# Marine Conservation Zone Assessment

**Site name:** Devon Avon Estuary MCZ
UKMCZ0058

**Protected feature(s):**
Intertidal mud
Intertidal sand and muddy sand
Moderate energy intertidal rock
Tentacled lagoon worm (*Alkmaria romijni*)

**Fishing activities assessed at this site:**
**Stage 1 Assessment**
Intertidal handwork: Handworking (access from vessel)
Intertidal handwork: Handworking (access from land)
Miscellaneous: Crab tiling
Bait collection: Digging with forks

Devon & Severn IFCA Inshore Fisheries and Conservation Authority

**D&S IFCA Reference**
DAV-MCZ-001

## Contents



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| **Author** | **Date** | **Comment** | **Version** |
| Lauren Henly | 08/2021 | First draft | 0.1 |
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# 1. Introduction

This assessment has been undertaken by Devon & Severn Inshore Fisheries and Conservation Authority (D&S IFCA) in order to document and determine whether management measures are required to achieve the conservation objectives of marine conservation zones (MCZs). The IFCA's responsibilities in relation to management of MCZs are laid out in Sections 124 to 126, & 154 to 157 of the Marine and Coastal Access Act 2009.

# 2. MCZ site name(s), and location

The Devon Avon Estuary MCZ is an inshore site located on the coast of south Devon in the south west of England. The site covers an area of 2 $km^2$ and extends from the mouth of the estuary up to a tidal weir at Aveton Gifford. This site protects a wide range of habitats and species, including a number of rare species. Estuaries are important contributors to a healthy environment and have an important role as a nursery ground for juvenile fish and is potentially important for seahorse populations as it provides suitable food and shelter. Various species of worm, crustacean and shrimp can be found here, including the nationally scarce tentacled lagoon worm *Alkmaria romijni*. This is a tiny bristleworm which grows up to 5 mm in length. It creates and lives in tubes within the mud habitats of the estuary. These worms have tentacles around their mouths used for gathering food from the surrounding muddy sediments. The tentacled lagoon-worm is particularly vulnerable to activities that cause changes in its habitat.

The saltmarshes provide habitat for crustaceans (such as crabs, lobsters and barnacles), molluscs (such as mussels and oysters) and a nursery area for fish, as well as feeding grounds for birds.

Further information regarding the MCZ and its protected features can be found in the Devon Avon Estuary MCZ Factsheet (Defra, 2019).

# 3. Feature(s) / habitat(s) of conservation importance (FOCI/HOCI) and conservation objectives

**Table 1 - Protected features relevant to this assessment**

| Feature | General management approach |
|---|---|
| Intertidal mud | Maintain in favourable condition |
| Intertidal sand and muddy sand | Maintain in favourable condition |
| Moderate energy intertidal rock | Maintain in favourable condition |
| Tentacled lagoon worm (*Alkmaria romijni*) | Maintain in favourable condition |

The conservation objectives for these features are that they remain in, favourable condition.

# 4. Gear/feature interaction in the MCZ categorised as 'red' risk and overview of management measure

None - There are no gear/feature interactions in the MCZ that are categorised as 'red' risk.

# 5. Activities under consideration

- Intertidal handwork: Handworking (access from vessel)
- Intertidal handwork: Handworking (access from land)

- Miscellaneous: Crab tiling
- Bait collection: Digging with forks

See Henly (2021) for more information regarding fishing activities occurring in the Devon Avon Estuary MCZ.

# 6. Is there a risk that activities are hindering the conservation objectives of the MCZ?

**Yes,**
**Evidence:**
To determine whether each pressure is capable of affecting (other than insignificantly) the site's feature(s), the sensitivity assessments and risk profiling of pressures from the advice on operations section of the Natural England conservation advice package were used (Natural England, 2021). Table 2 shows the fishing activities and pressures included for assessment. The justifications for the pressures chosen for inclusion in this assessment can be seen in Annex 2.

**Table 2 - Fishing activities and pressures included in this assessment.**

| Activity | Pressures |
|---|---|
| Shore based activities: Hand working, crab tiling, bait collection | Abrasion/disturbance of the substrate on the surface of the seabed |
| | Habitat structure changes - removal of substratum (extraction) |
| | Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion |
| | Removal of non-target species |
| | Removal of target species |

The relevant targets for favourable condition were identified within Natural England's conservation advice supplementary advice tables (Natural England, 2021). Table 3 shows which targets were identified as relevant to the activity assessed. The impacts of pressures on features were assessed against these targets to determine whether the activities causing the pressures are compatible with the site's conservation objectives.

