mollusc with two hinged valves (shells)

Brachiolaria larva - the late planktonic larval stage of a starfish

Branchial basket - the gas-exchange and filtration feeding system of tunicates (sea-squirts)

Brood - larval development of offspring takes place within a brood pouch

Bryozoa - mainly colonial animals that can form encrusting growths or leaf-like colonies attached to rocks and stones on the seabed

Byssus drifting - a mechanism whereby certain juvenile bivalve molluscs migrate by means of sequential attachment and detachment of byssus threads

Byssus threads - threads secreted from the foot of bivalve molluscs to attach themselves to substrata

Characterising genera - organisms that together account for the similarity of samples from a particular community

Cobbles - large stones-boulders (cf Folk classification)

Cohort analysis - analysis of the size-frequency of individuals in a population to estimate growth rate, age and recruitment

Colonial animal - organisms produced asexually which remain associated with each other to form a colony.

Colonisation - the establishment of marine communities by organisms

Community composition - the relative species variety, population density and biomass

Consent process - the regulatory process by which consent for a dredging licence is obtained

Conservation status - an assessment of the significance of an area for wildlife resources and habitats protected under conservation law

Crustacea - shellfish such as crabs, lobsters and prawns

Cyphonautes - the larva of an ectoproct bryozoan

Cypris larva - a late-stage larva of a barnacle

Dependent species - species that depend on the presence of other species for their occurrence in a particular habitat

Deposit feeders - organisms that feed on fragmented particulate organic matter deposited on the seabed or within the deposits–detritivores

Detritus - fragmented organic matter, derived from the decomposition of plant & animal remains

Designated habitats - habitats protected under Directive 92/43/EEC The Habitats Directive

Designated species - species protected under Directive 92/43/EEC The Habitats Directive

Diatoms - simple plant cells that can occur in chains. They form the main component of the phytoplankton and also occur on the surface of the seabed and in shallow sediments

Dispersal potential - the degree to which the animal can be dispersed in the larval stage

Dominance - a method of expressing the relative contribution of different species to the population density of a community

Draghead - the part of the dredge pipe that is in contact with the seabed and houses the centifugal pump

Dredge - the action of removing material from the seabed

Dredge 'zoning' - management of marine aggregate dredging such that dredging is confined to small zones within the licence area.

Dredging footprint - the area of seabed that is affected by dredging

Dredging intensity - the frequency that a particular area of seabed is dredged

Duration of Impact - the time over which an impact occurs - used as a component of risk assessment for environmental resources

Echinodermata - organisms such as starfish, sea urchins and sea cucumbers

Echinopluteus - the planktonic larva of a sea urchin (Echinoid)

Ecosystem - a community of organisms & their physical environment acting as an ecological unit

Endo-parasite - an organism that lives as a parasite inside the body of another (the host)

Entrainment - the process by which relatively slow-moving and sedentary organisms are drawn in by a suction pump

Environmental Impact Assessment (EIA) - An assessment of the environmental resources, their sensitivity to disturbance and proposals to minimise disturbance as required under the EU Environmental Impact Directive.

Epibenthic - animals or plants that live on the surface of the seabed

Epibiotic or epizoic - living attached to the surface of another organism, without any detriment or benefit to the host

Epigrowths - growth of animals and plants on the surface or rocks shells and stones
Epifauna - animals that live on the surface of the seabed
Epilithic - growing on the surface of rock
Epipsammic - attached to sand particles
Epitoke - the reproductive part of the body of polychaetes that contains the gametes and which swarm into the water column at a single episodic event at the end of the life of the adult
Equilibrium communities - communities with a slow rate of growth and reproduction ('***k***-strategists') that are often controlled by complex biological interactions
External fertilisation - gametes from both genders are released freely into the water column where fertilisation takes place

Fauna - animals - both invertebrates and vertebrates
Fecundity - the potential number of gametes (reproductive units) produced
Filter-feeders - organisms that feed by filtering suspended particulate matter from the water column
Fines - small particles such as sand and silt discharged or mobilised by the dredging and sorting processes
Fisheries resources - all aspects of the nature and abundance of exploitable fish and shellfish
Flatfish - demersal fish such as plaice, sole and flounder
Folk system - a system of classification of sediments based on particle size composition (Folk, 1954). See Figure 1.
Food web - a term used to describe the food relationships between members of a community

Gametes - reproductive units (male or female)
Genus - the taxonomic discrimination comprising the first half of the scientific name of an organism
Genera - plural of genus
Gonad - reproductive organ – source of gametes
Gonochoristic - having separate sexes (cf. hermaphroditic)
Granulometry - the particle size composition of deposits
Gravel - coarse material of a size between coarse sand and pebbles (cf Folk classification)
Growth ring - a method of estimating the age of an organism based on annual variations in growth. Used mainly on mollusc shells

Habitat - the summed physical and biological features of an area that distinguish it
Hamon grab - a type of grab used for sampling seabed deposits
Hermaphroditic - the animal can produce both male & female gametes either at the same time or sequentially
Hydroids - small plant-like colonies of polyps that live attached to stones and shells on the seabed
Hydrographic - pertaining to the movement of water

Infauna - animals that live within the deposits on the seabed
In situ material - material in an undisturbed condition on the seabed
Intermediate genus - a genus which may recover to an adult population within an intermediate period of time
Intertidal mudflats - areas of seabed that are alternately covered and uncovered by the tide and which comprise mainly muds
Intolerance - a measure of the ability of an organism to tolerate environmental stress
Invertebrates - animals without backbones - worms, molluscs etc.

JNCC -The Joint Nature Conservation Committee is the UK Government's wildlife adviser, undertaking national and international conservation work on behalf of the three country nature conservation agencies English Nature, Scottish Natural Heritage and the Countryside Council for Wales. www.jncc.gov.uk

Juveniles - the young post-larval stages of animals

Key faunal species - animal components considered of importance in defining the community

Larvae - stages that hatch from eggs

Larval mode - the type of larva – whether short-lived, lecithotrophic, or planktotrophic

Lecithotrophic larvae - larvae that are provided with yolk and use this as an energy resource rather than feeding on external sources

Licence Area - the area of seabed within which a licence for aggregate dredging has been granted

Life history - the life stages through which an animal or plant progresses from "birth" to death

Life-span - the period from "birth" to death

Macrofauna - larger animals generally defined as those retained on a 1mm mesh sieve

Marine Aggregates - sand and gravel deposits on the seabed

Marine Protected Areas - areas designated under the 1998 OSPAR Annex V on the Protection & Conservation of the Ecosystems & Biodiversity of the Maritime Area

Medusa - the 'jellyfish' stage in the life-cycle of hydroids

Megalopa - a late larval planktonic stage of a crab

Mitigation - measures to reduce or eliminate impacts

Mollusca - a large group of animals including snails, bivalves and squid

Muddy sands - sands that contain a proportion of mud

Multivariate Analysis - a statistical procedure that compares similarities and differences between communities using many different features including the type and number of organisms

Natura 2000 - a European network of SACs, SPAs and other protected sites

Nauplius larva - an early stage larva of crustaceans such as barnacles

Neap tide - the minimum amplitude of the tide (each 14 days between the full and new moon)

Nursery ground - and area of importance for juvenile animals including invertebrates and fish

