MILFORD HAVEN WATERWAY
ENVIRONMENTAL SURVEILLANCE GROUP

GRŴP CADW GOLWG AMGYLCHEDDOL
AR DDYFRFFORDD ABERDAUGLEDDAU

Annual Report 2021

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COVER IMAGE

Front cover: The amphipod *Ampelisca diadema* record from MHWESG macrobenthic survey, 2021. Photo: Hull Marine Laboratory.

MILFORD HAVEN WATERWAY ENVIRONMENTAL SURVEILLANCE GROUP

Dragon LNG

Natural Resources Wales

Pembrokeshire Coast National Park Authority

Pembrokeshire County Council

Port of Milford Haven

Puma Energy Ltd

RWE Generation UK plc

South Hook LNG Terminal Company LTD

Valero Energy Ltd

Valero Pembrokeshire Oil Terminal Ltd

Neyland Yacht Haven Ltd

Pembrokeshire Coastal Forum

Contact the MHWESG by e-mail at
mhwesg@gmail.com or see https://www.mhwesg.org.uk/

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Natural Resources Wales

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Pembrokeshire County Council

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WG Environment & Climate Change

UK Environmental Observation Framework secretariat

UK Marine Monitoring and Assessment Strategy secretariat

JNCC / UK Marine Monitoring and Assessment: Healthy and Biologically Diverse Seas Evidence Group

UK Marine Monitoring and Assessment: Clean and Safe Seas Evidence Group

Dwr Cymru-Welsh Water

EA Environmental Monitoring and Assessment, Peterborough

Pembrokeshire Marine SAC officer

Skomer MCZ personnel in NRW

Skomer MCZ Advisory Committee Chair

Milford Haven Waterway Environmental Surveillance Group
Report 2018

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Chair's Foreword

I said last year that 2021 was going to be a busy year and it was, despite the ever-present impact of COVID 19. Following a relatively lengthy hiatus for several of our cyclical projects (during which time we built up a healthy bank balance!) we were finally in a position to start commissioning some alongside the completion of our more frequent annual surveys such as the shelduck survey. In short, we got going on sediment contamination monitoring and macrobenthic survey, details of which are within.

We also took the opportunity to take stock of potential contaminants in the waterway from industry, agricultural catchments and municipal outlets. The University of Plymouth carried out a review of likely contaminants from these sources, their persistence and whether they should be included in future monitoring. The information will greatly inform the scope of future projects such as one we are considering for 2022/3 on the analysis of contaminants in dated core samples.

All this work would not have been possible without the hard work and dedication of our Project Co-ordinator and MHWESG members, who have spent their valuable time putting together project scopes, conducting timely reviews of tenders received as well as the everyday tasks. Thank you all.

Paul Howells, Dragon LNG Ltd

Chair MHWESG

Cyflwyniad y Cadeirydd

Nodais y llynedd y byddai 2021 yn flwyddyn brysur ac felly y bu ar waethaf effaith hollbresennol COVID 19. Ar ôl cyfnod o ddiddymdra cymharol faith yn achos nifer o'n prosiectau cylchol (cyfnod er hynny pan welwyd cynnydd yn ein cyfrif banc) roeddem o'r diwedd mewn sefyllfa i ddechrau comisiynu rhai prosiectau ochr yn ochr â chwblhau ein harolygon blynyddol a wneir yn amlach megis yr arolwg o hwyaid yr eithin. Mewn gair, aethpwyd ati i fonitro halogiad gwaddod ac i wneud arolwg macrobenthig, a cheir manylion amdanynt yn yr adroddiad.

Manteisiwyd ar y cyfle hefyd i gymryd stoc o ddifwynwyr posib yn y ddyfrffordd o ddiwydiant, o dalgylch amaethyddol ac o arllwysfeydd trefol. Gwnaeth Prifysgol Plymouth arolwg o ddifwynwyr posib o'r ffynonellau yma, eu dycnwch ac a ddylid eu cynnwys ai peidio ym monitro'r dyfodol. Bydd y wybodaeth yn werthfawr wrth i ni bennu maes prosiectau'r dyfodol megis yr un rydym yn ei ystyried ar gyfer 2022/23 ar ddadansoddiad difwynwyr mewn samplau craidd wedi'u dyddio.

Ni fyddai wedi bod yn bosibl gwneud yr holl waith yma heb ymdrech lew ac ymroddiad ein Cyd-Gysylltydd Prosiect ac aelodau Grŵp Gwyliadwriaeth Amgylcheddol Dyfrffordd Aberdaugleddau (MHWESG) sydd wedi treulio'u hamser gwerthfawr yn pennu maes prosiectau, yn gwneud arolygon amserol o dendrau a dderbyniwyd ynghyd â'r tasgau dyddiol. Diolch yn fawr.

Paul Howells, Dragon LNG Ltd

Cadeirydd MHWESG

1. Introduction

This is the 21st annual report of the Milford Haven Waterway Environmental Surveillance Group, covering the period from January to December 2021.

2021 marked the second sampling event for the sediment contaminant programme first established in 2018. An expansion of the list of contaminants analysed in 2021 (section 2.1) was informed by a MHWESG commissioned review of contaminants relevant to the Milford Haven Waterway. The purpose of this review of contaminants was to provide a list of both typical and emerging contaminants for the specific setting of the Milford Haven Waterway in the context of its agricultural and urban setting as well as existing and historical industries. This review can be found in section 2.2.

The macrobenthic survey has been established since 2008 (2.3). Sampling for the macrobenthic survey took place at the same time of year as the aforementioned sediment contaminant survey. 2021 is the first year when sampling for both surveys took place at the time time, and it is intended that both surveys will continue on the same 3 yearly cycle from now on.

The well-established annual shelduck survey is reported in section 2.3, as well as a long-standing synthesis of the Wetland Bird Survey data for the Milford Haven Waterway in section 2.4.

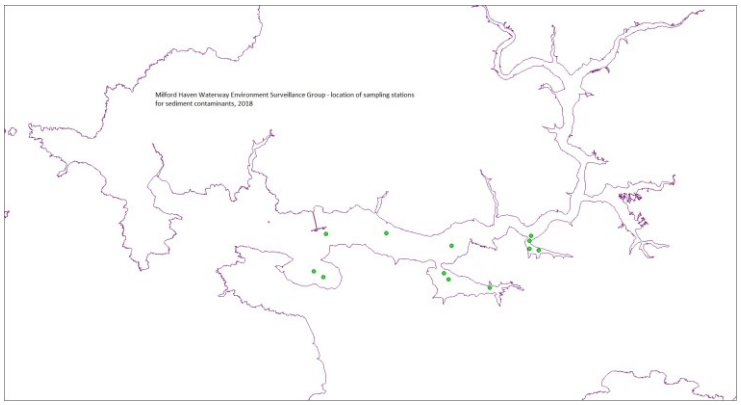
More general information on the MHWESG and summaries of reports are available at http://mhwesg.org.uk. Full reports for all MHWESG commissioned work are available from mhwesg@gmail.com.

2. MHWESG projects 2021

2.1 Milford Haven Waterway sediment contaminant survey, 2021

Field work – Natural Resources Wales
Laboratory analysis – University of Plymouth and Socotec

The MHWESG has commissioned numerous reviews relating to sediment contaminants in the Milford Haven Waterway over the years (see Appendix 3). A consistent recommendation from these has been the need to establish surveillance of sediment contamination in the waterway as a core component of the MHWESG's routine environmental quality surveillance. Having intercalibrated older and newer methods, and considered the historical baseline and trends in sediment contaminants (Little 2017), the MHWESG initiated a programme of routine sediment contaminant surveillance in September 2018. Dr. David Little was commissioned to provide advice on the scope of the laboratory analysis and sampling design.



