# APPENDIX No. 7

**Qualitative Surveys at Tawin**
**By**
**AQUAFACT**

# Qualitative Studies in Tawin

Produced by

## AQUAFACT International Services Ltd

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# 1. Introduction

Three areas on Tawin headland were identified for qualitative surveys:

1. Mweeloon Lagoon,
2. Glasheen Island and
3. Tawin West.

These are shown on Figure 1.


**Figure 1.** Locations of three areas selected for qualitative survey work

# 2. Materials and Methods

The following qualitative survey techniques were used:

1. Walk over surveys using photography and qualitative sampling of stony bank, salt marsh and intertidal mud, sand and reef habitats in each area. The sampling method included observations on the sediment types present *e.g.* mud, sand, shell debris, stones, bed rock, macroalgal species and % cover, obvious macrofauna, casts and estimate of REDOX depth.
2. Rocky shore transects to record macrophytes and macrofauna at HW, MW and LW. Identification was carried out in the field.
3. Aerial photographic surveys were carried out at each location. A Phantom 2 drone was used with a GoPro Hero 4 camera (see Figure 2) to work with a 2.4 Ghz Futaba T8J transmitter with a HD monitor and a 5.8Ghz video receiver for line of sight flight.

**Figure 2**. Drone and camera

Survey work was carried out at Spring tides (April 26th – 28th, 2017, minimum predicted low water 0.34m) to ensure that maximum areal mapping of the intertidal habitat was achieved. Winds were light easterly and weather conditions were sunny with no rain.

# 3. Results

## 3.1 Mweeloon Lagoon (see Appendix 1 for a selection of photographs)

Mweeloon Lagoon is the body of water to the north of the access road into Tawin (see Figure 1 above). Its main access to the open sea is via an opening in its northwest corner. This is a silled opening which creates an asymmetrical tide that ebbs for *ca* 9 hours and floods for *ca* 3 hours. There is one other small access channel to the sea, Mweeloon Channel (see Figure 3 below), but this only functions in *ca* the last hour before and 1 hour after High Water Spring tides. Within the lagoon, a channel under Ballynacloghy Bridge connects the mainland with Tawin East that links Mweeloon Lagoon with the body of water to the south of the road. (Just to the west of the bridge, there is a small culvert under the road that that links Mweeloon Lagoon with the body of water to the south).