Obligate cross-fertilising hermaphrodite – animals that can produce both male & female gametes but require external cross-fertilisation in order to reproduce

Octocoral - a 'soft coral'. These typically grow attached to wrecks, cobbles & other hard surfaces

Ophiopluteus larva - the larva of a brittle-star

Opportunistic species - small fast-growing organisms with a high rate of growth and reproduction ('***r***-strategists') that rapidly recolonise deposits

Overburden - deposits (often sand) deposited on top of local sediments

Pelagic - organisms that live in the water column

Plankton - animals and plants that drift in the water column
Planktonic phase - the time that an organism (larva) spends in the plankton
Planktotrophic - an organism that feeds on planktonic material in the water column.
Planula - a simple larval form found in some invertebrate groups such as hydroids
Plume - the visible material settling to the seabed following discharge from a dredger
Plume morphology - the shape and configuration of dispersing sediment plumes associated with dredging
Polychaete - a group of marine worms with numerous bristle-like chaetae
Population density - the numbers of organisms in a community
Predation - use of food species (prey) by predators
Predation pressure - the extent to which food resources are depleted by animals that prey on them
Primary production - fixing the energy of sunlight into carbon by plants
Productivity - the yield per unit area. In the case of Fisheries this is often expressed as the value per km² per year
Pycnogonida - sea-spiders

Quantitative - factors that can be measured in a precise way. This contrasts with qualitative, which is a more subjective assessment quantity or quality

Recolonisation - the re-establishment of marine communities by organisms
Recoverability - an assessment of the ability of a community to recover following disturbance
'Recovery' - the processes of recolonisation and growth that lead to the re-establishment of a community following disturbance
Recruitment - the successful colonisation and survival of an organism
Reef assemblage - a group of organisms that are interdependent and which are either attached to a rocky substrate or form one by accretion.
Regulators - statutory agencies involved in the regulation and consent for aggregate dredging
Rehabilitation - the recovery and restoration of seabed sediments, topography and biological communities
Risk assessment - a process of assigning 'risk' of impacts on resources
Robust genus - a genus that is resilient and may recover within a short period
Rough ground - areas of seabed where there are boulders or biogenic reefs
Ross worm - common name of Sabellaria spinulosa, a species that forms biogenic reefs by accretion that in turn support a range of dependent species

Sabellid worms - marine worms that live in a tube and filter water through a crown of tentacles
Sand waves - seabed 'sand dunes' that may be static or move under the influence of waves and tides
Screening - adjustment of gravel content with mesh screens
Sedentary - organisms that live on or within deposits on the seabed and are unable to move
Sensitivity - a measure of response of organisms and habitats to impacts based on the relative robustness and recoverability.
Serpulid worms - a group of polychaete worms that live in a calcareous tube attached to stones and shells
Sexual maturity - the age at which an animal is capable of reproduction
Shellfish - a general term that includes molluscs (whelks, scallops, mussels, cockles etc) and crustaceans (crab, lobster, shrimps)
Side scan sonar - a remote-sensing method of identifying seabed features
Spatial variability - variations in space

Spawning habitat	- areas or communities selected for release of eggs
SACs	- Special Areas of Conservation (Habitats Directive)
SPAs	- Special Protection Areas (Habitats Directive)
Species inventory	- the total species complement of a particular sample or deposit type
Spring tide	- the maximum amplitude of the tide (each 14 days corresponding with the new and full moon)
Stolons	- asexual budding individuals of some polychaete worms. Also a term for the tubes that connect hydroid colonies
Substrate	- the type of material on the seabed
Suction-trailer dredger	- a method of dredging where material is taken from the seabed by a centrifugal pump whilst the vessel is underway
Tadpole larva	- the larval stage of an Ascidian (sea-squirt)
Taxon/taxa	- a distinct category of organism such as species, genus or family
Temporal variability	- variations with time
Traits	- features of the biology of an organism such as size, age, and reproductive biology
Traits Diagram	- the diagrammatic format used in this report to summarise traits that are relevant to vulnerability and recoverability of marine organisms
Trawl	- a method of fishing using a towed net (trawl)
Trawlers	- vessels engaged mainly in fishing by trawl (beam or otter trawl)
Trochophore larva	- a free-swimming larval form found in some polychaete worms
Trophic level	- a step in the food web from one level to another
Trophic models	- estimates of the flow of material (or energy) from one level in the food web to another
Veliger larva	- a larval form typical of molluscs with lobed ciliated extensions of the body and a small shell
Vertebrates	- animals with backbones - fish, birds and mammals
Vulnerable genus	- a genus which is sensitive to disturbance and which may take a long time for recolonisation and growth
Vulnerability	- the degree to which animals are vulnerable to physical disturbance
Winnowing	- removal of fine material from coarse ones by winds or currents
Zoea larva	- a planktonic larval stage of crustaceans (prawns and crabs)
Zooids	- the component polyps that comprise colonial organisms such as bryozoans, hydroids and colonial ascidians
Zygote	- the early stage of development after fertilisation of an egg

ABBREVIATED REFERENCES

A full reference list is included in the interactive electronic version of this report. Where there is insufficient information to include a separate page for a particular genus, we have included the relevant references both in the abbreviated reference list and in the full reference list.

A

Abietinaria
(Foster-Smith, 2000, Hayward & Ryland, 1990, Hayward & Ryland, 1995)

Abra
(Dame, 1996, Dauvin et al., 1986, Eagle, 1975, Gibbs, 1984, Jensen, 1988, Le Mao, 1986, Nott, 1980, Rainer, 1985, Rees et al., 1976, Rees & Walker, 1983, Rees & Dare, 1993, Rees et al., 1992, Stephen, 1932, Warwick & George, 1980, Webb, 1986)

Aequipecten
(Allison, 1993, Brand et al., 1980, Fish & Fish, 1996, Foster-Smith, 2000, Heilmayer et al., 2004, Kamenos et al., 2004a, Kamenos et al., 2004b, Kamenos et al., 2004c, Lawrence, 1993, Lehane & Davenport, 2002, Nance, 2001, Tebble, 1976, Zhang, 1996)

Alcyonidium
(Hayward, 1985)

Alcyonium
(Allmon & Sebens, 1998, Ceccatty et al., 1963, Hartnoll, 1975, Hartnoll, 1977, Hartnoll, 1998, Hayward & Ryland, 1990b, Hayward & Ryland, 1995, Hickson, 1901, Hickson, 1892, Hickson, 1895, Mackie, 1987, Manuel, 1981, Manuel, 1988, Matthews, 1916, McFadden et al., 2000, Robins, 1968, Roushdy & Hansen, 1961, Stock, 1988)

Amaena
(Fauchald, 1983, McHugh, 1993)

Ampelisca
(Dauvin, 1988a, Dauvin, 1988b, Dauvin, 1988c, Dauvin & Zouhiri, 1996, Hastings, 1981b, Hastings, 1981c, King et al., 2004, Myers & McGrath, 1991, Myers & McGrath, 1994, Rachor & Gerlach, 1978, Sheader, 1977, Sheader, 1988)

Ampharete
(Fauchald & Jumars, 1979, Le Mao, 1986, MBA, 1957, Price & Warwick, 1980, Rouse & Pleijel, 2001, Spencer et al., 1996, Thorson, 1946)