Sediment contaminant sampling stations in the Milford Haven Waterway, 2021

This survey was repeated in 2021, where once again, Natural Resources Wales (NRW) undertook MHWESG's sediment sampling at the same time as their own. Apart from obvious financial and logistical benefits, MHWESG's data can be used alongside NRW's data to provide a more comprehensive coverage of the waterway. However, the MHWESG's sampling strategy is designed such that it can stand alone from NRW's data to provide information specific to the needs of the MHWESG. Dr David Little was commissioned again to provide advice on laboratory analyses.

Sediment samples are collected from 12 stations in the waterway. In addition to the repeat of analyses of metals, total hydrocarbons and polyaromatic hydrocarbons carried out in 2018, the list of contaminants analysed in 2021 was expanded to also include:

- Polychlorinated Biphenyls (PCBs)
- Polybrominated Diphenyl Ethers (PBDEs)
- Hexabromocyclododecane (HBCDD)
- Organochlorine pesticide (OCPs)

Analysis of total hydrocarbon concentrations by ultraviolet fluorescence (UVF) spectrometry used Forties Blend crude oil as the calibrant in 2018. This was to enable comparison with numerous samples taken in follow-up studies of the 'Sea Empress' oil spill that used the Forties Blend crude cargo oil as the calibrant. Limited laboratories have access to the correct Forties Blend crude cargo oil that can be used as a calibrant. Consequently, the MHWESG made the

Soft mud sample in Day Grab before taking sub-samples for lab analysis.

decision to undertake an intercalibration exercise whereby total hydrocarbon concentrations were gathered using UVF spectrometry and Forties Blend crude oil as the calibrant, UVF spectrometry and a commercially available calibrant, and also by gas chromatography with flame-ionization detection (GC-FID). This intercalibration exercise will mean that the MHWESG has more options when it comes to selecting laboratories to carry out measurements of total hydrocarbon concentrations in future sampling episodes.

Once a few sampling events have occurred, the data will be added to the established timeline of sediment contaminants (Little 2017). Sediment contamination data will also complement interpretation of macrobenthic surveillance undertaken by the group (see section 2.3).

2.2 Provision of advice to the MHWESG on contaminants in the Milford Haven Waterway, Pembrokeshire

Report prepared by University of Plymouth Enterprise Ltd

Executive Summary

The work detailed is a review of contaminants relevant to the Milford Haven Waterway (MHW), providing a recommended list of both typical and emerging contaminants for monitoring quality of water, sediment and biota for the specific setting of the MHW (i.e. its existing and historical industries, as well as its agricultural and urban settings). This document and supplementary material also discuss analytical techniques to support a standardised set of procedures relating to the contaminant list provided.

The key deliverables of the project were the review of available evidence to identify the full range of contaminants relevant to MHW in water, sediment and biota and to document details of these contaminants in a supplementary Excel database. Substances were graded in terms of likelihood of occurrence, and with regard to their presence on established lists of substances of concern, based upon criteria agreed with the Milford Haven Waterway Environmental Surveillance Group (MHWESG). A list of likely analytical procedures for analyses of these substances by commercial laboratories was provided alongside a list of substances recommended for monitoring in MHW.

A wide range of substances is currently included in MHW monitoring programmes, largely underpinned by the extensive monitoring undertaken by Natural Resources Wales (NRW). Based upon available data, evidence was lacking with regard to a number of key, relevant substances in water, sediment and biota, and it was subsequently recommended that future monitoring could include analyses for hexabromocyclododecanes (HBCDD), dioxins and furans and diethylhexylphthalate (DEHP). In addition, perfluorooctane sulfonate (PFOS), which is currently monitored in water, should be considered for monitoring in sediment and biota, given potential for increased partitioning to sediments in saline waters. Future monitoring in deep sediment cores should include the metals (As, Cd, Cr, Cu, Fe, Hg, Mn, Ni, Pb, Zn), PAHs and PCBs monitored in historic sediment cores alongside additional, legacy substances: the 'drins' (aldrin, dieldrin, endrin), dichlorodiphenyltrichloroethane (DDT), heptachlor, hexachlorobenzene (HCB), hexachlorocyclohexane (HCH), tributyltin (TBT), polybrominated diphenyl ethers (PBDE) and perfluorooctane sulfonate (PFOS).

2.3 Milford Haven Waterway sediment macrobenthic survey, 2021

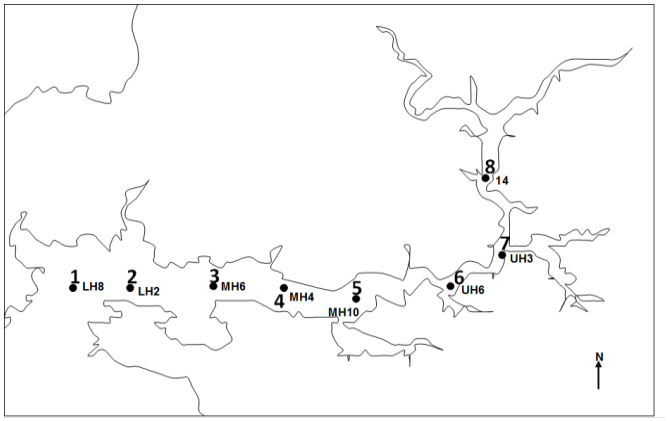
Field work – Natural Resources Wales
Laboratory analysis – University of Hull

In 2006, the MHWESG commissioned a review of past sediment macrofauna data in the Milford Haven Waterway, and this resulted in a recommendation for the establishment of a subtidal macrobenthic surveillance programme. The MHWESG initiated such a surveillance programme in 2008 at 8 stations (Figure 1), and this was repeated in 2010, 2015, 2017 and most recently in 2021.

In September 2021, sediment samples were collected at the same 8 stations in the Milford Haven Waterway. Natural Resources Wales provided personnel and use of the NRW boat 'Skalmey' as a sampling platform once again.

These results will form part of a future review of the macrobenthic fauna of the Milford Haven waterway once sufficient repeat sampling events have occurred.

Muddy gravel sample in Day Grab.



Macrobenthic sampling stations in Milford Haven Waterway showing new (1-8) and original station names.