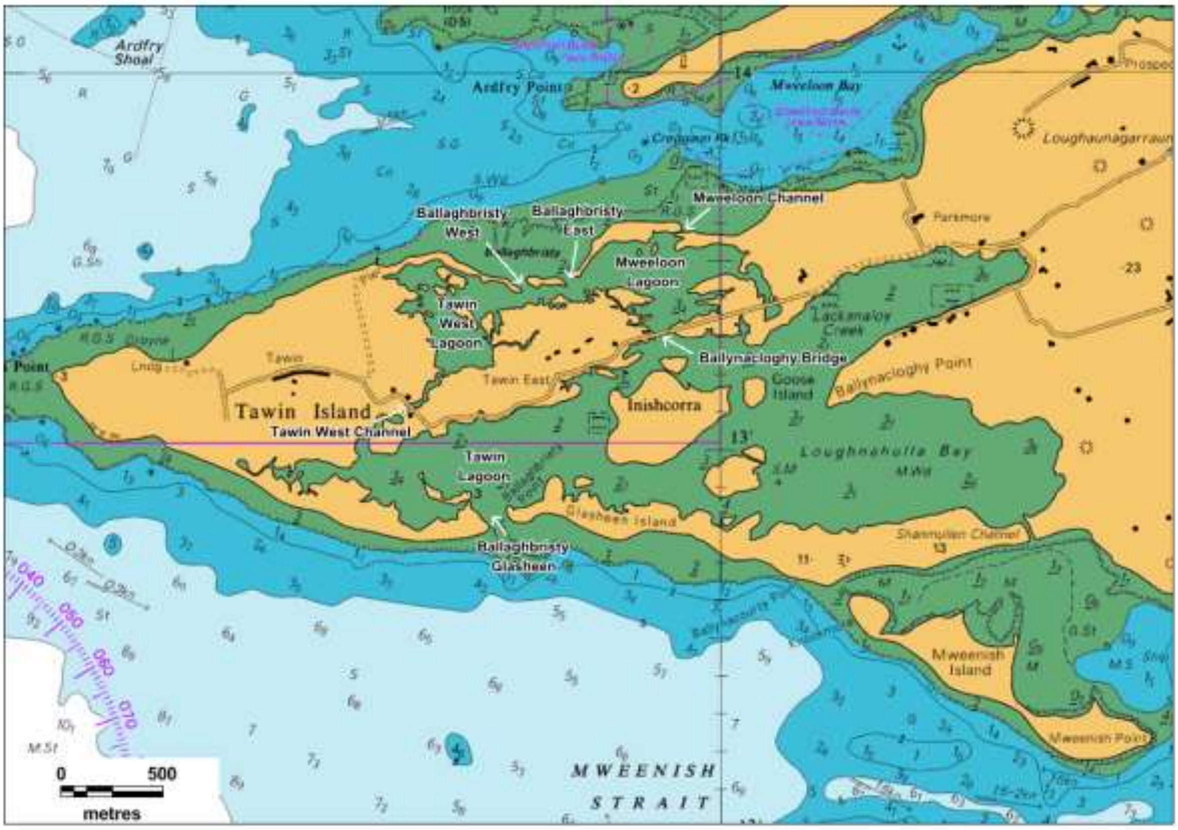


**Figure 3**. Site specific place names for Tawin Island

East of the bridge, there are two much smaller channels that connect Mweeloon Lagoon with Lackenaloy Creek (see Figure 3). However, as noted for Mweeloon Channel above, these only function in *ca* the last hour before and 1 hour after High Water Spring tides. Salinity was recorded at 32 psu (practical salinity units) at Lackenaloy Creek. The underlying geology is limestone.

### 3.1.1 Stony Bank

With regard to compensatory habitats, perennial vegetation of stony bank is present all along the northern seaward boundary of Mweeloon Lagoon (see Figure 4). In total, the area of stony bank habitat at Mweeloon Lagoon is estimated at *ca* 2.5 ha. Signs of poaching and tracking were recorded along the eastern half of where this habitat was recorded.