Amphipholis
(Emson et al., 1989, Emson & Whitfield, 1989, Fish & Fish, 1996, Foster-Smith, 2000, Hayward & Ryland, 1990b, Hayward & Ryland, 1995, Picton, 1993, Thorson, 1946)

Amphiura
(Bowmer, 1982, Buchanan, 1964, Duineveld et al., 1987, Fenaux, 1970, Fish & Fish, 1996, Gerdes, 1977, Glemarec, 1979, Josefson & Jensen, 1991, Munday, 1993, Munday & Keegan, 1992, Muus, 1981, Newell & Newell, 2006, O'Connor et al., 1983, O'Connor & McGrath, 1980, Ockelmann & Muus, 1978, Pedrotti, 1993, Skold et al., 2001)

Anoplodactylus
(Lebour, 1916)

Aonides
(Fauchald & Jumars, 1979, MBA, 1957, Rouse & Pleijel, 2001)

Aphelochaeta
(Beukema, 1995, Christie, 1984, Farke, 1979, Flach, 1996, Gibbs, 1969, Gibbs, 1971, Gibbs et al., 1983, Hayward & Ryland, 1995)

Aphrodita
(Fordham, 1925, Mettam, 1971, Mettam, 1980, Rouse & Pleijel, 2001, Schroeder, 1989, Schroeder & Hermans, 1975, Thorson, 1946).

Arcopagia
(MBA, 1957, Tebble, 1976)

Ascidia
(Havenhand, 1991, Havenhand & Svane, 1989, Millar, 1970, Newell & Newell, 2006, Svane & Lundalv, 1981, Svane & Young, 1989, Tarjuelo & Turon, 2004)

Asterias
(Bouland & Claereboudt, 1994, Fish & Fish, 1996, Guillou, 1983, Jangoux & van Impe, 1977, Newell & Newell, 2006, Nichols & Barker, 1984, Vevers, 1951)

Astropecten
(Freeman et al., 2001, Grant & Tyler, 1986, Hayward & Ryland, 1995, Henry et al., 1991, McEdward & Janies, 1993, McEdward & Morgan, 2001, Newth, 1925, Obrebski, 1979)

Atelecyclus
(Foster-Smith, 2000, MBA, 1957)

Autolytus
(Fish & Fish, 1996, Hayward & Ryland, 1990a, Hayward & Ryland, 1995, MBA, 1957, Okada, 1928, Rouse & Pleijel, 2001, Thorson, 1946, Yo, 1933)

Axius
(Hayward & Ryland, 1995, Wenner, 1985)

B

Balanus
(Barnes, 1953, Barnes, 1956, Barnes, 1962, Barnes & Bagenal, 1951, Barnes et al., 1963, Barnes & Powell, 1953, Barnett et al., 1979, Bassindale, 1936, Bassindale, 1964, Cawthorne & Davenport, 1980, Clare & Walker, 1986, Crisp, 1954, Crisp & Lewis, 1984, Evans & Burrows, 1987, Furman & Yule, 1991, Herbert et al., 2003, Kendall et al., 1982, Korn et al., 2001, Lucas & Crisp, 1987, Maughan & Barnes, 2000, Moore, 1936, Moyse & Hui, 1981, Neal & Yule, 1992, Rainbow, 1984, Ritz & Crisp, 1970, Walker, 1980)

Bathyporeia
(Fincham, 1970a, Fincham, 1970b, Fish, 1975, Fish & Fish, 1978, Fish & Fish, 1996, Fish & Preece, 1970, Khayrallah & Jones, 1980a, Khayrallah & Jones, 1980b, Mettam, 1989, Salvat, 1967, Watkin, 1939a, Watkin, 1939b)

Bispira
(Hayward & Ryland, 1995, Nash & Keegan, 2003, Nash & Keegan, 2004)

Bodotria
(Corey, 1981, Hayward & Ryland, 1995)

Buccinum
(Fish & Fish, 1996, Foster-Smith, 2000, Fretter & Graham, 1962, Graham, 1971, Graham, 1988)

Bugula
(Dyrynda & King, 1983, Dyrynda & Ryland, 1982, Franzen, 1977, Hayward & Ryland, 1998, Keough & Chernoff, 1987, Ryland, 1967, Ryland, 1970, Ryland, 1976, Wendt, 1998, Wendt, 2000, Wendt & Woollacott, 1999)

C

Caecum
(Barnes, 1994, Hoeksema & Segers, 1993, Seaward, 1987, Seaward, 1989)

Callianassa
(Atkinson, 1988, Atkinson, 1989, Atkinson & Nash, 1990, Lindley, 1987, Nickell & Atkinson, 1995, Rowden & Jones, 1994, Rowden & Jones, 1995, Stamhuis et al., 1998, Stamhuis et al., 1996, Stamhuis et al., 1997, Witbaard & Duineveld, 1989)

Calliostoma
(Fish & Fish, 1996, Hayward & Ryland, 1995, Holmes, 1997, Lebour, 1935, Lebour, 1937, Ramon, 1990)

Cancer
(Addison & Bennett, 1988, Addison & Bennett, 1992, Addison & Lovewell, 1991, Barfield, 2004, Bennett, 1974, Bennett, 1979, Bennett, 1995, Bennett & Brown, 1976, Bennett & Brown, 1983, Brown & Bennett, 1980, Eaton et al., 2001, Edwards, 1979b, Hall et al., 1991, Hall et al., 1993, Howard, 1982, Latrouite & Le Foll, 1989, Latrouite & Morizur, 1988, Lawton, 1983, Lawton & Hughes, 1985, Leach, 1815, Lindley, 1984, Martin, 1980, Martin, 1985, Nance, 2001, Naylor et al., 1999, Newell & Newell, 2006, Nichols et al., 1982, Robles et al., 1989, Shelton et al., 1979, Thompson & Ayers, 1987, Thompson & Ayers, 1988, Thompson et al., 1995)

Caulleriella
(Fauchald & Jumars, 1979, Gibbs, 1971, Rouse & Pleijel, 2001)

Cerianthus
(Fish & Fish, 1996, Manuel, 1981, Manuel, 1988, MBA, 1957)

Chaetozone
(Chambers & Woodham, 2003, Christie, 1984, Christie, 1985, Curtis, 1977, Hayward et al., 1996, Hayward & Ryland, 1995, Hily, 1987, Lopez-Jamar & Mejuto, 1988, Olsgard, 1999, Rachor & Gerlach, 1978, Rivain, 1984, Rouse & Pleijel, 2001, Thorson, 1946, Woodham & Chambers, 1994)

Chamelea
(Ansell, 1961, Corni et al., 1985, Deval, 2001, Hayward & Ryland, 1995, Newell & Newell, 2006, Thorson, 1946)

Cheirocratus
(Barnes et al., 2001)

Chlamys
(Bokordt et al., 2000, Broom & Mason, 1978, Hayward & Ryland, 1995, Hodgson & Burke, 1988, MBA, 1957, Mason, 1983, Spencer, 2002)

Circomphalus
(Lebour, 1938)

Cirriformia
(Gibbs, 1971)

Cirrophorus
(Rouse & Pleijel, 2001, Thorson, 1946)

Clausinella
(Brown et al., 2002, Hayward & Ryland, 1995, Lebour, 1938)

Clymenura
(Carson & Hentschel, 2006, Giangrande, 1997, Rouse & Pleijel, 2001, Wilson, 1991)