Taxonomic Points of Interest from 2021 survey

- **Species new to the United Kingdom**

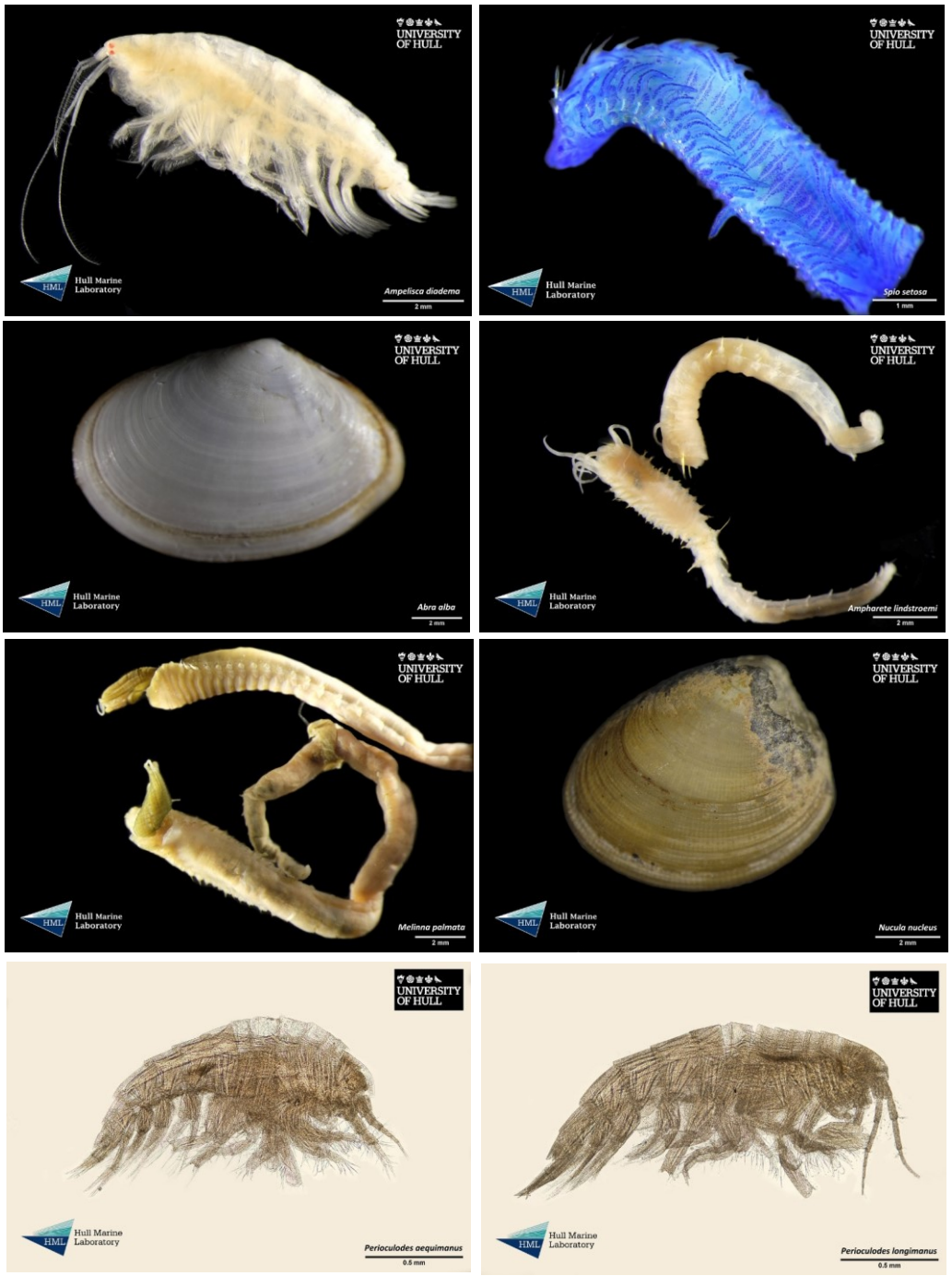
Two specimens believed to be the North American Spionid polychaete *Spio setosa* were recorded from stations 8 and 4. If confirmed, this would be the first occurence of this species in the UK. Specimens are to be verified by renowned polychaete taxonomist Dr. Andrew Mackie, a fellow of the National Museum Wales. With permission or in conjunction with MHWESG, if confirmed HML intend to produce a journal article recording the increase in range of this species and first UK record.

Specimens very similar to the North American Polydorid polychaete *Polydoria colonia* were recorded from station 6, though the difficulties associated with identifying *Polydora* preclude this identification being completely certain.

A vey small specimen of the Mediterranean amphipod Perioculodes aequimanus was also recorded from station 3, which hasn't been recorded from the UK before.

- **Other (previously recorded) Non-Native Species**

Other non-native species recorded from the MHWESG 2021 survey include: the barnacle *Austrominius modestus*, recorded from 9 samples; the ostracod *Eusarsiella zostericola,* recorded from 9 samples; the amphipod *Monocorophium sextonae,* recorded from 3 samples; the Slipper limpet *Crepidula fornicata*, recorded from 15 samples; the Manila clam *Ruditapes philippinarum* recorded from 2 stations; the Sand-gaper *Mya arenaria,* recorded from 2 samples; the bryozoan *Tricellaria inopinata*, recorded from 2 samples; and the seaweed Antithamnionella spirographidis, recorded from 4 samples.



Selection of benthic species from Milford Haven Waterway recorded by Hull Marine Laboratory from 2021 macrobenthic survey.

2.4 Daugleddau Estuary and Milford Haven Waterway: annual surveillance of summer shelduck populations 2021

Jane Hodges, Ecologist

Executive summary

The Daugleddau Estuary and Milford Haven Waterway hold regionally important numbers of shelducks during the winter months. There is also a small summer population that has been the subject of annual surveillance between 1991 and 2020. In 2020, Welsh Government restrictions aimed at controlling the spread of the SARS-CoV-2 virus in response to the pandemic precluded the use of a boat for the two surveys. As a consequence, both surveys were carried out entirely on foot, using the standard BTO Wetland Bird Survey methodology. In 2021, the summer shelduck survey was repeated as part of a programme of environmental surveillance work in the estuary system coordinated by the Milford Haven Waterway Environmental Surveillance Group (MHWESG). The lifting of restrictions in the spring 2021 by the Welsh Government enabled a return to boat surveys supplemented by land-based surveys.

The aims, objectives and methods used to carry out the annual surveillance, and the data obtained, are described in this report.

The data indicate that in terms of the total number of broods seen in the estuary system (14), the 2021 breeding season was (along with the 2019 season) the best since 2006. The 2020 breeding season was less successful than the 2021 season, although it was on a par with the 2018 season. This suggests that the numbers of broods in the estuary system have over the past four seasons, been fluctuating, and there is currently no clear upwards or downwards trend. Although slightly lower than in 2019, the overall mean brood size was higher in 2021 than in 2020 (or in 2018), again suggesting fluctuating productivity levels over the same period of time.

As in previous years, predation (by avian and/or mammalian predators) is likely to have been a (or the most) significant factor affecting the numbers and sizes of broods recorded in the estuary system during the 2021 survey. Adverse weather conditions (e.g., heavy rain accompanied by low temperatures) in late April, May and June can impact on the survival of eggs to hatching and/or recently hatched ducklings. In 2021, it is possible that early-nesting shelducks may have been affected by heavy rain and low temperatures in May e.g., as a result of waterlogging of individual nests. It is unlikely, however, that adverse weather conditions were a significant factor affecting the number of ducklings once they had left their nests or their survival once on the water.

Disturbance e.g., from recreational activities (on land and/or on the water) may affect breeding success and subsequent survival of ducklings. In 2021, levels of water-borne recreation in the estuary system were higher than in recent years, as a consequence of an increase in the number of visitors opting for “stay-cations” in Pembrokeshire during the coronavirus pandemic. Although there is no evidence to suggest that shelducks were adversely affected by water-borne recreation in 2021, the possibility that some disturbance of broods occurred as a result of water-borne recreational activities cannot be ruled out, especially in usually much quieter areas such as up-river from Lawrenny.

Other factors that may have localised impacts on the quality of foraging habitat (hence on shelduck productivity and development and survival of young) include the presence of dense mats of green macro-algae (linked to elevated levels of nutrients in the estuary system) on mud flats at low tide. These are not, however, known or understood.

The number of non-breeding shelducks recorded during the June survey was 29, twice the number recorded in 2020, but lower than in 2019 and 2018. A review of the 1992-2019 data carried out by the BTO suggested a strong correlation between the trend in the number of adults in the estuary system in the winter (and which subsequently stay on in the estuary system in the spring) and national trends, and that the adult population is subject to the same influences as is the population at regional (Wales) and national (UK) levels.

Data collected for other wetland birds once again underlined the importance of the estuary system during migration, especially for species such as curlew.

The report concludes with a recommendation that the annual surveillance of the summer shelduck population in the estuary system be continued as part of the MHWESG's annual work programme. In addition to this recommendation, potential lines of inquiry into the distribution and abundance of the favoured prey of shelducks (the mud snail *Peringia ulvae)* and links to factors affecting environmental conditions in the estuary system are identified for further consideration by the MHWESG and/or individual group members.