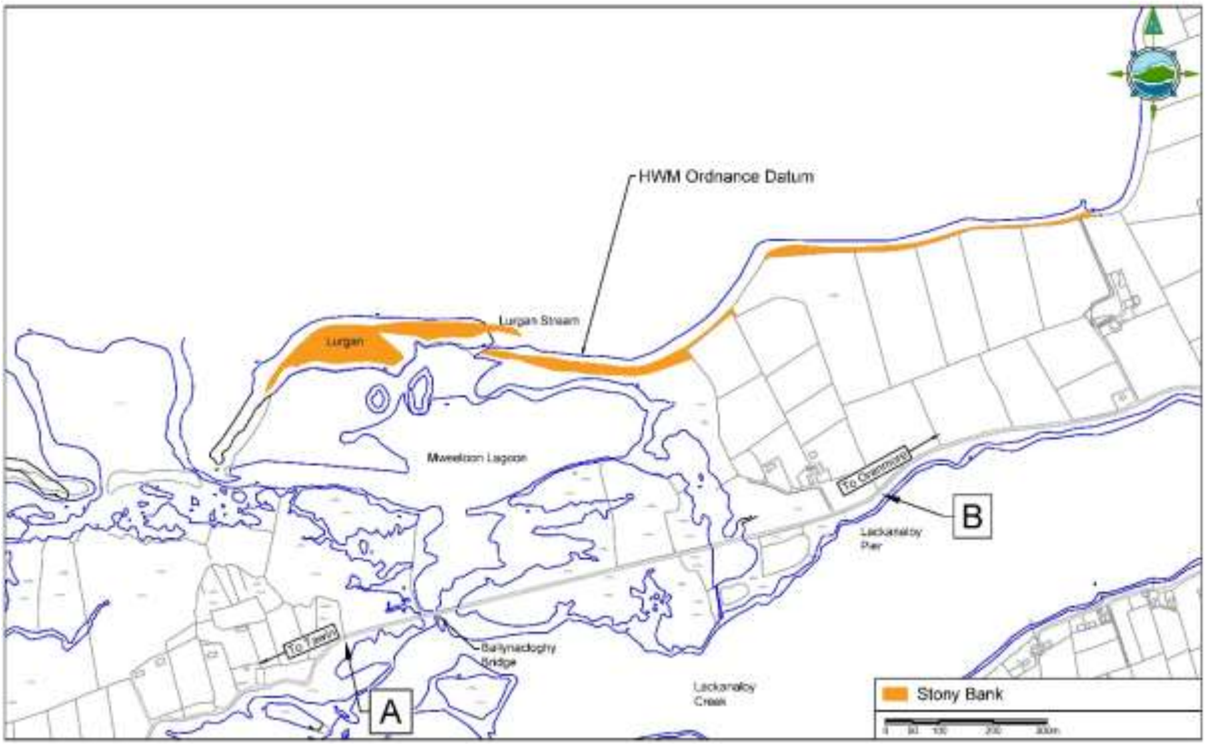


**Figure 4**. Distribution of perennial vegetation of Stony Bank at Tawin

### 3.1.2 Salt Marsh

There are two main areas of salt marsh, one along the eastern border in the townland of Mweeloon and the other along the eastern part of Tawin East (see Figure 5). In total, the area of salt marsh around Mweeloon Lagoon is estimated at *ca* 8.0 ha. Within the Salt Marsh habitat, brackish water pools occur. There was evidence of poaching and tracking by cattle and horses in both areas. Brent Goose droppings were recorded in some sections of the Salt Marsh in Tawin East.

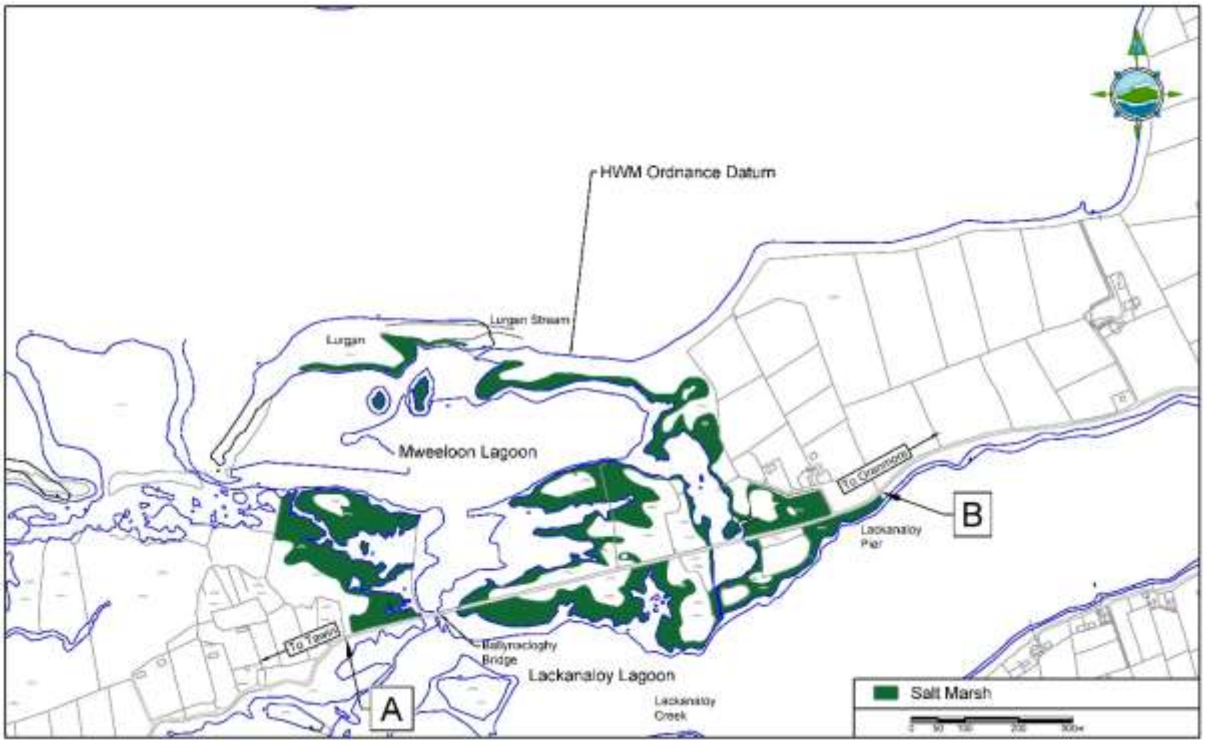


**Figure 5.** Distribution of Salt Marsh at Tawin

### 3.1.3 Intertidal

There are extensive tracts of intertidal habitat, which is a mosaic of mud flats and sand flats and fucoid covered reef exposed at low water, along the northern shore of Mweeloon Lagoon (see Figure 6). Oyster trestles were noted at the eastern end of this habitat. Smaller areas of intertidal habitat occur along the seashore within the lagoon proper. Redox depths varied from 0.5 cms to 2 cms. An area of intertidal sand/shell habitat is present at low water in the northwestern part of the lagoon.

