

*Report of the*  
**MILFORD HAVEN  
WATERWAY ENVIRONMENTAL  
MONITORING  
STEERING GROUP**



**MHWEMSG  
1995/96**

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## INTRODUCTION

This is the fourth annual report produced by the Milford Haven Waterway Environmental Monitoring Steering Group [MHWEMSG]. It encompasses the period until August 1996 owing to local government reorganisation and the Sea Empress incident. The last report being to April 1995.

The constitution of the Group has changed since the last report in that the Milford Port Health Authority ceased to exist and its functions absorbed by Pembrokeshire County Council. There is no representation therefore specifically from the Port Health function of the County Council whose representative is their Head of Public Health and Environment. The information contained in this report refers to the monitoring and analysis carried out by the Group and contains an updated programme of work and a financial summary of the commitments to date. The major items of work covered by the Group are as follows:-

1. Water Quality Monitoring
2. Rocky Shore Transects Survey
3. The Annual Shelduck Census
4. Wildfowl and Wader Counts

The collaboration and assistance in kind with manpower, survey vessels, analysis etc. from Group members makes it possible to provide value for money and enhances the Group's capabilities to provide a level of work in excess of that which could be paid for on the current financial budget with no administrative costs, these being absorbed by participating bodies. The loss of the Milford Port Health launch has been compensated for by the offer by the South Wales Sea Fisheries Committee to use MV Cranogwen, the Fisheries Patrol vessel. The background information provided through the Group's work is recognised as extremely valuable and is used in environmental impact assessments produced by other bodies. The Group is also conscious that much of the research carried out in the past years has been most useful and indispensable to the works of SEEEC [Sea Empress Environmental Evaluation Committee].

The decisions on whether the Milford Haven waterway is to become part of a candidate marine Special Area of Conservation [SAC] under the European Habitats Directive is still awaited and whether the area is created in part or in full, the work of the Group will still be necessary and important.

The Group agreed that the following projects should receive priority from the funding in the next twelve months:-

- [1] Contaminant Sourcing
- [2] Sediment Sink - tenders to be awarded later
- [3] Sediment Hotspots overall cost depending on scope of work
- [4] Post Sea Empress finger printing of hydrocarbons

**H G Evans, Chairman, MHWEMSG**  
**29 November 1996**

## ACKNOWLEDGEMENTS

The Group acknowledges the financial contributions made by the following bodies:

National Power	£6,000
Gulf	£5,000
Pembrokeshire County Council	£5,700
Elf Oil	£5,000
Texaco	£5,000
Countryside Council for Wales	£5,000
Pembrokeshire Coast National Park	£3,000
Dwr Cymru Welsh Water	£3,000

The financial resources available to pursue the Group's aims will be somewhat reduced following local government reorganisation and the distillation of the three previous authorities into one County Council.

Dwr Cymru has recently paid £3,000 to the Group as a contribution for a three year period.

As well as a financial contribution by the above named groups they also provide man power and equipment, expertise and facilities to the Group.

Up until 31<sup>st</sup> march 1996 the Milford Port Health Authority assisted with the use of its launch. Since then the MV Cranogwen has been offered by the South Wales Sea Fisheries Committee and in the absence of that vessel the Milford Haven Port Authority vessel.

The National Rivers Authority now the Environment Agency, the Pembrokeshire Coast National Park Authority and the Countryside Council for Wales also provide additional resources.

The MHWEMSG meetings are hosted by Pembrokeshire County Council and the Environment Agency provide the venue for the Project Group Sub-Meetings.

The cover of the report was designed by Pembrokeshire County Council.

## HYDROCARBON LEVELS IN MILFORD HAVEN WATERWAY FOLLOWING THE *SEA EMPRESS* OIL SPILL

Following the initial grounding of the *Sea Empress* on 15th February 1996 approximately 72,000 tonnes of Forties blend light crude oil and 360 tonnes of heavy fuel oil was spilt.

The spilt oil initially formed slicks on the sea surface which moved under the influence of wind and currents. As the Forties blend of crude oils is "light", about one third would be expected to evaporate within 24 hours of being spilt. The remaining oil either absorbed water to become a "mousse" on the surface or became dispersed into the water column. Dispersed oil droplets can be broken down by micro-organisms, resurface as slicks or become attached to sediments and settle in "sink" areas. The characteristics of fuel oil are different from the crude cargo as it neither disperses nor forms an emulsion as readily. The fuel oil was evident mainly within the Haven where the relatively small quantity had a major impact due to its persistence.