Corophium
(Chandrasekara & Frid, 1996, Corlett & Salkeld, 1974, Fish & Mills, 1979, Flach, 1996, Forbes et al., 1996, Hughes, 1988, Jensen & Kristensen, 1990, Madsen, 1982, McCurdy et al., 2000, Raffaelli et al., 1991, Schneider et al., 1994, Wilson & Parker, 1996)

Corystes
(Fish & Fish, 1996, Gurney, 1902, Hartnoll, 1968, Hayward & Ryland, 1995, Wenner, 1985)

Crangon
(Beukema, 1992, Boddeke, 1982, Boddeke et al., 1986, Lloyd & Yonge, 1947, Newell & Newell, 2006)

Crepidula
(Blanchard, 1997, Chipperfield, 1951, de Montaudouin, 2001, Deslou-Paoli, 1986, Orton, 1912, Pechenik, 1996, Thouzeau, 1991)

Crossaster
(Carlson & Pfister, 1999, Hayward & Ryland, 1995, Quiles et al., 2002, Strathmann, 1987)

D

Dendrodoa
(Fish & Fish, 1996, Foster-Smith, 2000, Hayward & Ryland, 1995, MBA, 1957, Millar, 1954, Picton, 1993, Thorson, 1946)

Didemnum
http://woodshole.er.usgs.gov/project-pages/stellwagen/didemnum/
(Bullard et al., 2007, Dias & Rodrigues, 2004, Valentine et al., 2007)

Diodora
(Fretter & Graham, 1962, Hayward & Ryland, 1995, Hodgson & Chia, 1993, Page, 2002, Pernet, 1997)

Distomus
(Berrill, 1948, Fish & Fish, 1996, Hayward & Ryland, 1995, Howson, 1997)

Dosinia
(Fish & Fish, 1996, MBA, 1957, Tebble, 1976)

Drilonereis
(Fauchald & Jumars, 1979, Hayward & Ryland, 1995, Rouse & Pleijel, 2001)

Dysidea
(Barnes et al., 2001, Hayward & Ryland, 1995, Mariani et al., 2005)

E

Ebalia
(Hayward & Ryland, 1995, Lebour, 1928, Newell & Newell, 2006, Quiles et al., 2002, Schembri, 1982)

Echinocardium
(Buchanan, 1967, Fish & Fish, 1996, Hayward et al., 1996, Hayward & Ryland, 1995, Kashenko, 1994)

Echinocyamus
(Fish & Fish, 1996, Foster-Smith, 2000, Hayward & Ryland, 1995, Newell & Newell, 2006, Picton, 1993, Telford et al., 1983, Thorson, 1946)

Echinus
(Baker, 2001, Bishop, 1985, Bishop, 1989, Bishop & Earll, 1984, Boolootian, 1966, Comely & Ansell, 1988, Comely & Ansell, 1989b, Edwards, 1979a, Emson & Moore, 1998, Fish & Fish, 1996, Forster, 1959, Gage, 1992a, Gage, 1992b, Gage & Tyler, 1985, Gage et al., 1986, Hayward & Ryland, 1995, Howson, 1997, Hyman, 1955, Jimmy et al., 2003, JNCC, 1999, Kelly, 2000, Kelly, 2001, Kelly & Cook, 2001, Kozloff & Westervelt, 1990, Lang & Mann, 1978, Lawrence, 1975, MacBride, 1903, Macbride, 1914, Moore, 1937, Mortensen, 1927, NBN, 2002, Nichols, 1969, Nichols, 1979, Nichols, 1984, Nichols et al., 1983, Nichols et al., 1984, Nichols et al., 1985a, Nichols et al., 1985b, Picton & Costello, 1998, Sime, 1982, Todd et al., 1996, Vost, 1986, White et al., 1985)

Ehlersia
(Rouse & Pleijel, 2001)

Ensis
(Armonies & Reise, 1999, Fahy & Gaffney, 2001, Fahy et al., 2001, Fish & Fish, 1996, Flach, 1996, Hayward et al., 1996, Henderson & Richardson, 1994, Holme, 1954, Newell & Newell, 2006, Palmer, 2004, Robinson & Richardson, 1998)

Eteone
(Fauchald & Jumars, 1979, Flach, 1996, Hayward & Ryland, 1995, Howson, 1997, McIntosh, 1912, Pleijel & Dales, 1991, Rouse & Pleijel, 2001, Thorson, 1946)

Euclymene
(Hayward, 1994, Hayward & Ryland, 1995b, Howson, 1997, Rouse & Pleijel, 2001)

Eulalia
(Bonse et al., 1996, Fish & Fish, 1996, Hayward & Ryland, 1995, MBA, 1957, Olive, 1981, Pleijel, 1987, Pleijel & Dales, 1991, Rouse & Pleijel, 2001, Thorson, 1946)

Eumida
(Hayward & Ryland, 1995, Howson, 1997, MBA, 1957, Pleijel & Dales, 1991, Rouse & Pleijel, 2001, Thorson, 1946)

Eurydice
(Alheit & Naylor, 1976, Fish & Fish, 1996, Fish, 1970, Hastings, 1981a, Hastings, 1981d, Hayward, 1994, Hayward et al., 1996, Hayward & Ryland, 1995, Holdich, 1981, Howson, 1997, Jones, 1970, Jones & Naylor, 1970, Jones & Naylor, 1967, Naylor, 1972, Naylor, 1990, Reid & Naylor, 1986, Salvat, 1966, Soika, 1955, Tully & O Ceidigh, 1986, Warman et al., 1993)

Eurysyllis
(Brown et al., 2002, Hayward & Ryland, 1995)

Exogone
(Fauchald & Jumars, 1979, Hayward & Ryland, 1995, Howson, 1997, Rouse & Pleijel, 2001, Thorson, 1946)

F

Flustra
(Dyer et al., 1982, Dyrynda, 1994, Eggleston, 1970, Eggleston, 1972, Fish & Fish, 1996, Hartnoll, 1983, Hayward et al., 1996, Hayward & Ryland, 1995, Hayward & Ryland, 1998, Hincks, 1880, Hiscock, 1985, Hiscock, 1983, Holme & Wilson, 1985, JNCC, 1999, Knight-Jones & Nelson-Smith, 1977, Menon, 1975, NBN, 2002, O'Dea & Okamura, 2000, Picton & Costello, 1998, Reed, 1991, Ryland, 1967, Ryland, 1970, Ryland, 1976, Ryland, 1977, Ryland & Bishop, 1993, Silén, 1981, Stebbing, 1971)

G

Galathea
(Bull, 1937, De Grave & Turner, 1997, Elmhirst, 1910, Hayward & Ryland, 1995, Lebour, 1930, Lebour, 1931, Newell & Newell, 2006)

Gammaropsis
(Hayward & Ryland, 1995, Powell, 1992, Powell & Moore, 1991, Steele et al., 1986)

Gari
(Brown et al., 2002, Hayward & Ryland, 1995, Lebour, 1938, Thorson, 1946, Urban & Campos, 1994)

Gastrosaccus
(Fish & Fish, 1996, Howson, 1997, MBA, 1957)

Glycera
(Fish & Fish, 1996, Hayward & Ryland, 1995, Howson, 1997, MBA, 1957, Rouse & Pleijel, 2001, Thorson, 1946)