Algae recorded included *Pelvetia canaliculata, Fucus spiralis, F. vesiculosus, F. serratus, Ascophyllum nodosum, Himanthalia* sp., *Codium* sp., *Laminaria hyperborea, Ceramium* sp., *Chondrus crispus, Ectocarpus* sp., *Lomentaria sp. Ulva lactuca, U. intestinalis, Corallina officinalis* and *Palmaria palmata.*

Invertebrate species noted included *Actinia equina,* hydroids indet., *Harmothoe* sp., *Arenicola marina, Spirobranchus triqueter, Spirorbis* sp*. Platynereis dumerilii, Phyllodoce* sp., *Anurida maritima, Apherusa* sp. amphipods indet., *Crangon crangon, Praunus flexuosus, Carcinus maenas, Calliostoma* sp., *Littorina littorea, L. obtusata, L. saxatilis, Nucella lapillus, Mytilus edulis* and Bryozoa indet. A *Mytilus edulis*-dominated community is present at the main opening to the sea in the northwestern part of Mweeloon Lagoon. The total area of intertidal habitat is estimated at *ca* 40.0 ha.

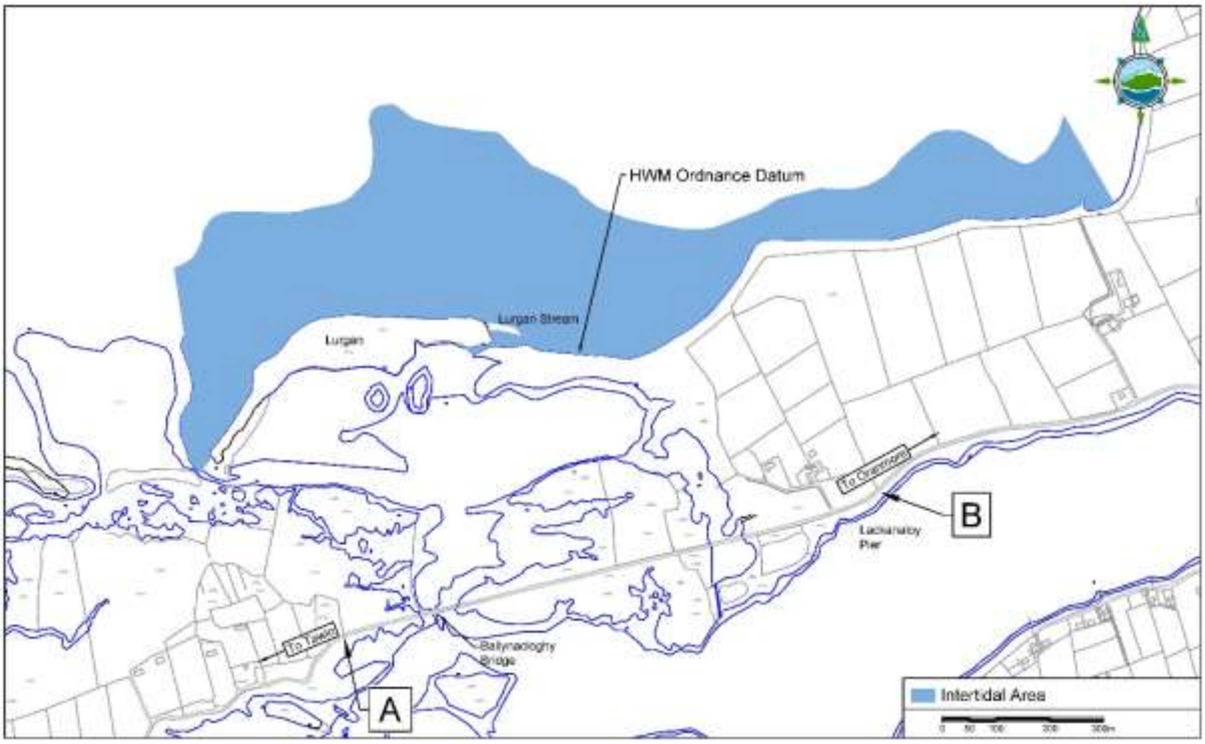


**Figure 6.** Distribution of Intertidal area at Tawin

### 3.1.4 Other Species

Bird species recorded included Brent Goose (present up to April 28th), Merganser, Mallard, Teal, Little Egret, Heron, Redshank, Greenshank, Ringed Plover, Dunlin, Curlew, Whimbrel (present from April 18th), Black headed Gull, Herring Gull, Great black backed Gull, Sandwich Tern (present from April 27th) and Common/Artic Tern (present from April 28th).

Otter spraints were noted along the stony bank habitat.

## 3.2 Glasheen Island (see Appendix 2 for a selection of photographs).

Glasheen Island is a relatively narrow (*ca* 150m) strip of land that extends westwards from Knockmore on Mweenish Island as far as Ballaghbristy Point (see Figure 3). The channel at Ballaghbristy Point is a silled opening that creates an asymmetrical tide that ebbs for *ca* 9 hours and floods for *ca* 3 hours in and out of Tawin Lagoon. There is one other small access channel to the sea, Shanmullen Channel (see Figure 3), but this only functions in *ca* the last hour before and 1 hour after High Water Spring tides. Open sea (Inner Galway Bay) is present off its southern shore and Tawin Lagoon is present to the north of it. Salinity was recorded at 33 psu (practical salinity units) at Ballaghbristy Point. The underlying geology is limestone.