**Table 3 - Relevant favourable condition targets for identified pressures.**

| Feature | Attribute | Target |
|---|---|---|
| Intertidal mud | Distribution: presence and spatial distribution of biological communities | Maintain the presence and spatial distribution of intertidal mud communities. |
| | Extent and distribution | Maintain the total extent and spatial distribution of intertidal mud. |
| | Structure and function: presence and abundance of key structural and influential species | [Maintain OR Recover OR Restore] the abundance of listed species*, to enable each of them to be a viable component of the habitat. |
| Intertidal sand and muddy sand | Distribution: presence and spatial distribution of biological communities | Maintain the presence and spatial distribution of intertidal sand and muddy sand communities. |
| | Extent and distribution | Maintain the total extent and spatial distribution of intertidal sand and muddy sand. |
| | Structure and function: presence and abundance of key structural and influential species | [Maintain OR Recover OR Restore] the abundance of listed species*, to enable each of them to be a viable component of the habitat. |

| | | |
|---|---|---|
| Moderate energy intertidal rock | Distribution: presence and spatial distribution of biological communities | Maintain the presence and spatial distribution of intertidal rock communities. |
| | Extent and distribution | Maintain the total extent and spatial distribution of intertidal rock subject to natural variation in sediment veneer. |
| | Structure and function: presence and abundance of key structural and influential species | [Maintain OR Recover OR Restore] the abundance of listed species*, to enable each of them to be a viable component of the habitat. |
| Tentacled lagoon worm (Alkmaria romijni) | Population: population size | Maintain the population size within the site. |
| | Population: recruitment and reproductive capability | Maintain the reproductive and recruitment capability of the species. |
| | Presence and spatial distribution of the species | Maintain the presence and spatial distribution of the species. |
| | Structure and function: biological connectivity | Maintain connectivity of the habitat within sites and the wider environment to ensure larval dispersal and recruitment, and / or to allow movement of migratory species. |
| | Supporting habitat: extent and distribution | Maintain the extent and spatial distribution of the following known supporting habitat: intertidal mud. |

# 7. Can D&S IFCA exercise its functions to further the conservation objectives of the site?

**Yes,**
**Evidence: Monitoring and Control Arrangements**

- Monitor activity levels

- Introduction of a new Hand Working Permit Byelaw to manage the use of crab tiles, bait digging and many other hand gathering types of fishing activity.

On the 14th November 2019, the D&S IFCA Byelaw & Permitting Sub-Committee discussed the different options that exist to manage hand working types of fishing activity as set out in a report (D&S IFCA, 2019). The development of a new byelaw was the option selected, however it is envisaged that it will be a slightly different regulatory format as compared to the D&S IFCA permit based byelaws already implemented to manage other fishing activity.
The potential need for a permit to conduct the different activities will become a factor in the on-going drafting work. It is envisaged that the requirement for a permit to conduct bait collection and hand gathering will be dependent on the amounts of resource taken. The Hand Working Permit Byelaw would introduce fixed provisions that apply to all persons. Fixed provisions are expected to include a series of catch limits (bag limits) for different species (sea fisheries resources) that are targeted by different types of hand working fishing methods. The bag limits would provide an upper level of catch (a threshold) that would apply to all persons but providing the individual take of the specified species was below the levels set for personal use, it is not envisaged that a permit would be required for the collection of the resources. Commercial activity would exceed the bag limits for recreational take and would therefore be regulated by conditions of use that would be placed in the permits issued by D&S IFCA. D&S IFCA will be seeking the views of all stakeholders to better inform the decision making needed to set the initial bag limits. The development of a Hand Working Permit Byelaw is now a longer-term commitment for D&S IFCA. As a reflection of the time and resource required and available to conduct the required elements of the work, including reporting and the decision-making of D&S IFCA's Byelaw and Permitting Sub-Committee, the development of this Byelaw is not included in D&S IFCA's 2022–23 Annual Plan

(D&S IFCA, 2022). Key Tasks for 2022-23 reflect what is deliverable with the current level of staffing and financial resourcing available to D&S IFCA.

# 8. Referenced supporting information to inform assessment

Bait digging has been found to have a range of impacts on both the sediment it occurs on, and the communities within it:

**Impacts on sediment**
Bait digging usually occurs to depths of 30cm, unearthing a deeper sediment that would usually remain undisturbed (Jackson and James, 1979). Changes can therefore occur in sediment characteristics as a result of bait digging. Undug sediment was found to have a higher organic content. The process of turning over the sediment and erosion of sediment mounds by tides and wave action leads to a loss of finer fractions and associated organic material. In contrast, the basins may collect organic matter and fine sediments (Anderson and Meyer, 1986). This could have implications for local sediment load and turbidity levels (Watson *et al.*, 2017).

If the mounds of sediments are subsequently returned through the process of back- or in-filling, then the effect of the disturbance is reduced and recovery can occur within three weeks (Fowler, 1999). Recovery rates are therefore influenced by the energy of the site, and behaviour of the bait diggers. Coarse sand beaches with considerable wave action will recover more quickly than sheltered sites. Experimentally dug plots in a very sheltered location in the Menai Strait (Wales) were still visible after a year, although this is thought to be due to the presence of boulder clay (Johnson, 1984). Other, less sheltered, sites have reported a timeframe of 25 days for holes to disappear (Johnson, 1984).

**Impacts on target species**
Both blow lugworm (*Arenicola marina*) and king ragworm (*Alitta virens*) are targeted by bait diggers throughout the D&S IFCA's District.

Contrasting evidence exists as to the *direct* environmental effects of bait digging for lugworm. Relative to other exploited intertidal invertebrates, blow lugworms are relatively resilient to exploitation and disturbance because of their relatively high fecundity and widespread distribution (Fowler, 1999). In addition, *A. marina* exhibit a marked annual cycle in the numbers and condition of individuals, so that any changes in population structure correlated to bait digging, would have to control for these factors (Olive, 1993). Removal rates of 50-70% of worms in the area dug have been reported in the literature (Blake, 1979; Heiligenberg, 1987), but D&S IFCA's observations suggest this may be much lower in some areas, especially where large areas of lugworm exist and holes are relatively well spread out. A bait density survey of lugworms at Burnham-on-Sea, Berrow, Brean, Weston-Super-Mare and Sand Bay found remarkably similar spatial patterns of abundance and densities to those reported in the 1970's suggesting no long-term decline in lugworm populations (Ross, 2013).