Glycinde
(Blake, 1975, Carson & Hentschel, 2006, Giangrande, 1997, Rouse & Pleijel, 2001, Yokouchi, 1991)

Glycymeris
(Bull, 1937, De Grave & Turner, 1997, Elmhirst, 1910, Fish & Fish, 1996, Hayward & Ryland, 1995, Howson, 1997, Lebour, 1930, Lebour, 1931, MBA, 1957, Newell & Newell, 2006, Newell et al., 2004, Steingrimsson, 1989, Tebble, 1976)

Golfingia
(Cutler, 1994, Gibbs, 1975, Gibbs, 1976, Hayward & Ryland, 1995, Rice, 1989)

Goniada
(Carson & Hentschel, 2006, Fauchald, 1983, Giangrande, 1997, Rouse & Pleijel, 2001, Yokouchi, 1991)

Grania
(Barnes et al., 2001, Coates & Erseus, 1985, Locke & Coates, 1998, Rota & Erseus, 2003)

Guernea
(Lincoln, 1979)

H

Harmothoe
(Clark, 1988, Fish & Fish, 1996, Garwood, 1978, Garwood & Olive, 1982, Gremare & Olive, 1986, Hayward et al., 1996, Hayward & Ryland, 1995, Howson, 1997, Olsgard, 1999, Rouse & Pleijel, 2001, Thorson, 1946, Watson et al., 2000)

Harpinia
(King et al., 2004)

Hesionura
(Howson, 1997, Pleijel & Dales, 1991, Rouse & Pleijel, 2001)

Heteromastus
(Flach, 1996, Gillet & Gorman, 2002, Hayward & Ryland, 1995, Howson, 1997, Josefson & Jensen, 1991, Madsen, 1982, Rouse & Pleijel, 2001)

Hiatella
http://www.crabproject.com/mod/organisms/item.php/22
(Greena & Grizzle, 2007, Hayward & Ryland, 1995, Lebour, 1938, Sejr et al., 2002)

Hinia
(Fretter & Graham, 1962, Hayward & Ryland, 1995, Newell & Newell, 2006, Tallmark, 1980)

Hippolyte
(Cobos et al., 2005, Hayward & Ryland, 1995, Newell & Newell, 2006, Reverberi, 1950, Sheild, 1978, Veillet et al., 1963, Zupo & Buttino, 2001, Zupo & Messina, 2007)

Hyas
(Anger, 1983, Bryant & Hartnoll, 1995, Hayward & Ryland, 1995, Petersen, 1995, Quijan & Snelgrove, 2005, Thorson, 1946)

Hydrallmania
(Cornelius, 1995, Hayward & Ryland, 1995, Kosevich, 2006, MBA, 1957)

I

Inachus
(Bacescu, 1972, Brand, 1991, Bryant & Hartnoll, 1995, Crothers & Crothers, 1988, Fish & Fish, 1996, Hartnoll et al., 1993, Hayward & Ryland, 1995, Ingle, 1997, Ingle, 1980, Ingle, 1996, JNCC, 1999, Lebour, 1926, NBN, 2002, Newell & Newell, 2006, Wilson, 1982a)

Iphinoe
(Foster-Smith, 2000c, Hayward & Ryland, 1995, Howson, 1997, Jones, 1976)

J

Jasmineira
(Giangrande, 1997, Hayward & Ryland, 1995a, Rouse & Fitzhugh, 1994)

L

Laevicardium
(Howson, 1997, MBA, 1957, Newell & Newell, 2006, Tebble, 1976)

Lagis
(Fauchald & Jumars, 1979, Fish & Fish, 1996, Hayward et al., 1996, Hayward & Ryland, 1995, Kirkegaard, 1978, Newell & Newell, 2006, Rouse & Pleijel, 2001, Thorson, 1946)

Lanice
(Ansell, 1995, Arnoux et al., 1995, Beukema, 1990, Beukema et al., 1993, Buhr & Winter, 1977, Callaway, 2003a, Callaway, 2003b, Carey, 1987, Corlett & Salkeld, 1974, Eagle, 1975, Fish & Fish, 1996, Flach, 1996, Harms, 1990, Hayward et al., 1996, Hayward & Ryland, 1995, Kuhl, 1972, Marcano, 1994, Marcano & Bhaud, 1995, Newell & Newell, 2006, Rees et al., 1976, Rees et al., 1992, Ropert, 1996, Ropert & Dauvin, 2000, Smith, 1989, Strasser, 2000, Strasser & Pieloth, 2001)

Laonice
(Fauchald & Jumars, 1979, Hayward & Ryland, 1995, Howson, 1997, MBA, 1957, Rouse & Pleijel, 2001, Sikorski, 2003)

Lepidonotus
(Fish & Fish, 1996, Hayward et al., 1996, Hayward & Ryland, 1995, Howson, 1997, Rouse & Pleijel, 2001, Thorson, 1946, Thorson, 1950)

Leptocheirus
(Hayward & Ryland, 1995, Howson, 1997, MBA, 1957)

Leptochiton
(Fish & Fish, 1996, Foster-Smith, 2000, Howson, 1997, Light & Killeen, 1992)

Leptosynapta
(Eltringham, 1971, Fish & Fish, 1996, Foster-Smith, 2000, Hayward & Ryland, 1995b, Picton, 1993, Thorson, 1946)

Liocarcinus
(Abelló, 1989, Abelló et al., 1991, Abelló et al., 1988, Comely & Ansell, 1989a, Freire, 1996, Freire et al., 1996, Hayward et al., 1996, Hayward & Ryland, 1995, Howson, 1997, Ingle, 1997, Mathieson & Berry, 1997, Mori & Zunino, 1987, Muino et al., 1999, Wear, 1974)

Lucinoma
(Gros et al., 1999, Hayward & Ryland, 1995, Lebour, 1938)

Lumbrineris
(Fauchald & Jumars, 1979, Hayward, 1994, Hayward & Ryland, 1995, Howson, 1997, Rouse & Pleijel, 2001, Thorson, 1946)

M

Macrochaeta
(Howson, 1997, Rouse & Pleijel, 2001)

Macropodia
(Crothers & Crothers, 1988, Gonzales-Gordillo & Rodriguez, 2001, Howson, 1997, Ingle, 1980, Ingle, 1982, Ingle, 1996, JNCC, 1999, Lebour, 1926, NBN, 2002, Salman, 1981, Van Noort & Adema, 1985)

Maerella
(Lincoln, 1979)

Magelona
(Bosselmann, 1989, Fauchald & Jumars, 1979, Fiege et al., 2000, Fish & Fish, 1996, Hayward, 1994, Hayward et al., 1996, Hayward & Ryland, 1995, JNCC, 1999, Jones, 1977, Kröncke, 1990, Kuhl, 1972, Lackschewitz & Reise, 1998, Marcano, 1994, MBA, 1957, Newell & Newell, 2006, Niermann et al., 1990, Picton & Costello, 1998, Probert, 1981, Rees, 1983, Rouse & Pleijel, 2001, Thorson, 1946, Wilson, 1982b)

Maja
(Fish & Fish, 1996, González-Gurriarán et al., 1996, González-Gurriarán & Freire, 1994, Hardy & Guiry, 2003, Hartnoll, 1963, Hayward et al., 1996, Hayward & Ryland, 1995, Howson, 1997, Ingle, 1997, JNCC, 1999, Latrouite & Le Foll, 1989, Lebour, 1927, Morton, 1994, NBN, 2002, Picton & Costello, 1998, Rodhouse, 1984)