### 3.2.1 Stony Bank

With regard to compensatory habitats, perennial vegetation of stony bank is present all along the southern seaward boundary of Glasheen Island (see Figure 5). In total, the area of stony bank habitat at Glasheen Island is estimated at *ca* 2.31ha. There were signs of poaching and tracking along the eastern half of where this habitat was recorded.

### 3.2.2 Salt Marsh

Salt Marsh is limited in distribution to the northern shore of Glasheen Island. In total, the area of salt marsh around Glasheen Island is estimated at *ca* 10.06ha. Unlike the Salt Marsh habitat recorded at Mweeloon Lagoon, no brackish water pools were recorded. There was evidence of poaching and tracking in the eastern half of Glasheen Island and there was also evidence of machine tracks along its entire extent. No Brent Goose droppings were recorded.

### 3.2.3 Intertidal

Due to the exposed nature of the southern shore to southeasterly, southerly, southwesterly and westerly winds, no sand flat of mud flat habitat occur in that area of Glasheen Island. The shore line is composed of limestone boulders which above half tide are bare of any algae. Algae recorded in this area of intertidal habitat were limited to *Fucus spiralis, F. vesiculosus, F. serratus, Ascophyllum nodosum, Laminaria hyperborea* and small patches of *Ulva lactuca,* corraline crusts and *Corallina officinalis*.

Invertebrate species noted along the southern shore of Glasheen Island included hydroids indet., *Harmothoe* sp., *Spirobranchus triqueter, Spirorbis sp.* amphipods indet., *Carcinus maenas,* *Calliostoma* sp., *Littorina littorea, L. obtusata, L. saxatilis, Nucella lapillus, Mytilus edulis* and Bryozoa indet. A *Mytilus edulis*-dominated community is present at the main opening to the sea at Ballaghbristy Point.

Within Tawin Lagoon to the north of Glasheen Island, there are areas of intertidal habitat, which are a mixture mud flats and sand flats exposed at low water. Redox depth was measured at 1 cm. An area of intertidal sand/shell habitat is present at low water in the central part of the lagoon and to the southeast of Inishcorra.

Algae recorded in this area of intertidal habitat were limited to *Pelvetia canaliculata, Fucus spiralis, F. vesiculosus, Ascophyllum nodosum* and small patches of *Ulva lactuca*.

Invertebrate species noted included hydroids indet., *Harmothoe* sp., *Arenicola marina, Spirobranchus triqueter, Spirorbis sp., Platynereis dumerilii, Phyllodoce* sp., Cirripedia sp., *Apherusa* sp., amphipods indet., *Crangon crangon, Carcinus maenas, Mytilus edulis* and Bryozoa indet.