2.4 Wildfowl and wader counts on the Milford Haven Waterway 2020-2021

Annie Haycock, Pembrokeshire WeBS Coordinator

Executive Summary

The Wetland Bird Survey was carried out on the Milford Haven Waterway and Cleddau Estuary system (here-in after referred to as the Cleddau Estuary complex) between September 2020 and March 2021 with additional counts for June and July 2020 made by Jane Hodges during the annual survey of summer shelduck populations. Due to Covid-19 movement restrictions, these summer counts were incomplete, as were the core winter counts in January and February.

The methodology used followed that set out in the BTO WeBS Counters Handbook.

A total peak count of 28,131 birds between November and February confirms that the estuary complex is of international importance for its winter waterbird populations. Including counts of migrating birds (notably curlew) in July takes this total to 30,292. This peak count is above average for the site, as often happens when there is a large influx of lapwing and golden plover.

The levels of "National Importance" for many water birds were revised in 2019, and only four species now qualify (based on a five-year mean): wigeon (max. 7485 in November), greenshank (max 63 in October), and Dunlin (3994 in January). Light-bellied Brent Geese (67 in November) of the Greenland/Canadian population are now considered separately and the increasing numbers on the Cleddau are of national importance.

Curlew (536 in September) were apparently at their lowest level since 1999-2000, a reflection of the decline recorded across their range, however this also reflects the covid-related difficulties of counting during July 2020 when numbers would normally have been higher.

Shelduck (379 in January) were still well below the qualifying level.

The monthly total numbers of birds recorded between September and January was higher than the average of the past twenty years.

Comparison of counts with the national report for 2019-20 (the most recent that is available) show that for most species, the local population trends are similar to those experienced nationally.

Comparisons with the all-Wales 5-year averages show that the Cleddau complex is still one of the top five sites for fifteen species, topping the table for wigeon, lapwing and golden plover.

The Cleddau Estuary complex is the most important site in Wales for wigeon, golden plover and lapwing, and one of the top five sites in Wales for twelve other wetland bird species.

3. Work programme 2022

Apart from the annual shelduck survey and synthesis of wetland bird species, 2022 would be scheduled to be a quiet field survey year.

This scenario however, makes it an ideal window of opportunity to progress isotope dating and contaminant analyses of deep cores at carefully selected locations in the Milford Haven Waterway. The objective of this work would be to determine the status of sediment contamination generally over the last few decades, with particular emphasis on banned contaminants e.g. tributyl tin (TBT) and dichloro-diphenyl trichloroethane (DDT) and emerging contaminants.

One of the recommendations of the British Trust for Ornithology review in 2020 of the 30 year long summer shelduck dataset was to extract additional data from field notes and reports to be entered with the archived data. It is planned to embark on this work in 2022, along with reformatting the structure of the data archive.

Implementation of these projects is subject to there being sufficient available finances.

Appendices

Appendix 1: Purpose and terms of reference

The Milford Haven Waterway[1] is an extensive natural inlet of the sea with a long and distinguished maritime history. Its deep waters provide a natural harbour of significant economic importance. It is one of the best examples of a ria system in Britain and supports a particularly diverse range of high quality marine and estuarine habitats and biological communities.

The identification and consideration of political and management issues or the setting of environmental standards are specifically excluded from these Terms of Reference. However, group members are free, and are expected to use the group's outputs to help meet their own requirements.

Purpose

To provide high quality environmental information to enable members of the Group, and other authorities and industry working in and adjacent to the Waterway, to contribute to the maintenance and enhancement of the rich and diverse marine environment of the Waterway.

Terms of Reference

The Milford Haven Waterway Environmental Monitoring Steering Group will:

1. Maintain surveillance of the quality of the marine physico-chemical environment, marine biology and ornithology of the Milford Haven Waterway

2. Undertake surveillance of the foreshore, seabed and waters of the Milford Haven Waterway from a line between St Anne's Head and Sheep Island to the tidal reaches of the Eastern and Western Cleddau Rivers and other tributaries to normal tidal limits by:

2.1 keeping under review all relevant survey, surveillance and monitoring;

2.2 commissioning surveys to fill gaps in knowledge and to establish baselines;

2.3 undertaking surveillance projects;

2.4 maintaining a literature and information database.

3. Jointly maintain, and keep under review, a prioritised programme of survey and surveillance projects.

4. Share technical output equally under joint ownership and copyright.

5. Function as a technical, science based, group.

6. Form and appoint specific sub-groups to undertake specific responsibilities as required.

[1] The term Waterway in this document specifically refers to the waters, seabed and foreshore of the Milford Haven Waterway and the Daugleddau Estuary from a line between St Anne's Head and Sheep Island to the tidal reaches of the Eastern and Western Cleddau Rivers and other tributaries to normal tidal limits.

7. Publish an annual report which will comprise a summary of work undertaken, the executive summaries from individual project reports, a financial statement and the planned work programme.

8. Make its output available to the wider community in addition to its membership.

Membership and Funding

Membership is comprised of statutory authorities, industry and others with an interest in the environmental quality of the Waterway. Membership will be at the invitation and discretion of the Group's existing members.

Each member will contribute to the functioning of the group, either in monetary terms or 'in kind'.

Appendix 2: Milford Haven Waterway Environmental Surveillance Group Knowledge Collaboration Agreement

Agreement dated 17 January 2017 between:

1) Dragon LNG Limited
2) Milford Haven Port Authority
3) Natural Resources Wales
4) Pembrokeshire Coast National Park Authority
5) Pembrokeshire County Council
6) Puma Energy (UK) Ltd
7) RWE Generation UK Plc
8) Semlogistics Milford Haven Ltd
9) South Hook LNG Terminal Company Ltd
10) Valero Energy Ltd

PREAMBLE

The Milford Haven Waterway is an extensive natural inlet of the sea with a long and distinguished maritime history. Its deep waters provide a natural harbour of significant economic importance as a port handling strategic energy resources and ferry services sustaining many valuable long-term jobs in Pembrokeshire. It is one of the best examples of a ria system in Britain and supports a particularly diverse range of high quality marine and estuarine habitats and biological communities.

RECITALS

(A) The Group Members agree to work collaboratively in a non-binding knowledge collaboration as the **Milford Haven Waterway Environmental Surveillance Group** in order to provide high quality environmental information to the Group Members, so enabling the Group Members to contribute to the maintenance and enhancement of the rich and diverse marine environment of the Waterway whilst sharing this information with the local and scientific communities, and to perform the objects set out in clause 3.2.

(B) This Agreement serves to continue the successful collaborative Milford Haven Waterway Environmental Surveillance Group that began with establishment of the Milford Haven Waterway Environmental Monitoring Steering Group in 1991 and resulted in a Memorandum of Agreement being entered into by the members of the Group on 1 July 2004.

(C) The Memorandum of Agreement has gradually been overtaken by time and is now recognised as being insufficiently flexible for an evolving membership.

(D) Accordingly, on the date of this Agreement the Group Members have agreed to terminate the Memorandum of Agreement on the basis that the Group would be reconstituted as a non-binding knowledge collaboration Group in order to continue fulfilling the Objects of the Group.

(E) Consequently, the Group Members have agreed to enter into this Agreement on the terms and conditions set out below.

The Group Members agree as follows:

1 INTERPRETATION

1.1 In this Agreement, unless there be anything in the context inconsistent therewith the following expressions shall have the following meanings:

"Committee" has the meaning ascribed to it by clause 4.1;

"Group" means the Milford Haven Waterway Environmental Surveillance Group reconstituted under this Agreement and any agreement supplemental to it;

"Group Members" means all of the parties listed on page 2 of this Agreement and Group Member shall have a corresponding meaning;

"Intellectual Property" means all intellectual property rights of whatever nature including without limitation copyright, patents, know-how, trade secrets, trademarks, trade names, design right, get-up, database right, utility models, service rights, moral rights, domain names and all similar rights and, in each case:

a) whether registered or not;

b) including any applications to protect or register such rights and the right to make such applications;

c) including all renewals, continuations and extensions of such rights or applications;

d) whether vested, contingent or future; and

e) wherever existing;

"IP Rights" all rights which may now or in the future subsist in respect of or derived from any Intellectual Property.