A wide range of responses by *A. marina* to exploitation or experimental simulations of exploitation have been found, relating to local environmental conditions and the intensity and distribution of bait digging activity. Olive (1993) describes the scenario which led to complete removal of all lugworms from a large area of a National Nature Reserve in Northumberland in 1984, with densities falling from >40$m^{-2}$ to <1$m^{-2}$. When the site was closed to bait digging it repopulated within a matter of months, thanks to the presence of extensive non-exploited populations nearby. Similarly, lugworm populations in the Dutch Wadden Sea appear to be unaffected by large scale commercial exploitation, with an estimated 2 x $10^7$ individuals taken annually. However, Cryer *et al*. (1987) found no recovery in worm densities after 6 months following experimental removal, although natural densities at the test site in South Wales were low (9-16 $m^{-2}$) and the survey ran through the less productive winter months. The capacity of a population to withstand bait digging activities therefore relies on a number of factors including the size of the exploited area relative to

the total lugworm bed, the presence of other lugworm beds nearby, the presence of nursery areas, the relative exploitation of adult and juvenile lugworms, and the intensity and seasonality of bait digging. However, on the whole they are thought to be resilient to bait digging.

*A. virens* is a keystone intertidal species as prey for fish, birds and crustaceans, is a predator of other invertebrates and has an important role in bioturbation of the sediment (Watson *et al.*, 2017). King ragworm are generally found in more sheltered sediment areas but they can also be found in more mixed sediments. Differing reports exist of the life-history and population characteristics of *A. virens.* Whilst early studies of North American populations suggested a mean age at breeding of >3 years with the population dominated by 0-group individuals, a population from the Menai Straight, Wales was thought to mature later, and to have very few 0-group individual present. The latter population was therefore seen as being vulnerable to exploitation. On the North East coast of England, a study found similar densities (~15$m^2$ during the summer, ~3$m^2$ during the winter) of *A. virens* in both exploited and unexploited populations Blake (1979), suggesting that at least some populations are unaffected by bait digging. In other cases the change in macrofaunal community has been thought to benefit *A. virens*, due to its opportunistic nature (Evans *et al.*, 2015).

**Impacts on non-target species**

Bait digging can have adverse effects on a wide variety of species as a result of physical damage, burial, smothering and/or exposure to desiccation or predation to non-target invertebrates. Recovery of small short-lived invertebrates will usually occur within a year, but populations of larger, long-lived invertebrates may take much longer (Fowler, 1999). In some extreme cases local diversity may be reduced, which may be especially true in physically fragile environments such as eelgrass or mussel beds (Fowler, 1999). Similarly, Beukema (1995) found that within a 1$km^2$ area of the Dutch Wadden Sea, the local lugworm stock declined by more than 50% over a four-year mechanical digging period. As a result of this decline, total zoobenthic biomass also declined, with short lived species showing a marked reduction during the digging period. Recovery of the benthos took several years, especially by the slower establishing species. However, if disturbance by digging is short term, benthic communities can recover within six months (Beukema, 1995).

Mosbahi *et al*. (2015) also explored the impacts of bait digging on the macrofauna of intertidal mudflats. The fauna of their study area (the tidal mudflats of Kneiss Islands, Tunisia) was mainly composed of polychaetes, the more abundant families being the *Nereididae*, *Arenicolidae* (fishing target species) and the *Cirratulidae*. They found the number of taxa and abundance of individuals were affected by bait digging; the abundance estimates at the control stations were significantly higher than those estimated at the three stations before and after bait collection, with some polychaete species disappearing after one month of bait digging. This indicates that the intertidal macrozoobenthic biodiversity at the impacted stations is affected by the bait digging activity, or possibly by trampling.

Jackson and James (1979) investigated the effects of bait digging on cockle populations. They found that increased digging in an area caused higher cockle mortality, particular on smaller individuals. The cause of mortality was due to burial/smothering as individuals that were buried at a depth of 10cm rarely survived.

Rossi *et al*. (2007) investigated the effects of trampling on mudflats, such as that associated with recreational activities like bait digging. They found that trampling did not influence mobile species such as *Hydrobia ulvae* and *Hediste diversicolor,* but clearly modified the abundance and population dynamics of bivalves such as the clam *Macoma balthica* and the cockle *Cerastoderma edule.* There was a negative impact on adults of both species, which was attributed to footsteps directly killing or burying the animals, leading to asphyxia. Abundance of small-sized/juvenile *C. edule* showed no reaction to trampling. It is likely that small animals could recover more quickly because trampling occurred during the reproductive season (April to October), which meant that there was likely a continuous supply of larvae and juveniles in the water column to replace those displaced by the trampling. In contrast, trampling seemed to indirectly enhance the recruitment

rate of *M. balthica*. In an environment with little trampling, adult cockles can easily outcompete larvae and spats of other bivalves; disturbance of sediment whilst feeding or moving and high filtration of planktonic larvae can reduce the settling and recruitment of other bivalves. The direct impacts of trampling (e.g. a reduction in adult cockle abundance), can therefore indirectly increase the recruitment opportunities for other bivalve species such as *M. balthica*, which take advantage of the reduced competition from *C. edule* adults. Over the long term, this could ultimately cause a shift towards a dominance of *M. balthica* in the macrofaunal assemblage, at the cost of *C. edulae*, thereby potentially affecting ecosystem functioning. Therefore, despite potentially fast recovery times, Rossi *et al*. (2007) concluded that human trampling is a relevant source of disturbance for the conservation and management of mudflats.