The total area of intertidal habitat is estimated at 32.06ha.

### 3.2.4 Other Species

Bird species recorded included Great Northern Diver (coming into Summer plumage on April 25th.), Cormorant, Brent Goose (present up to April 28th), Merganser, Mallard, Little Egret, Heron, Redshank, Greenshank, Ringed Plover, Dunlin, Curlew, Whimbrel (present from April 18th), Black headed Gull, Herring Gull, Great black backed Gull, Sandwich Tern (present from April 27th), Common/Artic Tern (present from April 28th), Wheatear (present from April 18th), Peregrine Falcon and Kestrel.

Otter spraints were noted along the stony bank habitat and Harbour seals were frequently seen hauled out on the northeastern tip of Ballybristy Point. The maximum number recorded was 74 on April 20th.

## 3.3 Tawin West (see Appendix 3 for a selection of photographs).

The western extent of Tawin headland is separated from the central island of Tawin East by a channel, Tawin West Channel that links Tawin Lagoon on the south to Tawin West Lagoon to the north (see Figure 3). The specific area of interest extends westwards from Ballaghbristy to Kilcolgan Point including the southern half of Tawin West Channel. Water flow direction in this channel was from south to north under Tawin West Bridge up to *ca* 1 hour before High Water and the flow then reversed to flow from north to south for the last hour of the flood tide. Salinity in this channel was recorded at 31 psu.

### 3.3.1 Stony Bank

With regard to compensatory habitats, as for Glasheen Island, perennial vegetation of stony bank is present only along the southern seaward boundary of Tawin West. In total, the area of Stony Bank habitat at Tawin West is estimated at *ca* 4.3ha. There were signs of poaching and tracking along the eastern half of where this habitat was recorded.

### 3.3.2 Salt Marsh

Salt Marsh is limited in distribution to the inner western parts of Tawin West. In total, the area of Salt Marsh at Tawin West is estimated at *ca* 9.0ha. No brackish water pools were recorded. There was evidence of poaching and tracking in the central parts of Tawin West and along the western part of Tawin West Channel. A drivable track is present in that same section of Tawin West Channel.

### 3.3.3 Intertidal

As noted for Glasheen Island, the exposed nature of the southern shore to southeasterly, southerly, southwesterly and westerly winds means that no sand flat of mud flat habitat occurs in that area of Tawin West. The shore line is composed of limestone boulders which above half tide are bare of any algae. Algae recorded in this area of intertidal habitat were limited to *Fucus spiralis, F. vesiculosus, F. serratus, Ascophyllum nodosum, Laminaria hyperborea* and small patches of *Ulva lactuca*.

Invertebrate species noted along the southern shore of Tawin West included hydroids indet., *Harmothoe* sp., *Spirobranchus triqueter, Spirorbis* sp., *Cirripedia* sp., Amphipoda indet., *Carcinus maenas, Littorina littorea, L. obtusata, L. saxatilis, Nucella lapillus, Mytilus edulis* and Bryozoa indet.

There are areas of intertidal habitat which are a mixture mud flats and sand flats exposed at low water in the inner section of Tawin West. Redox depth was measured from between 0.5 cms to 2 cms.

Algae recorded in this area of intertidal habitat were limited to *Pelvetia canaliculata, Fucus spiralis, F. vesiculosus, Ascophyllum nodosum* and small patches of *Ulva lactuca*.

Invertebrate species noted included hydroids indet., *Arenicola marina, Spirobranchus triqueter, Spirorbis sp., Platynereis dumerilii, Phyllodoce* sp., Cirripedia sp., *Apherusa* sp., amphipods indet., *Crangon crangon, Carcinus maenas and Mytilus edulis.*

The total area of intertidal habitat is estimated at 61.4ha.

The underlying geology is limestone.

### 3.3.4 Other Species

Bird species recorded included Cormorant, Brent Goose (present up to April 28$^{th}$), Merganser, Mallard, Little Egret, Heron, Redshank, Greenshank, Ringed Plover, Dunlin, Curlew, Whimbrel (present from April 18$^{th}$), Black headed Gull, Herring Gull, Great black backed Gull, Sandwich Tern (present from April 27$^{th}$) and Common/Artic Tern (present from April 28$^{th}$).