"Memorandum of Agreement" means the Memorandum of Agreement dated 1 July 2004 entered into between the parties;

"Objects" means the objects of the Group itemised in clause 3.2;

"Waterway" means the waters, seabed and foreshore of the Milford Haven Waterway and the Daugleddau Estuary from a line between St Anne's Head and Sheep Island to the tidal reaches of the Eastern and Western Cleddau Rivers and other tributaries to the normal tidal limits.

2 TERMINATION OF THE MEMORANDUM OF AGREEMENT

2.1 The Group Members agree that as at the date of this Agreement the Memorandum of Agreement shall immediately terminate and be replaced by the terms and conditions contained in this Agreement.

2.2 From the date of this Agreement any monies held pursuant to the Memorandum of Agreement shall be subject to this Agreement and in particular the terms of clause 5.2.

3 SCOPE OF THE COLLABORATION

3.1 The Group Members agree with one another to enter into this Agreement to generate and share high quality environmental information to assist the Group Members to contribute to the maintenance and enhancement of the rich and diverse marine environment of the Waterway and to perform the objects set out in clause 3.2 under the terms of this Agreement.

3.2 The Objects of the Group are to maintain surveillance of the quality of the marine physico-chemical environment, marine biology and ornithology of the foreshore, seabed and waters of the Milford Haven Waterway, by:

a) keeping under review all relevant surveys, surveillance and monitoring;

b) undertaking surveys to improve current knowledge and establish baselines;

c) undertaking surveillance projects;

d) maintaining a literature and information database.

3.3 The Group will:

a) maintain under review a work programme of agreed projects;

b) share technical output equally under joint ownership and copyright;

c) function as a technical, science based, group;

d) make its findings available to the wider community in addition to the Group Members.

3.4 Membership of the Group comprises statutory authorities, industry and others with an interest in the environmental quality of the Waterway. Membership will be at the invitation and discretion of the Group's existing members.

3.5 Any Group Member may, at their discretion, share with the other Group Members any information and /or data generated by their own environmental survey, monitoring or surveillance activities. In these instances, any such member shall retain its IP rights to that information or data. However, for the avoidance of doubt, this clause does not constrain the Group's use of information provided by any member to regulatory authorities, for example to meet statutory consenting processes, which has thereby entered the public domain.

3.6 For the avoidance of doubt:

a) any survey, surveillance and monitoring agreed by the Group will be limited to crown foreshore, seabed and/or waters of the Waterway and will specifically exclude the premises, whether freehold or held under the terms of a commercial operating lease or license of any Group Member;

b) nothing in this Agreement shall be deemed to override or in any way restrict the statutory obligations of any of the Group Members;

c) the identification and consideration of political and management issues or the setting of environmental standards are specifically excluded from this Agreement. However, Group members are free, and are expected to use the Group's outputs, to help meet their own requirements.

4 CONTROL AND MANAGEMENT

4.1 A Committee comprising of one or more representatives nominated by each of the Group Members will be maintained for the purposes of:

a) discussing, determining and approving the purpose, terms of reference and work programme of the Group;

b) exchanging information;

c) implementing the agreed work programme;

d) reporting on progress, including publishing an annual report that comprises of a summary of all work undertaken for the year and work planned for the forthcoming year.

4.2 Each Group Member shall notify the Chairperson, or Secretary, in writing of their nominated representative and shall be entitled to appoint alternative representatives.

4.3 The Committee shall appoint a chairperson from its number to chair Committee meetings and a vice chairperson to chair committee meetings in the absence of the chair. In the absence of both the chair and the vice chair those nominated representatives present shall appoint one of their members present to act as chair for that particular meeting. The appointment of the chair and the vice Chair will be subject to biennial review, at which time the incumbent vice chair will normally be expected to assume the role of chair and a new vice-chair appointed, subject at all times to principles of good governance and best practice. Notwithstanding the above and subject to the agreement of Committee representatives, the term of the serving chair may be extended or any other representative appointed chair, depending on the circumstances then prevailing.

4.4 The quorum for meetings of the Committee shall be 5 nominated representatives of the Group Members. Notes of all meetings of the Committee shall be taken and copies of such notes circulated to Group Members as soon as practicable after each meeting.

4.5 Every effort will be made to ensure Committee business is conducted by consensus. In the event of issues arising at a meeting of the Committee that cannot be resolved by consensus, they shall be decided by a majority of votes and each nominated representative shall have one vote. In the case of an equality of votes the chairperson of the meeting shall have a casting vote.

4.6 The Committee may delegate any of its functions to sub-committees or to other persons as it considers appropriate for the task; provided that the delegation and the reasons therefore are recorded in writing.

4.7 The Committee will meet as often as necessary or desirable for the purposes of achieving the Objects at a convenient time and venue.

4.8 The Group Members shall at all times co-operate with each other and act in good faith to enable the Objects to be attained.

5 RESOURCING

5.1 Each of the Group Members will provide either a monetary contribution and/or some other contribution, e.g. services, premises, that shall be agreed by all the Group Members for the furtherance of the Objects of the Group in accordance with the work programme

referred to in clause 3.3(a). The contributions are to be provided promptly within the time frame agreed for contributions.

5.2 Milford Haven Port Authority shall receive all financial contributions by Group Members and shall keep such monies in a separate interest bearing bank account in trust for the Group.

5.3 Other contributions for the furtherance of the Objects of the Group, as identified in clause 5.1, may include (where applicable) the sharing of environmental surveillance or monitoring data, information or reports collected by members for their own purposes or to meet legal obligations, as identified in clause 3.5.

6 CONTRACTS

Under the terms of this Agreement, the members agree that:

6.1 Milford Haven Port Authority shall have the authority to, and be the sole Group member to let contracts with third parties on behalf of the Group in order to achieve the Group's Objects, including the appointment of professionals, advisers and consultants on behalf of the Group, subject to request from and prior approval of the Committee, and clause 6.3. MHPA shall only let contracts with third parties on behalf of the Group upon written instruction from Group compliant with the terms of clause 7.1. Responsibilities and liabilities arising from contracts will be owned by the Group; MHPA is the contract letting agent for administrative purposes.

6.2 Milford Haven Port Authority shall make payments on behalf of the Group in respect of contracts agreed at clause 6.1 but may not make any other payments or commitments on behalf of the Group without the prior approval of the Committee. Milford Haven Port Authority shall provide regular statements to the Committee in respect of such account.

6.3 No such contract shall be entered into unless there are sufficient funds available within the interest bearing bank account referred to in clause 5.2 to meet the obligations of Milford Haven Port Authority acting on behalf of the Group under the relevant contract.

6.4 Consultants and/or contractors will be engaged pursuant to MHPA's contract Terms and Conditions.

7 LIABILITY

7.1 Risk of liability will be minimised by:

a) agreeing to works and requesting contracts be let only when sufficient funds are available as set out in clause 6.3;

b) ensuring prospective contractors have appropriate levels of expertise, experience, competence and responsibility,

c) requiring contractors to carry appropriate liability insurance for damages arising as a result of fieldwork (prior to letting contracts (as stipulated in clause 6.1) and excluding liability arising from force majeure (as defined in clause 7.3);

d) requiring Contractors to submit an appropriate Risk Assessment and Method Statement prior to the commencement of works;

e) review and approval of Contractor's Risk Assessment and Method Statements by appropriate Group members, and / or delegated individual(s), most suited to the task, and maintaining written records of such reviews and approvals;

f) ensuring appropriate oversight of fieldwork and Contractors adherence to Risk Assessment and Method Statements by appropriate Group members, and / or delegated individual(s), most suited to the task, and maintaining written records of such oversight;

g) including a liability exclusion statement in all Group reports.