Maldanidae
(McIntosh, 1913)

Marphysa
(Barnes et al., 2001, Prevedelli & Simonini, 2003)

Mediomastus
(Hansen, 1993, Hayward & Ryland, 1995, Rasmussen, 1973, Warren, 1979)

Metopa
(Hayward & Ryland, 1995, Weslawski & Legezynska, 2002)

Minuspio
(Howson, 1997)

Modiolus
(Anwar et al., 1990, Bayne, 1976, Brown, 1976, Brown, 1984, Brown & Seed, 1977, Brown & Seed., 1976, Comely, 1978, Davenport & Kjørsvik, 1982, de Schweinitz & Lutz, 1976, Fish & Fish, 1996, Hayward et al., 1996, Holt et al., 1998, Jasim, 1986, Jasim & Brand, 1989, Jones et al., 2000, Mackie et al., 1995, Navarro & Thompson, 1996, Nielsen, 1975, Roberts, 1975a, Roberts, 1975b, Sebens, 1985, Seed, 1976, Seed & Brown, 1975, Seed & Brown, 1977, Seed & Brown, 1978, Tebble, 1976, Wiborg, 1946, Wildish & Fader, 1998, Wildish et al., 1998, Wilson, 1977b)

Moerella
(Howson, 1997, Tebble, 1976)

Mya
(Allen, 1962, Armonies, 1994, Beukema, 1995, Brousseau, 1978, Brousseau, 1979, Brousseau, 1987, Brousseau & Baglivo, 1987, Bruce et al., 1963, Callaway, 2003b, Campbell, 1994, Clay, 1966, Commito, 1982, Crothers, 1966, Dow & Wallace, 1961, Emerson & Grant, 1991, Eno et al., 1997, Fish & Fish, 1996, Flach, 1996, Foster-Smith, 2000, Gibbons & Blogoslawski, 1989, Gosselin & Qian, 1997, Hayward et al., 1996, Howson, 1997, Kammermans, 1994, Kühl, 1981, Loosanoff & Davis, 1963, Loosanoff et al., 1966, Lutx et al., 1982, Madsen, 1982, McLaughlin & Faisal, 2000, Nelson, 1928, Newell & Hidu, 1986, Pfitzenmeyer & Drobeck, 1967, Seaward, 1982, Seaward, 1990, Stickney, 1964, Strasser, 1999, Strasser, 2000, Strasser et al., 1999, Tebble, 1976, Turk & Seaward, 1997, Warwick & Price, 1976)

Mysella
(Christensen, 1980, Hayward & Ryland, 1995b, JNCC, 1999, NBN, 2002, Ockelmann & Muus, 1978, Picton & Costello, 1998, Tebble, 1976)

N

Necora
(Hearn, 2004, Lee et al., 2006, Mene et al., 1991, Nance, 2001, Newell & Newell, 2006, Norman & Jones, 1993)

NEMATODA
(Chandrasekara & Frid, 1996)

NEMERTEA
(McIntosh, 1873)

Nephasoma
(Fish & Fish, 1996, Foster-Smith, 2000, Hayward & Ryland, 1995, Howson, 1997)

Nephtys
(Alheit, 1978, Arndt & Schiedek, 1997, Barnes, 1994, Bentley, 1989, Bentley et al., 1984, Beukema, 1987, Beukema et al., 1996, Beukema et al., 1993, Clark et al., 1962, Clark & Haderlie, 1960, Clay, 1967, Elliott & Taylor, 1989, Fallesen & Jørgensen, 1991, Flach, 1996, Garwood & Olive, 1981, Gremare & Olive, 1986, Hardege et al., 1998, Hayward et al., 1996, Hayward & Ryland, 1995b, Holme, 1949, Kirkegaard, 1978, Lewis et al., 1982, Linke, 1939, Mathivat-Lallier & Cazaux, 1991, Olive, 1976, Olive, 1977, Olive, 1978a, Olive, 1978b, Olive et al., 1985, Olive et al., 1981, Olive & Morgan, 1983, Olive & Morgan, 1991, Olive et al., 1997, Oyenekan, 1986, Price & Warwick, 1980, Rainer, 1989, Rainer, 1990, Rainer, 1991a, Rainer, 1991b, Rees, 1983, Spencer et al., 1996, Vader, 1964)

Nereis
(Armonies & Reise, 2003, Gremare & Olive, 1986, Nithart, 1995)

Notomastus
(Fauchald & Jumars, 1979, Fish & Fish, 1996, Hayward & Ryland, 1995b, Howson, 1997, MBA, 1957, Rouse & Pleijel, 2001, Thorson, 1946, Wilson, 1933)

Nucula
(Allen, 1953, Allen, 1954, Bruce et al., 1963, Davis & Wilson, 1983a, Davis & Wilson, 1983b, Davis & Wilson, 1985, Edwards, 1965, Hayward & Ryland, 1995b, Howson, 1997, JNCC, 1999, Lebour, 1938, NBN, 2002, Petersen, 1977, Picton & Costello, 1998, Rachor, 1976, Rachor & Salzwedel, 1976, Seaward, 1982, Tebble, 1976, Webb, 1987, Wilson, 1992, Yonge, 1939)

Nuculana
(Allen, 1954, Ansell et al., 1978, Hutchings & Haedrich, 1984, Knudsen, 1979, Mackie, 1984, Thorson, 1946, Tyler et al., 1992)

Nymphon
(Hayward & Ryland, 1995, Jarvis & King, 1978, King & Jarvis, 1970)

O

Obelia
(Berrill, 1948b, Berrill, 1949, Billard, 1901a, Billard, 1901b, Boero, 1984, Boero & Bouillon, 1993, Calder, 1990, Cornelius, 1990, Cornelius, 1992, Cornelius, 1995, Crowell, 1953, Elmhirst, 1925, Faulkner, 1929, Hammett, 1943, Hammett, 1951a, Hammett, 1951b, Hammett, 1951c, Hammett, 1951d, Hammett, 1951e, Hammett & Hammett, 1945, Howson, 1997, Hunter, 1989, JNCC, 1999, Judge & Craig, 1997, Kosevich & Marfenin, 1986, Lauckner, 1980, NBN, 2002, Picton & Costello, 1998, Salvini-Plawen, 1972, Standing, 1976, Stepanjants, 1998, Zamponi et al., 1998)

Odontosyllis
(Daly, 1975, Hayward & Ryland, 1995)

Ophelia
(Amoureux & Dauvin, 1981, Barnes, 1965, Browning, 1995, Fauchald & Jumars, 1979, Fish & Fish, 1996, Harris, 1988, Harris, 1991a, Harris, 1991b, Hayward et al., 1996, Hayward & Ryland, 1995, Howson, 1997, MBA, 1957, Rouse & Pleijel, 2001, Thorson, 1946, Wilson, 1948)