Otter spraints were noted along the stony bank habitat.

A previously unrecorded shell midden was noted at the southwestern end of Tawin West.

## 4. Discussion

One of **the** most important findings of this survey work is the finding that the marine waters within Tawin Headline can be defined as "lagoon" which is a priority habitat within the EU Habitats Directive. It is estimated that there are *ca* 2km$^2$ of this priority habitat at Tawin alone.

Of the three sections of Tawin Headland examined, the area of Mweeloon Lagoon is seen as most similar to the area where the proposed expansion of the Galway Docks is proposed. This is because it is less exposed as it faces to the northwest and the fetch distance to the north shore is *ca* 5km whereas the fetch distance of Tawin West and Glasheen Island is potentially thousands of kilometres. This is reflected by the clear signs of coastal collapse observed at both these areas. Furthermore, the exposed nature of the southern shore makes it impossible for finer sediments to accrete and give rise to mud and sand flats exposed at low water. The habitat type only occurs in the inner parts of both Glasheen Island and Tawin West.

Observations also showed that although there is some erosion, the northern shoreline of Mweeloon Lagoon is experiencing a lower level of erosion in comparison to the southern shore of Glasheen Island and Tawin West. Given the lower level of exposure along the northern shoreline of Mweeloon Lagoon, sandy sediments can and do accrete there and there are extensive areas of this habitat type at that location. Sea weeds are abundant on this shore whereas macroalgae only occur on the lower half of the southern shore.

The more sheltered nature of the north shore line in comparison to Glasheen Island and Tawin West also means that the stony bank habitat is less frequently disturbed in that area than the much more exposed nature of the southern shoreline.

The sheltered nature of the inner parts of Mweeloon Lagoon give rise to muddy sediments and lug worm casts were noted on the surface of these sediments.

For all of the above reasons, the area of Mweeloon Lagoon is considered to be the preferred location for carrying out the proposed management plan to compensate for habitat loss that arose during the construction of the Galway Harbour Enterprise Park and that will arise from the planned Galway Harbour Extension.

## Appendix 1

## Selection of photographs from Mweeloon Lagoon

Photo. 1. Ballaghbristy East, Mweeloon Lagoon and salt marsh. Shore protection visible on stony bank habitat on the right of the photo.

Photo. 2. *Arenicola* casts in soft intertidal muds within Mweeloon Lagoon.

Photo. 3. Intertidal mosaic habitat on the north shore of Mweeloon Lagoon.

Photo.4. Panoramic view of the southern part of Mweeloon Lagoon with salt marsh and intertidal habitats to the east and west of Balynacloghy Bridge.

Photo.5. Fucoid dominated intertidal reef and mixed sediments on the open sea north shore of Mweeloon Lagoon.

Photo.6. Exposed intertidal sediment habitat within Mweeloon Lagoon.

Photo. 7. HW in SW corner of Mweeloon Lagoon.

Photo. 8. Cattle poaching in the western part of Mweeloon townland.

Photo. 9. Panoramic view of Mweeloon Lagoon looking east. Intertidal mosaic habitat visible in centre front of image, outflow from the lagoon also visible in the same area. Intertidal exposed sand flat visible within the lagoon.

## Appendix 2

## Selection of photographs from Glasheen


Photo. 1. Erosion on southern shore at Glasheen Island.

Photo. 2. Expanse of salt marsh habitat on north side of Glasheen Island.

Photo. 3. Shanmullen Channel.

Photo.4.Tracking damage at Glasheen Island.

Photo. 5. Western end of Glasheen Island showing the opening to the sea at Ballaghbristy Point.

Photo. 6. Panoramic view of Glasheen Island looking east from Ballaghbristy Point.

Photo. 7. Ballaghbristy Point with Brent Geese in the foreground and seals hauled in the background.

# Appendix 3

# Selection of photographs from Tawin West

Photo. 1. Salt marsh and stony bank at Tawin West.

Photo. 2. Poaching at a round feeder, Tawin West.

Photo. 3. Shell midden at Tawin West.

Photo. 4. Stony bank habitat at Tawin West.

Photo. 5. Tracking damage at Tawin West.

Photo. 6. Panoramic view of the southern part of Tawin West showing strip of stony bank habitat along the southern shore and salt marsh habitat (pale green/brown) inside the lagoon.