7.2 The costs or consequences of any legal action against the Group or against MHPA in connection with the activities of MHSWEG will be shared equally and the MHPA's risk as the party letting contracts will be mitigated through the measures set out in clause 7.1.

7.3 Consequently, as at the date of this Agreement the Group Members shall ensure that the Group has effected public liability insurance with a minimum limit of liability of £5,000,000 (five million pounds) in respect of each and every occurrence to cover the potential liability of the Group Members in relation to this Agreement and shall maintain such insurance until the date of termination of this Agreement.

7.4 The Group shall not be liable for losses, damages, costs and/or expenses incurred as a result of force majeure which shall include without limitation any failure or delay attributable to facts beyond the control of the Group such as wars, hostilities, boycotts, embargoes, public disorders, sabotage, strikes, lockouts, floods, fires or acts of God.

8 INTELLECTUAL PROPERTY RIGHTS

8.1 All IP Rights developed or generated by the Group in pursuance of the Objects shall be owned by the Group Members jointly.

8.2 Any Group member that withdraws from the Agreement will retain joint ownership of Group IP Rights developed or generated during the period of their membership of the Group.

8.3 Any Group Member shall be entitled to use any IP Rights free of charge provided that any such use shall not compromise the Objects of the Group and provided further that if any Group Member wishes to license or authorise any third party to use or exploit any IP Rights owned by the Group, the Group Members shall jointly agree and grant such a licence to such third party and such third party shall be required to pay a licence fee.

8.4 All costs and expenses and all receipts in respect of any IP Rights owned jointly by the Group Members shall be shared equally by the Group Members.

8.5 Each Group Member shall retain all rights to Intellectual Property in all materials, information etc. contributed by that Group Member as stipulated in clause 3.5.

9 TERM AND TERMINATION

9.1 The provisions of this Agreement shall come into force on the date stated above.

9.2 A Group Member may at any time terminate its participation in respect of this Agreement subject to having given notice in writing to the Chairperson with no right of return of financial contributions.

9.3 In the event that any Group Member is in breach of this Agreement which they fail to remedy within 14 days of written request by the Committee then such Group Member's involvement in the Group may be terminated by notice given to them by the Committee at any time following expiry of the said period of 14 days, with no right of return of financial contributions.

9.4 Subject to clauses 8.2 and 8.3 this Agreement will terminate on completion of the Objects stated in clause 3.

9.5 Upon termination of this Agreement the Group shall either be:

a) reconstituted as appropriate to fulfil the Objects of the Group; or

b) terminated forthwith and the Group Members shall take such further steps as may be necessary in order to wind up the Group in a fair and reasonable manner.

The financial assets of the Group at winding up should be distributed or shared pro rata to the direct financial contributions by Group Members.

9.6 If a Group Member's participation in the Group is terminated in accordance with clause 8.2 or 8.3 the provisions of clauses 6.1 to 6.3 shall no longer apply in respect of that Group Member.

10 THIRD PARTIES

10.1 Nothing in this Agreement shall create any rights for third parties under the Contracts (Rights of Third Parties) Act 1999. No variation to this Agreement and no supplemental or ancillary agreement to this Agreement shall create any such rights unless expressly so stated in any such agreement by the Group Members to this Agreement. This does not affect any right or remedy of a third party that exists or is available apart from that Act.

11 NO BINDING PARTNERSHIP

11.1 Nothing in this Agreement shall be construed as establishing or implying any legally binding partnership between the Group Members.

12 SUCCESSORS

12.1 References in this Agreement to the Group Members shall include their respective heirs, successors in title, permitted assigns and personal representatives.

13 ASSIGNMENT

13.1 No Group Member should assign its interests in this Agreement without prior approval of the Committee (not to be unreasonably withheld) except that no such approval is required for an assignment to a company in the same group as the Group Member.

14 GENERAL

14.1 Provisions which by their terms or intent are to survive termination of this Agreement will do so.

14.2 No amendment or variation of this Agreement will be valid unless agreed in writing by an authorised signatory of each party.

14.3 Unless otherwise expressly agreed, no delay, act or omission by either party in exercising any right or remedy will be deemed a waiver of that, or any other, right or remedy.

14.4 Each party will do all further acts and execute all further documents necessary to give effect to this Agreement.

15 INFORMATION SHARING AND DATA PROTECTION

15.1 Several members of the Group (public bodies) are subject to the Freedom of Information (FoI) Act and Environmental Information Regulations (EIR) whilst others (industry bodies) are not. Whilst circumstances under which valid FoI and/or EIR requests may

be submitted to the Group are anticipated to be limited since the Group operates transparently, places all outputs in public domain, and commercial tender assessments and contract details are protected by confidentiality exemptions, every effort will be made to meet any such request, taking into account advice and guidance from the Information Commissioner's Office and the obligations on public bodies.

15.2 The Group will comply with the Data Protection Act and adhere to the data protection principles to ensure personal data is safeguarded.

16 REVIEW

This Agreement will be subject to review and reaffirmation at five yearly intervals from the date of the Agreement.

17 COUNTERPARTS

This Agreement may be executed in any number of counterparts, each of which is an original and which together have the same effect as if each Group Member had signed the same document.

Appendix 3: Chronological list of MHWEMSG / MHWESG[2] reports

1992

Hobbs, G and Morgan, C I (eds.) (1992). *A review of the current state of environmental knowledge of the Milford Haven Waterway*. Report from Oil Pollution Research Unit; xi &140pp

Hobbs, G and Morgan, C I (eds.) (1992). *A review of the current state of environmental knowledge of the Milford Haven Waterway; Executive Summary*. Report from Oil Pollution Research Unit, 12pp

MHWEMSG (1992). *Report of the Milford Haven Waterway Environmental Monitoring Steering Group 1992*. 6pp

1993

Hodges, J E (1993). *Daugleddau Estuary and Milford Haven Waterway annual shelduck survey: report for 1993.* Report from Pembrokeshire Coast National Park Authority, 8pp + appendices

1994

Ellis, R & Poole, A (1994). *Cleddau Estuary wader and wildfowl counts 1993 – 94. 20* pp + appendices

Hodges, J E (1995). *Daugleddau Estuary and Milford Haven Waterway annual shelduck survey: report for 1995.* Report from Pembrokeshire Coast National Park Authority,8pp + appendices

Levell, D, Smith, J and Hobbs, G (1994). *Milford Haven macrobenthic survey October 1993*. Report from Oil Pollution Research Unit; xii, 26pp + figures, tables & data appendices.