Ophiothrix
(Allain, 1974, Broom, 1975, Bruce et al., 1963, Davoult, 1989, Davoult & Gounin, 1995, Davoult et al., 1994, Emson & Wilkie, 1980, Fish & Fish, 1996, Gage, 1990a, George & Warwick, 1985, Gorzula, 1976, Hayward et al., 1996, Hayward & Ryland, 1995, Holme, 1984, Hughes, 1998, JNCC, 1999, Lefebvre & Davoult, 1997, Lefebvre & Davoult, 2000, Lefebvre et al., 1999, Lefebvre et al., 2003, Migné & Davoult, 1997, Newton & McKenzie, 1995, Pedrotti, 1993, Picton & Costello, 1998, Sides & Woodley, 1985, Sköld, 1998, Warner, 1971, Warner & Woodley, 1975, Wilkie, 1978)

Ophiura
(Fish & Fish, 1996, Gage, 1990b, Hayward et al., 1996, Hayward & Ryland, 1995, Howson, 1997, Olsgard, 1999, Tyler, 1977, Tyler & Gage, 1980, Webb & Tyler, 1985, Wilding & Gage, 1995)

Orbinia
(Fauchald & Jumars, 1979, Fish & Fish, 1996, Hayward, 1994, Hayward & Ryland, 1995, Howson, 1997, Rouse & Pleijel, 2001, Thorson, 1946)

P

Pagurus
(Addison & Bennett, 1988, Addison & Bennett, 1992, Addison & Lovewell, 1991, Barfield, 2004, Bennett, 1974, Bennett, 1979, Bennett, 1995, Bennett & Brown, 1976, Bennett & Brown, 1983, Brown & Bennett, 1980, Eaton et al., 2001, Edwards, 1979b, Elmhirst, 1910, Elwood et al., 1995, Elwood & Stewart, 1987, Fish & Fish, 1996, Hall et al., 1991, Hall et al., 1993, Howard, 1982, Howson, 1997, Ingle, 1985, Lancaster, 1988, Lancaster, 1990, Lancaster & Wigham, 1990, Latrouite & Le Foll, 1989, Latrouite & Morizur, 1988, Lawton, 1983, Lawton, 1989, Lawton & Hughes, 1985, Lindley, 1984, Macdonald et al., 1957, Martin, 1980, Martin, 1985, Nance, 2001, Naylor et al., 1999, Newell & Newell, 2006, Nichols et al., 1982, Perkins, 1984, Ramsay et al., 1997, Regnault, 1994, Shelton et al., 1979, Thompson & Ayers, 1987, Thompson & Ayers, 1988, Thompson et al., 1995)

Palaemon
(Thorson, 1946)

Palliolum
(Hayward & Ryland, 1995, Lebour, 1938)

Pandalina

(Newell & Newell, 2006)

Pandalus
(Bergstrom, 2000, Hayward & Ryland, 1995)

Parametaphoxus
(King et al., 2004)

Paraonis
(Howson, 1997, Rouse & Pleijel, 2001)

Pasiphaea
(Company et al., 2001, Williamson, 1960)

Pecten
(Allison, 1993, Allison et al., 1994, Amirthalingam, 1928, Ansell et al., 1991, Beaumont & Barnes, 1992, Beaumont & Budd, 1982, Beaumont & Zouros, 1991, Beukers-Stewart et al., 2003, Brand, 1991, Brand et al., 1980, Burnell et al., 1995, Cochard & Devauchelle, 1993, Fish & Fish, 1996, Foster-Smith, 2000, Franklin & Pickett, 1980, Gruffydd, 1974, Heilmayer et al., 2004, Howell & Fraser, 1984, Howson, 1997, Kamenos et al., 2004a, Kamenos et al., 2004b, Kamenos et al., 2004c, Kuznetsov et al., 1966, Lawrence, 1993, Lehane & Davenport, 2002, Mackie & Ansell, 1993, Mason, 1983, Mason et al., 1979a, Mason et al., 1979b, Mason et al., 1980, Mason et al., 1981, Minchin, 1981, Minchin, 1992, Minchin & Mathers, 1982, Murphy, 1986, Nance, 2001, Thouzeau, 1991, Wilding et al., 1999, Wilding et al., 1998, Zhang, 1996)

Phaxas
(Hayward et al., 1996, Hayward & Ryland, 1995, Howson, 1997, MBA, 1957, NBN, 2002, Picton & Costello, 1998)

Pholoe
(Christie, 1982, Fish & Fish, 1996, Hayward & Ryland, 1995, Heffernan & Keegan, 1988a, Heffernan & Keegan, 1988b, Heffernan et al., 1983, Howson, 1997, Rouse & Pleijel, 2001, Thorson, 1946)

Pilumnus
(Fish & Fish, 1996, Newell & Newell, 2006)

Pionosyllis
(Fauchald & Jumars, 1979, Hayward & Ryland, 1995, Howson, 1997, McIntosh, 1913, MBA, 1957, Rouse & Pleijel, 2001)

Pirimela
(Crothers & Crothers, 1988, Edwards, 1966, Foster-Smith, 2000, Howson, 1997)

Pisidia
(Howson, 1997, Ingle, 1997, Robinson & Tully, 2000a, Smaldon, 1972)

Pisione
(Aguado & San Martin, 2004, Fauchald & Jumars, 1979, Gradek, 1991, Howson, 1997, Pleijel & Dales, 1991, Rouse & Pleijel, 2001, Stecher, 1968)

Podarkeopsis
(Carson & Hentschel, 2006, Giangrande, 1997)

Poecilochaetus
(Allen, 1905, Nozais et al., 1997, Rouse & Pleijel, 2001)

Polinices
(Hayward & Ryland, 1995, Kingley-Smith et al., 2003, Kingley-Smith et al., 2005)

Polycarpa
(Chen & Dai, 2000, Millar, 1970)

Polycirrus
(Fauchald & Jumars, 1979, Hayward & Ryland, 1995, Howson, 1997, Rouse & Pleijel, 2001)

Polydora
(Daro & Polk, 1973, Fish & Fish, 1996, Gudmundsson, 1985, Hansen, 1999, Hayward & Ryland, 1995, Marcano, 1994, Murina, 1997, Mustaquim, 1986, Olsgard, 1999)

Pomatoceros
(Addison & Bennett, 1992, Bacescu, 1972, Bianchi, 1992, Campbell & Kelly, 2002, Castric-Fey, 1983, Cotter et al., 2003a, Cotter et al., 2003b, Crisp, 1965, Dons, 1927, Fish & Fish, 1996, Hayward et al., 1996, Hayward & Ryland, 1995, Howson, 1997, Kloeckner, 1976, Maughan & Barnes, 2000, Moate, 1985, O'Connor, 1982, OECD, 1967, Price et al., 1980, Roscoe, 1993, Rubin, 1985, Segrove, 1941, Thomas, 1940)

Prionospio
(Fauchald & Jumars, 1979, Howson, 1997, McIntosh, 1914, Marcano, 1994, Olsgard, 1999, Rouse & Pleijel, 2001, Sigvaldadottir, 2002, Thorson, 1946)

Protodorvillea
(Fauchald & Jumars, 1979, Howson, 1997, Rouse & Pleijel, 2001)

Psamathe
(Giangrande, 1997, Hayward & Ryland, 1995, Olive & Pillai, 1983)