Wynberg and Branch (1997) assessed the impacts of trampling associated with the use of suction pumps for the collection of prawns as bait, by comparing areas that had been sucked over with a prawn pump, to areas that had been trampled only. Prawn densities were depressed six weeks following both sucking and trampling but recovered by 32 weeks. Macrofaunal numbers declined in most treatment areas and macrofaunal community composition in the most-disturbed areas was distinct from that in other areas. Wynberg and Branch determined that the trampling itself has almost the same effect as sucking for prawns, on both the prawns and on the associated biota.

It is important to note that the effects on macrofaunal communities can differ substantially between estuaries. For example, the mud content of an estuary can affect the resilience of the communities to bait digging. Although Dernie *et al*. (2003) found that it was not possible to predict the recovery rates of assemblages based on percentage of silt and clay in the sediment, there was a good relationship between recovery rate and infilling rate, which is linked to the physical characteristics of the sediment. Clean sand habitats were the quickest to recover both in terms of physical and biological characteristics. Other studies have also found extended recovery times for estuaries with high mud content (Carvalho *et al.*, 2013).

The site-specific nature of the impacts of bait digging was also demonstrated by Watson *et al*. (2017). They found that responses were both site and disturbance type specific. Their data also showed that responses were not consistent between species (e.g. *Corophium volutator* and *Peringia ulvae*) or even between those within the same trophic group. They therefore concluded that bait collection alters the macrofaunal community and the associated sediment characteristics across large spatial scales, but with the caveat that the strength (and type) of the response is site specific.

**Local evidence**

Within the Devon Avon Estuary MCZ, there have been no crab tiles present since 50 were observed in 2003/4 on the intertidal mud (Davies, 2017). D&S IFCA's Officers conducted 6 hours and 45 minutes of dedicated bait digging surveys in the Devon Avon Estuary MCZ during September and October 2020; no bait digging activity was observed during these surveys. However, hand gathering and bait digging are known to occur on the intertidal mud on the estuary, which can contain the tentacled lagoon worm (Figures 2 & 3, Annex 1). In 2021, Bantham Estate staff reported two instances of bait digging to D&S IFCA; this activity occurred on intertidal mud habitat near to Bantham. In addition, reports from the Avon River Patrol in 2021 have highlighted infrequent bait digging occurring in the 'Doctor's Wood' area of the Avon (approximately 50.2983° N -3.8606° W). In 2022, D&S IFCA's circulated a request for information to permit holders; two respondents reported that they dig for bait in the estuary. The first of these respondents digs occasionally, mainly throughout the winter months, whereas the other digs four or five times per year in the summer. One respondent highlighted that they gather cockles occasionally from the Devon Avon estuary. It is not clear whether these are the same individuals that were observed by the Avon River Patrol. The known locations of bait digging (near Bantham and Doctor's Wood) do not overlap with the point observations of tentacled lagoon worm documented in Natural England (2021).

# 9. In-combination assessment

**Table 4 - Relevant activities occurring in or close to the site**

| **Plans and Projects** | | |
|---|---|---|
| **Activity** | **Description** | **Potential Pressure(s)** |
| No other plans or projects known to be occurring within Devon Avon Estuary MCZ | The impact of future plans or projects will require assessment in their own right, including accounting for any in-combination effects, alongside existing activities. | N/A |
| **Other activities being considered** | | |
| **Activity** | **Description** | **Potential Pressure(s)** |
| Static – pots/traps: Pots/creels, cuttlepots, fish traps | There are currently low levels of this activity in the MCZ. The location of the activities assessed are unlikely to overlap with the potting activity in the MCZ, so no in combination effect is thought to be possible. | Abrasion/disturbance of the substrate on the surface of the seabed<br><br>Habitat structure changes - removal of substratum (extraction)<br><br>Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion<br><br>Removal of non-target species<br><br>Removal of target species.<br><br>Visual disturbance |
| Seine nets & other: Beach seine/ring, shrimp push nets, Fyke and stakenets | There are currently low levels of this activity in the MCZ. The location of the activities assessed are unlikely to overlap with the seine netting activity in the MCZ, so no in combination effect is thought to be possible. | |
| Aquaculture | Activity is occurring in the Devon Avon Estuary MCZ, but as the activities assessed in this assessment are only occurring occasionally and at low levels, no in-combination effect is thought to be possible. This element of the assessment can be revisited following the upcoming review of consents for Pacific oyster mariculture in MCZs, being undertaken by Cefas (Fish Health Inspectorate) and Natural England, if this review process highlights areas of concern and pathways for in-combination impacts. | Abrasion/disturbance of the substrate on the surface of the seabed<br><br>Changes in suspended solids (water clarity)<br><br>Introduction of microbial pathogens<br><br>Introduction or spread of invasive non-indigenous species (INIS)<br><br>Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion |

| | | |
|---|---|---|
| | | Removal of non-target species<br><br>Smothering and siltation rate changes (Light)<br><br>Visual disturbance |

D&S IFCA conclude there is no likelihood of significant adverse effect on the interest features from in-combination effects addressed within Table 4.