MHWEMSG (1994). *Report of the Milford Haven Waterway Environmental Monitoring Steering Group 1993/94*. 20pp

Smith, J and Hobbs, G (1994). *Metal concentrations in Milford Haven sea bed sediments - data storage, analysis and initial interpretation*. Report from Oil Pollution Research Unit; v, 8pp + tables & maps

1995

Hodges, J E (1995). *Daugleddau Estuary and Milford Haven Waterway annual shelduck survey: report for 1995.* Report from Pembrokeshire Coast National Park Authority 10pp + appendices

Howe, M (1995). *Monitoring of eelgrass populations in the Milford Haven waterway and Daugleddau Estuary*. Report from Pembrokeshire Coast National Park Authority; 7pp

MHWEMSG (1995). *Report of the Milford Haven Waterway Environmental Monitoring Steering Group 1994/95.* 19pp

Poole, A & Ellis, R (1995). *Cleddau Estuary including Milford Haven Waterway: wildfowl and wader counts 1994 – 95.* 30pp

Rostron, D M (1995). *The macrobenthos of the foreshore soft sediments of Milford Haven, 1994*. Report from SubSea Survey; 2 vols, 17pp + maps, figures & data appendices

[2] The Group changed its name in 2000

1996

Hodges, J E (1996). *Daugleddau Estuary and Milford Haven Waterway annual shelduck survey: report for 1996.* Report from Pembrokeshire Coast National Park Authority, 8pp + appendices

MHWEMSG (1996). *Report of the Milford Haven Waterway Environmental Monitoring Steering Group 1995/96.* 14pp

Poole, A (1996). *Milford Haven and Cleddau Estuary wetland bird survey 1995-96*. 18pp

1997

Hodges, J E (1997). *Daugleddau Estuary and Milford Haven Waterway annual shelduck survey: report for 1997.* Report from Pembrokeshire Coast National Park Authority. 10pp + tables & appendices

MHWEMSG (1997). *Report of the Milford Haven Waterway Environmental Monitoring Steering Group 1996/97.* 36pp

Moore, J J (1997). *Rocky shore transect monitoring in Milford Haven, October 1995.* Report from Oil Pollution Research Unit. OPRU Report No OPRU/14/96. 36pp + appendices

Poole, A (1997). *Milford Haven Waterway and Cleddau Estuary bird survey 1996-97*. 13pp + appendices

1998

Hodges, J E (1998). *Daugleddau Estuary and Milford Haven Waterway annual shelduck survey – report for 1998.* Report from Pembrokeshire Coast National Park Authority. 9pp + tables & appendices

Munro, C (1999). *Monitoring of the rocky sub-littoral of Milford Haven: May-July 1998.* Report from Marine Biological Surveys. v, 38pp + appendices, photographs and videorecording

Poole, A (1998). *Milford Haven Waterway and Cleddau Estuary bird survey 1997-98*. 12pp + appendices

1999

Hodges, J E (1999). *Daugleddau Estuary and Milford Haven Waterway annual shelduck survey – report for 1999.* Report from Pembrokeshire Coast National Park Authority. 8pp + tables & appendices

Kitts, H (1999). *Quantification of inputs to Milford Haven*. Report from Hyder Ltd. 29pp + tables & appendices

MHWEMSG (1999). *Report of the Milford Haven Waterway Environmental Monitoring Steering Group 1997 - 1999*. 25pp

Poole, A (1999). *Milford Haven Waterway and Cleddau Estuary Bird Survey 1998-99*. 13pp + appendices

Posford Duvivier (2000). *A survey of subtidal Zostera beds in Milford Haven*. 36pp + appendices

2000

Bent, E J (2000). *A review of environmental studies in Milford Haven Waterway 1992 – 2000*. iv, 65 pp + tables & maps

Hodges, J E (2000). *Daugleddau Estuary and Milford Haven Waterway annual shelduck Survey – Report for 2000.* Report from Pembrokeshire Coast National Park Authority. 10pp + tables + appendices

MHWESG (2000). *Milford Haven Waterway Environmental Surveillance Group Annual Report 1999 - 2000*. 20pp & appendices

Poole, A (2000). *Milford Haven waterway and Cleddau Estuary Bird Survey 1999-2000*. 15pp + appendices

2001

Hodges, J E (2001). *Daugleddau Estuary and Milford Haven Waterway surveillance of summer shelduck populations: report for 2001.* Report from Pembrokeshire Coast National Park Authority. 8pp + appendices

Poole, A (2001). *Milford Haven Waterway and Cleddau Estuary bird survey 2000-01*. 14pp + appendices

2002

Hodges, J E (2002). *Daugleddau Estuary and Milford Haven Waterway surveillance of summer shelduck populations: report for 2002.* Report from Pembrokeshire Coast National Park Authority. 8pp + appendices

Poole, A (2002). *Milford Haven Waterway and Cleddau Estuary bird survey 2001-02.* 12pp + appendices

2003

Bent, E J (2003). *Milford Haven Waterway review of work programme 2000 – 2010*. 32pp

Hodges, J E (2004). *Daugleddau Estuary and Milford Haven waterway surveillance of summer shelduck populations: report for 2003.* Report from Pembrokeshire Coast National Park Authority. 9pp + appendices

Poole, A (2003). *Milford Haven Waterway and Cleddau Estuary bird survey 2002-03.* 16pp + appendices

Prosser, M V & Wallace H L (2003). *Milford Haven salt-marsh survey 2002.* Report from Ecological Surveys (Bangor). 2 vols. 58pp + appendices, photographs & maps

2004

Hodges, J E (2004). *Daugleddau Estuary and Milford Haven Waterway surveillance of summer shelduck populations: report for 2004.* Report from Pembrokeshire Coast National Park Authority. 7pp + appendices

Haycock, A (2004). *Milford Haven Waterway and Cleddau Estuary Bird Survey 2003-04.* 14pp + appendices

2005

Atkins (2005). *Development of an Inputs Budget for Milford Haven Waterway.* 68pp + cd database & GIS data

Hodges, J E (2005). *Daugleddau Estuary and Milford Haven Waterway surveillance of summer shelduck populations: report for 2005.* Report from Pembrokeshire Coast National Park Authority. 8pp + appendices

Haycock, A (2005). *Milford Haven Waterway and Cleddau Estuary Bird Survey 2004-05. 7*pp + appendices

2006

Hodges, J E (2006). *Daugleddau Estuary and Milford Haven Waterway surveillance of summer shelduck populations: report for 2005.* Report from Pembrokeshire Coast National Park Authority. 8pp + appendices

Haycock, A (2006). *Milford Haven Waterway and Cleddau Estuary Bird Survey 2004-05. 7*pp + appendices

Warwick, R (2006). *Review of benthic and intertidal sediment macrofauna data and development of a surveillance programme*. 105pp + electronic data annex

2007

Hodges, J E (2007). *Daugleddau Estuary and Milford Haven Waterway surveillance of summer shelduck populations: report for 2006.* Report from Pembrokeshire Coast National Park Authority. 8pp + appendices

2008

Haycock, A (2008). *Wildfowl and wader counts on the Milford Haven Waterway 2006-07* 20pp

Haycock, A (2008). *A review of the status of wetland birds in the Milford Haven waterway and Daugleddau estuary*. A report to the Milford Haven Waterway Environmental Surveillance Group. 122pp

Hodges, J E (2008). *Daugleddau Estuary and Milford Haven Waterway surveillance of summer shelduck populations: report for 2008*. Report from Pembrokeshire Coast National Park Authority. 26pp + appendices

2009

Haycock, A (2009). *Wildfowl and wader counts on the Milford Haven Waterway 2007-08* 20pp

Hodges, J E (2009). *Daugleddau Estuary and Milford Haven Waterway surveillance of summer shelduck populations: report for 2009*. Report from Pembrokeshire Coast National Park Authority. 9pp + appendices

Langston, W J, O'Hara, S, Imamura M & Pope, N D (2009) *Bioaccumulation surveillance in Milford Haven Waterway 2007-2008*. Report to the Milford Haven Waterway Environmental Surveillance Group from the Marine Biological Association Plymouth. 66pp + appendices

Little, D I (2009) *Sediment Contaminants & Transport Review*. A report to the Milford Haven Waterway Environmental Surveillance Group. 368pp + appendices

2010

Haycock A (2010). *Wildfowl and wader counts on the Milford Haven Waterway, 2009-10*. A report to the Milford Haven Waterway Environmental Surveillance Group. 24pp

Hodges, J E (2010). *Daugleddau Estuary and Milford Haven Waterway surveillance of summer shelduck populations: report for 2010.* Report from Pembrokeshire Coast National Park Authority. 8 pp + appendices

Mieszkowska, N. (2011). *Reestablishment of intertidal rocky surveillance*. A report to the MHWESG from the Marine Biological Association on ot the UK. 54pp + appendices.