Psammechinus
(Allain, 1978, Aquascope, 2000, Baker, 2001, Bedford & Moore, 1985, Boolootian, 1966, Bull, 1939, Comely, 1979, Cook et al., 2000, Cook et al., 1998, Cranmer, 1985, Gage, 1991, Hancock, 1957, Hayward et al., 1996, Hayward & Ryland, 1995, Hinegardner, 1969, Jensen, 1969, Kelly, 2000, Kelly, 2001, Kelly & Cook, 2001, Lawrence, 1975, Lindahl & Runnström, 1929, MacBride, 1903, Massin, 1999, MBA, 1957, Mortensen, 1927, Newell & Newell, 2006, Otero et al., 2003, Sukarno et al., 1979)

Psammolyce
(Fauchald & Jumars, 1979)

Pseudocuma
(Foster-Smith, 2000, Howson, 1997, Jones, 1976)

Pseudomystides
(Hayward & Ryland, 1995, Howson, 1997, Pleijel & Dales, 1991, Rouse & Pleijel, 2001)

Pseudothyone
(Foster-Smith, 2000, Howson, 1997, Picton, 1993)

S

Sabellaria
(Bamber & Irving, 1997, Bhaud & Gruet, 1984, Campbell, 1994, Cunningham et al., 1984, Fauchald & Jumars, 1979, Fish, 1996, George & Warwick, 1985, Gruet, 1985, Gruet, 1986, Gruet & Lassus, 1983, Hayward et al., 1996, Hayward & Ryland, 1995, Holt et al., 1998, Howson, 1997, JNCC, 1999, MBA, 1957, NBN, 2002, Pawlik, 1988, Picton & Costello, 1998, Rouse & Pleijel, 2001, Vorberg, 2000, Wilson, 1929, Wilson, 1969, Wilson, 1970, Wilson, 1971, Wilson, 1974, Wilson, 1976, Wilson, 1977a)

Sagitta
(Alvarez-Cadena, 1993a, Alvarez-Cadena, 1993b, Barnes et al., 2001, Falkenhaug, 1993, Moriyuki, 1975, Russell, 1932)

Scalibregma
(Fauchald & Jumars, 1979, Hayward et al., 1996, Hayward & Ryland, 1995, Rouse & Pleijel, 2001, Thorson, 1946)

Schistomysis
(Hayward & Ryland, 1995, Mauchline, 1967, Mauchline, 1970, Vicente & Sorbe, 1995)

Sclerocheilus
(Hayward & Ryland, 1995)

Scoloplos
(Armonies & Reise, 2003, Coosen et al., 1994, Fish & Fish, 1996, Gibbs, 1968, Hayward et al., 1996, Hayward & Ryland, 1995, Kruse & Reise, 2003, Kruse et al., 2004, Nithart, 1995, Rasmussen, 1973)

Sepiola
(Boyle & Rodhouse, 2005, Gabel-Deickert, 1995, Hayward & Ryland, 1995, Salman & Onsoy, 2004, Yau & Boyle, 1996)

Sertularia
(Fish & Fish, 1996, Hancock et al., 1956, Hayward & Ryland, 1995, Round et al., 1961, Schmidt & Warner, 1991)

Solecurtus
(Howson, 1997, MBA, 1957, Tebble, 1976)

Spatangus
(Fish & Fish, 1996, Howson, 1997, Newell & Newell, 2006, Thorson, 1946)

Sphaerosyllis
(Fauchald & Jumars, 1979, Hayward & Ryland, 1995, Howson, 1997, MBA, 1957, Rouse & Pleijel, 2001, Thorson, 1946)

Sphenia
(Foster-Smith, 2000, Howson, 1997, Tebble, 1976)

Spio
(Diaz-Castaneda et al., 1989, Fauchald, 1977, Hayward & Ryland, 1995, Howson, 1997, JNCC, 1999, MBA, 1957, Picton & Costello, 1998, Rouse & Pleijel, 2001, Sriknshnadhas & Ramoorthi, 1981)

Spiophanes
(Dauer et al., 1981, Fauchald & Jumars, 1979, Gage, 1972, Hayward, 1994, Hayward et al., 1996, Hayward & Ryland, 1990a, Hayward & Ryland, 1990b, Hayward & Ryland, 1995, JNCC, 1999, Marcano, 1994, Maurer & Lethem, 1980, NBN, 2002, Pearson & Rosenberg, 1978, Rachor & Gerlach, 1978, Rees, 1983, Rouse & Pleijel, 2001, Thorson, 1946)

Spisula
(Fahy, 2003, Fahy et al., 2003, Fish & Fish, 1996, Ford, 1925, Gaspar & Monteiro, 1999, Howson, 1997, JNCC, 1999, Kristensen, 1996, NBN, 2002, Picton & Costello, 1998, Tebble, 1976, Theede et al., 1969, Webb, 1987, Weinberg & Helser, 1996)

Styela
(Bourque et al., 2007, Hayward & Ryland, 1995, Millar, 1970)

Syllides
(Daly, 1975, Hayward & Ryland, 1995)

Syllis
(Fish & Fish, 1996, Hayward & Ryland, 1995, Howson, 1997, McIntosh, 1913, Nygren, 1999, Rouse & Pleijel, 2001, Yo, 1933)

T

Tapes
(Beninger & Lucas, 1984, Hayward & Ryland, 1995, Ponurovsky & Yakovlev, 1992, Xie & Burnell, 1994)

Thelepus
(Hayward & Ryland, 1995, Rouse & Pleijel, 2001)

Thracia
(Howson, 1997, MBA, 1957, Tebble, 1976)

Thyone
(Foster-Smith, 2000, Hayward & Ryland, 1995, Howson, 1997, Picton, 1993)

Timoclea
(Dauvin, 1985, Hayward & Ryland, 1995, Thorson, 1946)

Travisia
(Fauchald & Jumars, 1979, Hayward et al., 1996, Hayward & Ryland, 1995, Howson, 1997, Rouse & Pleijel, 2001)

Tridonta
(Schander, 2001, von Oertzen, 1972)

Tubificoides
(Barnes, 1965, Brinkhurst, 1982, Chandrasekara & Frid, 1996, Gustavsson & Erseus, 1997, Hayward et al., 1996, Howson, 1997, MBA, 1957, Powilleit & Kube, 1999)

Tubularia
(Browne, 1897, Fish & Fish, 1996, Hayward & Ryland, 1995, Howson, 1997, Hughes, 1983, Moate, 1985, Rees, 1963, Schmidt, 1983)

Typosyllis
(Hayward & Ryland, 1995, Howson, 1997, Rouse & Pleijel, 2001)

U

Upogebia
(Bruce et al., 1963, Campbell, 1982, Candisani et al., 2001, Hall-Spencer & Atkinson, 1999, Hayward et al., 1996, Howson, 1997, MBA, 1957, Newell & Newell, 2006, Tunberg, 1986, Webb, 1919)

Urothoe
(Fish & Fish, 1996, Foster-Smith, 2000, Howson, 1997, Lackschewitz & Reise, 1998)

V

Venus
(Dauvin, 1985, Hayward & Ryland, 1995, Rachor & Gerlach, 1978, Tirado et al., 2003, Webb, 1987)

Verruca
(Barnes & Barnes, 1968, Barnes & Stone, 1973, Bassindale, 1936, Hayward & Ryland, 1995)

Vesicularia
(Hayward, 1985, Hayward & Ryland, 1995)

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Marine Ecological Surveys Limited
24a Monmouth Place
BATH
BA1 2AY

Tel:+44(0)1225442211
Fax:+44(0)1225444411
Email: marine@seasurvey.co.uk

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