# 10. NE consultation response

N/A Natural England has not been consulted at this stage.

# 11. Conclusion

The literature detailed in section 8 found that trampling associated with bait digging and other shore-based activities including crab tiling and hand gathering has the potential to influence the species assemblages on the rocky habitats assessed, and could influence the sediment characteristics, the populations of the target species, and the macrofaunal communities if levels of shore-based activities were sufficiently high and over a prolonged period.

Based on the current levels of the assessed activities on the Devon Avon Estuary there is not believed to be a significant impact of the shore-based activities on the protected features assessed. It is believed that these activities are occurring infrequently and at low levels, which likely gives the disturbed areas time to recover before they are revisited and disturbed again. The evidence presented in section 8 suggests recovery times for both sediment and smaller invertebrates that are impacted by trampling and digging are shorter when activity levels are low.

D&S IFCA is considering the introduction of a new Hand Working Permit Byelaw to manage the use of crab tiles, bait digging and many other hand gathering types of fishing activity in the district. The introduction of a byelaw would introduce fixed provisions that apply to all persons. Fixed provisions are expected to include a series of catch limits (bag limits) for different species (sea fisheries resources) that are targeted by different types of hand working fishing methods. The bag limits would provide an upper level of catch (a threshold) that would apply to all persons thus limiting the effort of shore-based activities on the Estuary. As outlined in section 7, the development of a Hand Working Permit Byelaw is now a longer-term commitment for D&S IFCA and has not been included in D&S IFCA's Annual Plan for 2022–2023.

The activities assessed are believed to be occurring at a very low level within the MCZ. Therefore, D&S IFCA conclude that there is no significant risk of the activities hindering the achievement of the conservation objectives for the Devon Avon Estuary MCZ.

# 12. Summary table

| **Feature or habitat of Conservation interest** | **Conservation objectives/ Target Attributes** (Natural England, 2021) | **Activity** | **Potential pressures from activity and sensitivity of habitats to pressures.** (Natural England, 2021) | **Potential exposure to pressures and mechanism of impact significance** | **Is there a risk that the activity could hinder the achievement of conservation objectives of the site?** | **Can D&S IFCA exercise its functions to further the conservation objectives of the site?**<br><br>**If Yes, list management options** |
|---|---|---|---|---|---|---|
| Intertidal mud | Maintain the presence and spatial distribution of intertidal mud communities.<br><br>Maintain the total extent and spatial distribution of intertidal mud.<br><br>[Maintain OR Recover OR Restore] the abundance of listed species*, to enable each of them to be a viable component of the habitat. | Commercial fishing; Intertidal handwork: Handworking (access from vessel)<br><br>Intertidal handwork: Handworking (access from land)<br><br>Miscellaneous: Crab tiling<br><br>Bait collection: Digging with forks | • See Annex 2 for pressures audit trail | Within the Devon Avon Estuary MCZ, there have been no crab tiles present since 50 were observed in 2003/4 on the intertidal mud. Hand gathering and bait digging, are known to occur on the intertidal mud on the estuary, which is known to contain the tentacled lagoon worm | Based on the current levels of these activities on the Devon Avon Estuary there is not believed to be a significant impact of the shore-based activities on the protected features assessed | Yes,<br><br>Management measures could include:<br><br>1. Monitor activity levels<br>2. Potential introduction of a new Hand Working Permit Byelaw to manage the use of crab tiles, bait digging and many other hand gathering types of fishing activity. |

| | | | | | | |
|---|---|---|---|---|---|---|
| Intertidal sand and muddy sand | See above | Commercial fishing;<br>Intertidal handwork: Handworking (access from vessel)<br><br>Intertidal handwork: Handworking (access from land)<br><br>Miscellaneous: Crab tiling<br><br>Bait collection: Digging with forks | • See Annex 2 for pressures audit trail | See above | See above | See above |
| Moderate energy intertidal rock | See above | Commercial fishing;<br>Intertidal handwork: Handworking (access from vessel)<br><br>Intertidal handwork: Handworking (access from land)<br><br>Miscellaneous: Crab tiling | • See Annex 2 for pressures audit trail | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | Bait collection: Digging with forks | | | | |
| Tentacled lagoon-worm (Alkmaria romijni) | Maintain the population size within the site.<br><br>Maintain the reproductive and recruitment capability of the species.<br><br>Maintain the presence and spatial distribution of the species.<br><br>Maintain connectivity of the habitat within sites and the wider environment to ensure larval dispersal and recruitment, and / or to allow movement of migratory species.<br><br>Maintain the extent and | Commercial fishing; Intertidal handwork: Handworking (access from vessel)<br><br>Intertidal handwork: Handworking (access from land)<br><br>Miscellaneous: Crab tiling<br><br>Bait collection: Digging with forks | • See Annex 2 for pressures audit trail | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | spatial distribution of the following known supporting habitat: intertidal mud. | | | | | |