2011

Haycock A (2011). *Wildfowl and wader counts on the Milford Haven Waterway, 2010-11*. A report to the Milford Haven Waterway Environmental Surveillance Group. 24pp

Hodges, J E (2011). Daugleddau Estuary and Milford Haven Waterway surveillance of summer shelduck populations: report for 2011. Report from Pembrokeshire Coast National Park Authority. 8pp + appendices

2012

Fugro-ERT (2012). *Investigation into the source of hydrocarbons present in sediment samples from Milford Haven waterway*. Report to the Milford Haven Waterway Environmental Surveillance Group from the Fugro-ERT (Fugro Geoconsulting). v&40pp + appendices

Hodges, J E (2012). *Daugleddau Estuary and Milford Haven Waterway surveillance of summer shelduck populations: report for 2012*. Report from Pembrokeshire Coast National Park Authority. 9pp + appendices

Langston, W J, O'Hara, S, Davey, M, Shortridge, E, Pope, N D, Harino, & Vane, C H. (2012) *Bioaccumulation surveillance in Milford Haven Waterway Phase II (2010)* Report to the MHWESG from the Marine Biological Association UK. 85pp + appendices

2013

Germano & Associates (2013). *Sediment-Profile Imaging Survey of Milford Haven Waterway, Wales, UK - May 2012*. Report to the Milford Haven Waterway Environmental Surveillance Group from Germano & Associates, Inc., Seattle, Washington, USA. vii&34pp + tables, figures and appendices

Haycock, A (2013). *A review of the status of wetland birds in the Milford Haven Waterway and Daugleddau Estuary 2013* A report to the Milford Haven Waterway Environmental Surveillance Group. 123pp

Hodges, J E (2013). *Daugleddau Estuary and Milford Haven Waterway surveillance of summer shelduck populations: report for 2013*. Report from Pembrokeshire Coast National Park Authority. 9pp + appendices

2014

Galperin, Y & Little, D I (2014). *Forensic Evaluation Of Milford Haven Sediment Hydrocarbon Contamination: Supplemental Report*. Report to Milford Haven Waterway Environmental Surveillance Group from EGC Consulting California USA & David I. Little; 60 pp.

Haycock, A (2014). *A review of the status of wetland birds in the Milford Haven Waterway and Daugleddau Estuary 2013-14*. A report to the Milford Haven Waterway Environmental Surveillance Group; 24 pp.

Hodges, J E (2014). *Daugleddau Estuary and Milford Haven Waterway surveillance of summer shelduck populations: report for 2014*. Report from Pembrokeshire Coast National Park Authority. 11pp + appendices

Morrell, S (2014). *Rocky Shore Surveillance 2013*. Report to Milford Haven Waterway Environmental Surveillance Group from the Field Studies Council Dale Fort Field Centre; 50 pp.

Little, D I & Galperin, Y, 2014. *Milford Haven sediment hydrocarbon and metals contamination: supplemental report on recent contaminant trends*. Report to Milford Haven Waterway Environmental Surveillance Group

2015

Haycock, A (2015). *A review of the status of wetland birds in the Milford Haven Waterway and Daugleddau Estuary 2014-15*. Report to the Milford Haven Waterway Environmental Surveillance Group.

Hodges, J E (2015). *Daugleddau Estuary and Milford Haven Waterway surveillance of summer shelduck populations: report for 2015*. Report to MHWESG from Pembrokeshire Coast National Park Authority.

Rumney H S, K Potter, P Mellor & P Bersuder (2015). *Analysis of Sediment Contaminants in Milford Haven Waterway Total Hydrocarbon (THC) concentration in sediments*. Data report to MHWESG from Centre for Environment, Fisheries & Aquaculture Science, Lowestoft.

2016

Clough, R (2016). *Determination of Multiple Analytes in Sediment Samples*. Data report to MHWESG from Analytical Research facility, University of Plymouth.

Haycock, A (2016). *Review of the status of wetland birds in the Milford Haven Waterway and Daugleddau Estuary 2016*. Report to the Milford Haven Waterway Environmental Surveillance Group.

Hodges, J E (2016). *Daugleddau Estuary and Milford Haven Waterway surveillance of summer shelduck populations: report for 2016.* Report to the Milford Haven Waterway Environmental Surveillance Group

Warwick, Richard M (2016). *Milford Haven Waterway sediment macrobenthos data analysis & review 2008-15*. Report to the Milford Haven Waterway Environmental Surveillance Group, Plymouth Marine Laboratory.

2017

Archer-Thomson, J H S and Morrell, S L (2018). *Milford Haven Waterway rockshore surveillance 2017.* Report to the Milford Haven Waterway Environmental Surveillance Group.

Haycock A (2017). *Wildfowl and wader counts on the Milford Haven Waterway, 2016-17.* A report to the Milford Haven Waterway Environmental Surveillance Group.

Hodges, J E (2017). Daugleddau Estuary and Milford Haven Waterway surveillance of summer shelduck populations: report for 2017. Report to the Milford Haven Waterway Environmental Surveillance Group.

Little, D I (2017). *Sediment contaminant concentrations in Milford Haven waterway: data conversion and timeline*. Report to the Milford Haven Waterway Environmental Surveillance Group.

Unsworth, R K F, Bertelli, C M, Robinson, M, Mendzil, A (2017). Status review and surveillance recommendations for seagrass (Zostera species) in Milford Haven Waterway. Report to the Milford Haven Waterway Environmental Surveillance Group.

2018

Haycock A (2018). Wildfowl and wader counts on the Milford Haven Waterway, 2017-18. A report to the Milford Haven Waterway Environmental Surveillance Group.

Hodges, J E (2018). Daugleddau Estuary and Milford Haven Waterway surveillance of summer shelduck populations: report for 2018. Report to the Milford Haven Waterway Environmental Surveillance Group.

Birkhead, T R (2018). The Value of Long-term Monitoring and Long-term Research. A report to the Milford Haven Waterway Environmental Surveillance Group.

2019

Haycock A (2019). A review of the status of wetland birds in the Milford Haven Waterway and Daugleddau Estuary, 2019. A report to the Milford Haven Waterway Environmental Surveillance Group.

Hodges, J E (2019). Daugleddau Estuary and Milford Haven Waterway surveillance of summer shelduck populations: report for 2019. Report to the Milford Haven Waterway Environmental Surveillance Group.

www.mhwesg.org.uk/ website for the Milford Haven Waterway Environmental Surveillance Group

2020

Archer-Thomson, J H S and Morrell, S L (2020). Milford Haven Waterway Rocky Shore Surveillance, 2020. A report to the Milford Haven Waterway Environmental Surveillance Group.

Green, R M W, Burton, N H K and Cook, A S C P (2020). A review of shelduck data (1992-2019) for the Milford Haven Waterway, Pembrokeshire. A report to the Milford Haven Waterway Environmental Surveillance Group.

Haycock, A (2020). Wildfowl and wader counts on the Milford Haven Waterway, 2019-20. A report to the Milford Haven Waterway Environmental Surveillance Group.

Hodges, J E (2020). Daugleddau Estuary and Milford Haven Waterway surveillance of summer shelduck populations: report for 2020. Report to the Milford Haven Waterway Environmental Surveillance Group.

2021

Haycock, A (2021). Wildfowl and wader counts on the Milford Haven Waterway, 2020-21**.** A report to the Milford Haven Waterway Environmental Surveillance Group.

Hodges, J E (2021). Daugleddau Estuary and Milford Haven Waterway surveillance of summer shelduck populations: report for 2021. Report to the Milford Haven Waterway Environmental Surveillance Group.

University of Plymouth Enterprise Ltd (2021). Provision of advice to the MHWESG on contaminants in the Milford Haven Waterway, Pembrokeshire**.** Report to the Milford Haven Waterway Environmental Surveillance Group.