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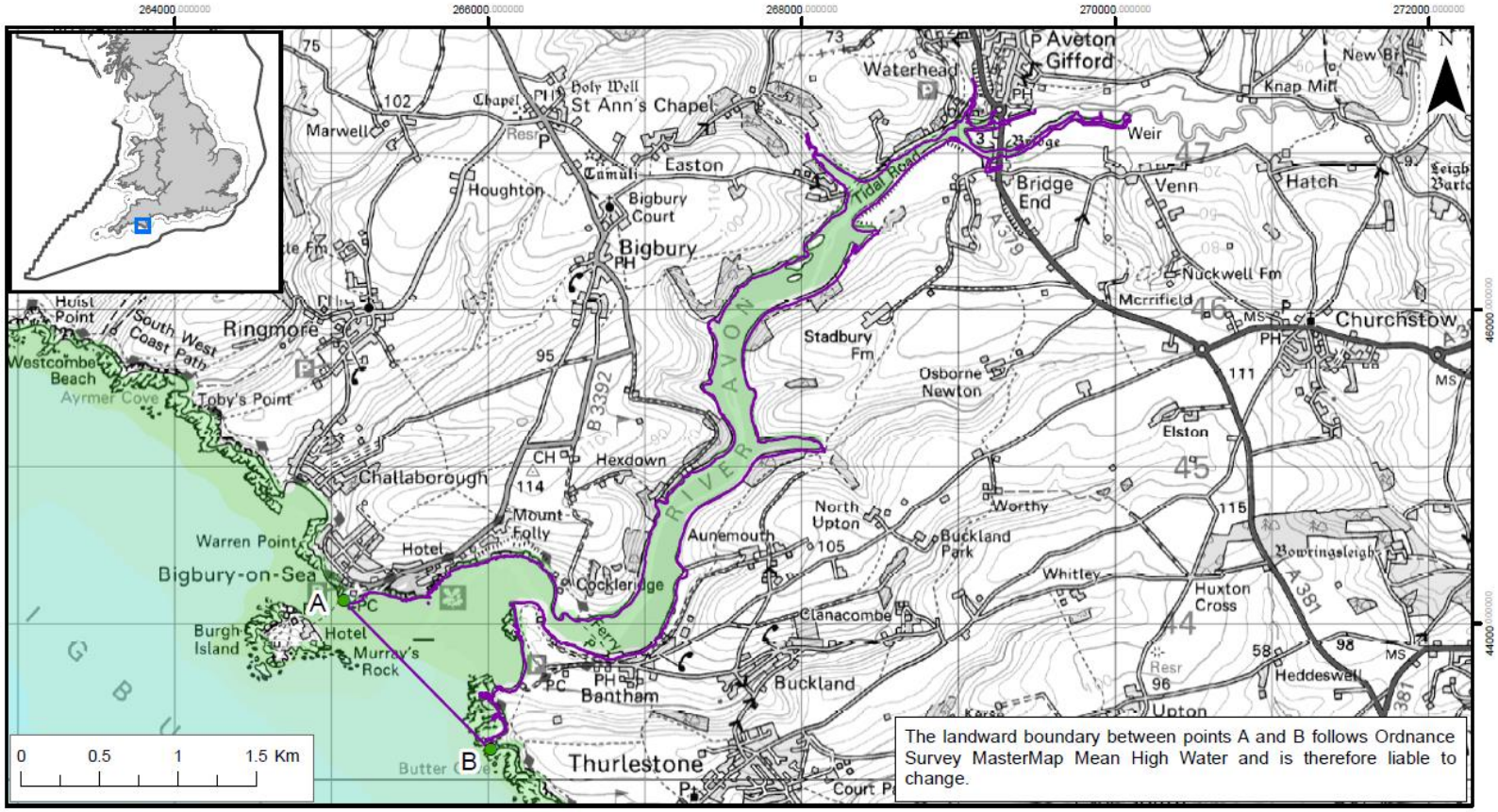
# Annex 1: Site Map(s)




**Devon Avon Estuary MCZ Boundary**

- Marine Conservation Zone
- MCZ boundary co-ordinates
- UK Continental Shelf
- 12nM Territorial Seas Limit
- Land

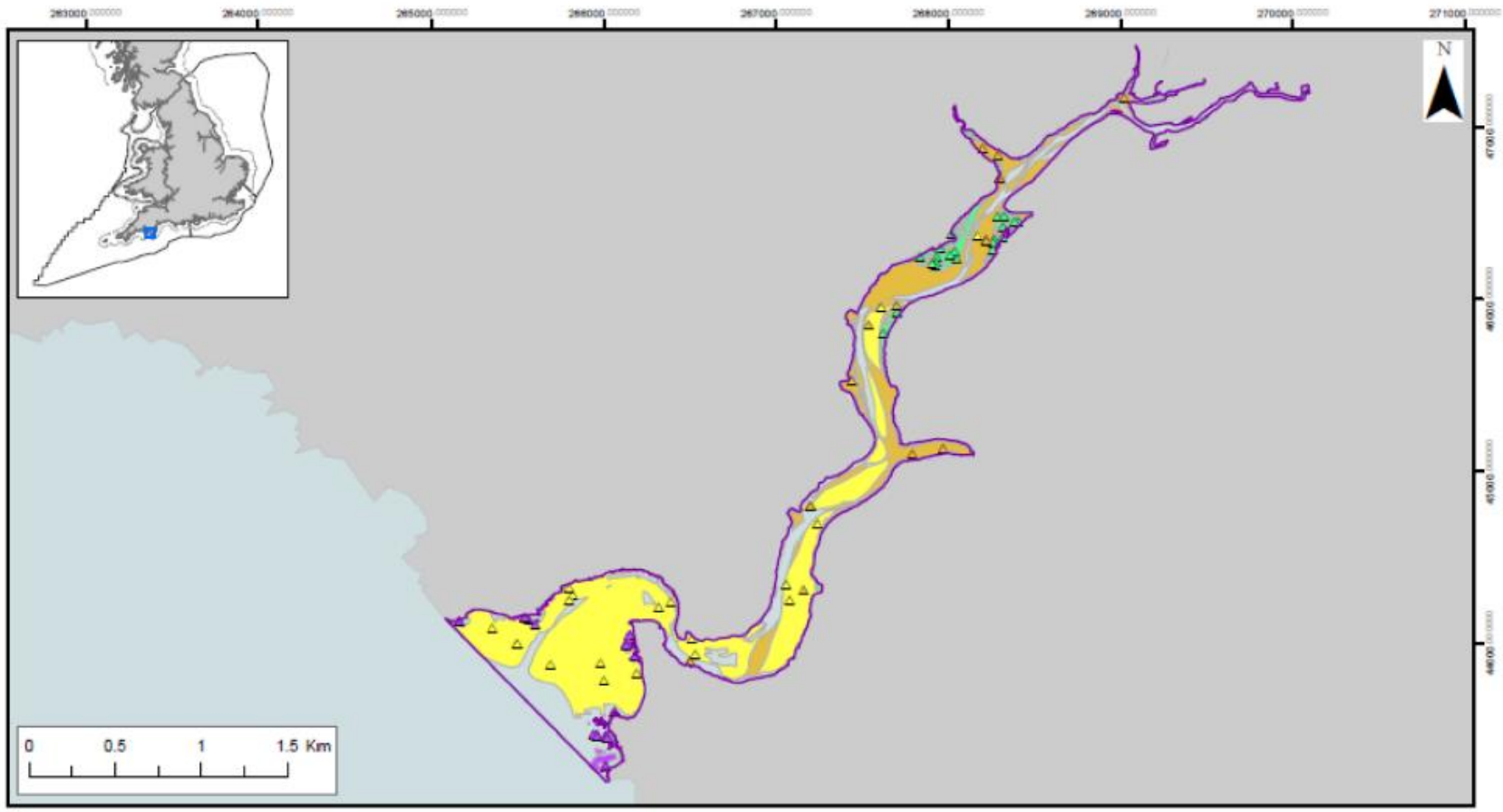
| Point | Lat | Long |
|---|---|---|
| A | 50° 16' 54.410" N | 3° 53' 42.226" W |
| B | 50° 16' 24.493" N | 3° 52' 53.862" W |

**Depth Areas (metres)**

| | |
|---|---|
| -20.0 - -10.0 | 25.1 - 50.0 |
| -9.9 - -5.0 | 50.1 - 100.0 |
| -4.9 - 0.0 | 100.1 - 250.0 |
| 0.1 - 5.0 | 250.1 - 500.0 |
| 5.1 - 10.0 | 500.1 - 1000.0 |
| 10.1 - 25.0 | |



**Figure 1 – Devon Avon Estuary MCZ**




**Devon Avon Estuary MCZ**
**Broad Scale Habitats**

- Marine Conservation Zone
- Regional MCZ Project Area
- 12nM Territorial Seas Limit
- Sea
- Land

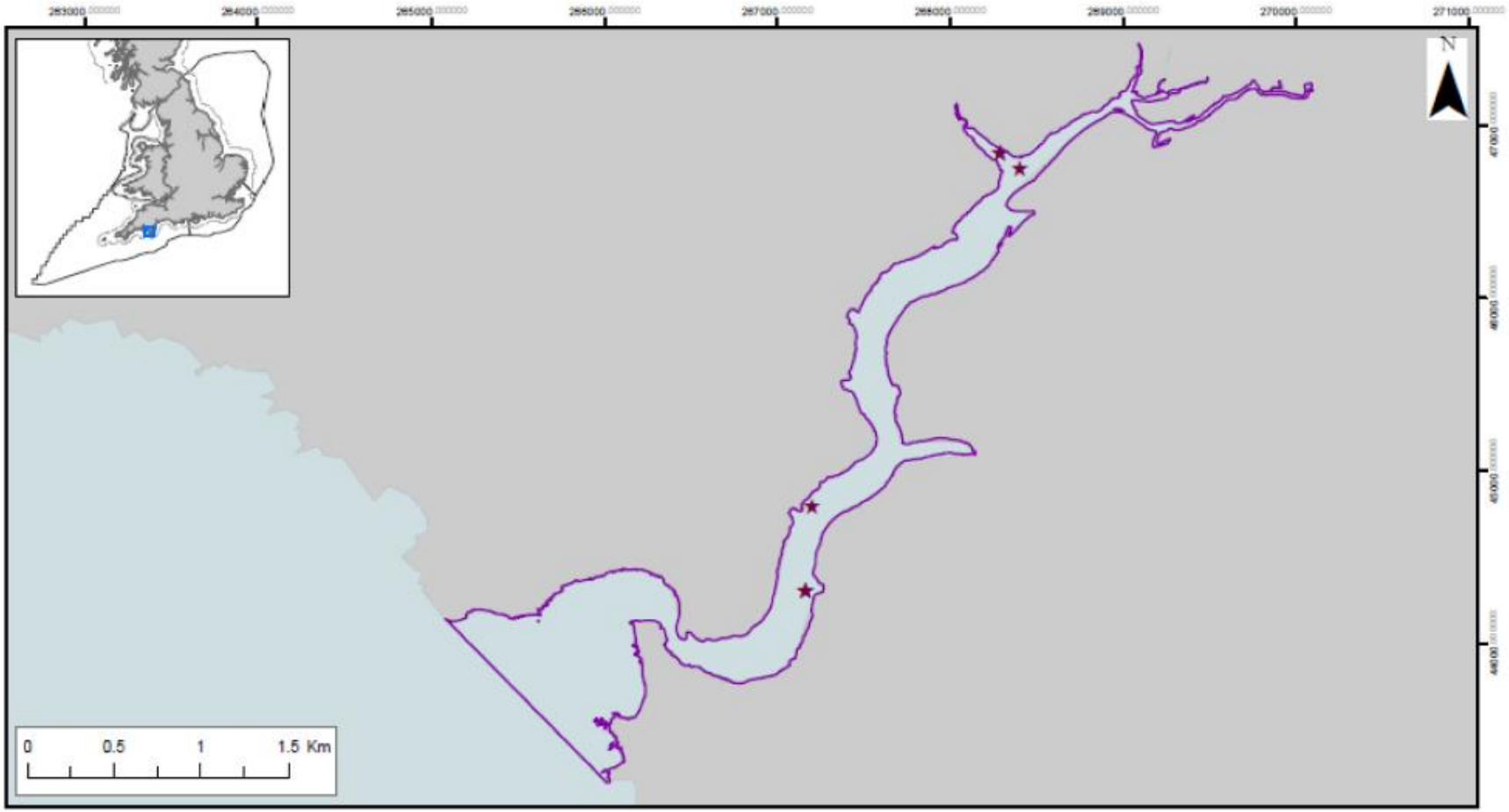
**Features designated in 2019**

- Moderate energy intertidal rock (A1.2)
- Intertidal sand and muddy sand (A2.2)
- Intertidal mud (A2.3)
- Coastal saltmarshes and saline reedbeds (A2.5)

△ Groundtruthing sampling points, such as diver survey, grab sampling, drop down video, walk over survey or core sampling

Shaded areas represent habitats mapped according to data originating from surveys and mathematical models


Reference: Theme ID: 1477647
Map Projection: British National Grid




**Devon Avon Estuary MCZ**
**Features of Conservation Importance**

- Marine Conservation Zone
- Regional MCZ Project Area
- 12nM Territorial Seas Limit
- Sea
- Land

**Features designated in 2019**

- ★ Tentacled lagoon-worm (*Alkmaria romijni*)

# Annex 2: Pressures Audit Trail

| **Fishing Activity Pressures:** Shore-based activities | **Habitat** | | | | **Species** | |
|---|---|---|---|---|---|---|
| | **Coastal saltmarshes and saline reedbeds** | **Moderate energy intertidal rock** | **Intertidal mud** | **Intertidal sand and muddy sand** | **Tentacled lagoon-worm** | **Screening Justification** |
| | | | | | | |
| Abrasion/disturbance of the substrate on the surface of the seabed | S | S | S | S | S | IN – Trampling associated with these activities may cause pressure to the features assessed. Need to consider spatial scale/intensity of activity to determine likely magnitude of pressure |
| Habitat structure changes - removal of substratum (extraction) | S | S | S | S | S | IN - Need to consider spatial scale/intensity of activity to determine likely magnitude of pressure |
| Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion | S | S | S | S | S | IN – Need to consider spatial scale/intensity of activity to determine likely magnitude of pressure |
| Removal of non-target species | S | S | S | S | IE | IN - Need to consider spatial scale/intensity of activity to determine likely magnitude of pressure |
| Removal of target species | | S | S | S | | IN - Need to consider spatial scale/intensity of activity to determine likely magnitude of pressure |

| | | | | | | |
|---|---|---|---|---|---|---|
| Visual disturbance | | NS | | NS | | IN - Need to consider spatial scale/intensity of activity to determine likely magnitude of pressure |
| Deoxygenation | NS | S | NS | S | NS | OUT – Insufficient activity levels to pose risk at level of concern |
| Hydrocarbon & PAH contamination | NA | NA | NA | NA | NA | OUT - Not applicable |
| Introduction of light | | S | NS | S | | OUT - Insufficient activity levels to pose risk of large scale pollution event |
| Introduction or spread of invasive non-indigenous species (INIS) | S | S | S | S | IE | OUT – Insufficient activity levels to pose risk of large scale pollution event |
| Litter | S | NA | NA | NA | NA | OUT – Insufficient activity levels to pose risk of large scale pollution event |
| Synthetic compound contamination (incl. pesticides, antifoulants, pharmaceuticals) | NA | NA | NA | NA | NA | OUT - Not applicable |
| Transition elements & organo-metal (e.g. TBT) contamination | NA | NA | NA | NA | NA | OUT - Not applicable |