Monitoring for levels of hydrocarbons in the watercolumn within Milford Haven Waterway began on 21st February using the Environment Agency's vessel *Vigilance*. Samples and fluorometer readings were taken at the surface, 1m and 5m depths. The highest results were obtained around the mouth of the Haven, in particular between Dale and Angle. By the beginning of April levels of total hydrocarbons had reduced to between 5.7 and 14 µg/l (parts per billion). This compares with samples taken at the same locations between 21st February and 7th March which peaked at between 1,220 and 5,380 µg/l. Pre-spill data was obtained using a less sensitive analytical technique producing a detection limit of 300 µg/l. Background levels were below this detection limit.

By May the mean level of total hydrocarbons in a routine mid-channel water quality survey had fallen to 2.6 µg/l. There were only three recorded values > 10 µg/l during the summer period. These were found at St. Ann's Head (63 µg/l on 15/6/96), the Warrior (18 µg/l on 15/6/96) and off Neyland (16.7 µg/l on 19/7/96). These higher results increased the mean values for the June survey to 8.9 µg/l and for July to 4.9 µg/l. However by August the mean value obtained from the routine mid-channel monitoring had fallen to 2.5 µg/l, with a range of 1.6 to 3.7 µg/l. These values of total hydrocarbons are approaching background levels that would be expected within the Waterway. This post-spill analysis has been carried out by the Environment Agency's laboratory, being sampled at the same time as the Group's monitoring. A routine monthly survey is continuing to monitor any changes. The results of post-spill surveys, including the levels of hydrocarbons in sediments and the impact on the flora and fauna, are still being collated.

These water quality results cannot indicate the severity of the impact of the oil on the Haven Waterway. This can only be established over time as the results of the various impact studies become known. The effect of the *Sea Empress* oil spill can only be established where good baseline data exists. The work of the Group in undertaking surveys (on the benthic, intertidal and rocky shore biology for example) has been invaluable in providing such a baseline dataset against which to quantify the impact and recovery.

## ROCKY SHORE TRANSECTS MONITORING IN MILFORD HAVEN, OCTOBER 1995

The Group commissioned OPRU to carry out surveys of rocky shore fauna and flora at fixed transect sites throughout the Haven and the Daucleddau Estuary. The aim of these surveys was to provide a baseline for future monitoring of the rocky shore life. The work is part of an on-going programme of baseline and monitoring surveys of the environmental quality of the Haven to assess the effects of pollution and other impacts.

The survey was carried out during periods of low spring tides in October 1995. Twenty four previously established rocky shore transect sites were used as the basis for the site selection and seven additional sites were established to provide further geographic coverage, particularly in the Daucleddau Estuary. One of the new sites was established on the open coast just outside the Haven as a reference site.

The survey methodology was the same as that used in previous rocky shore transect surveys in Milford Haven. Discontinuous belt transects run down the shore on a fixed bearing from a fixed point at the top of the shore. Site location sheets from previous surveys aided relocation of the already established transects. The stations (3m wide by 30 cm deep) were marked at 60cm height intervals along each transect. All conspicuous species of fauna and flora were recorded and their abundance assessed using semi-quantitative abundance scales. These sites and some of the stations were marked. Photographs, sketches and notes were taken along each transect and used to aid description of the habitats and communities and for new site location sheets. Annotated photographs have also been used in new site location sheets which have been prepared for the 31 sites. The sheets are encapsulated in plastic for field use.

Descriptions of each transect site and the habitats and communities found at the stations are given in the report. Descriptions of the habitats and communities are put in the context of recognised UK rocky shore "biotopes". Photographs of the sites have been annotated with biotope codes to show the relationship of the transect stations to the rocky shore biotopes.

The species abundance data have been entered into a computer database. Data from two previous surveys of rocky shore transects in Milford Haven (in 1979 and 1982) were used in a simple comparative analysis used to highlight changes in species abundance. Although some changes in taxonomy and recording methodology require caution when assessing differences in the data, it is clear that some species and groups of species had undergone significant changes since 1982. The grey topshell *Monodonta lineata* populations were dramatically reduced at most sites in the Haven and densities of the australasian immigrant barnacle *Elminius modestus* were also lower than in 1982. Decreased abundance was also evident in some other gastropod molluscs, and the only significant increase in any animal species was in populations of the beadlet anemone *Actinia equina*. There were decreases in some rocky shore plants - particularly the channelled wrack *Pelvetia canaliculata*, the red alga *Laurencia pinnatifida* and the black lichen *Verrucaria mucosa*.

A full repeat of the rocky shore sites has been carried out in October 1996 by SEECC, using this baseline data.

**IMMEDIATE POST SEA EMPRESS SPILL  
ROCKY SHORE SURVEY WORK  
FEBRUARY 1996**

The Sea Empress oil spill incident began on the 15<sup>th</sup> February 1996 and clearly had the potential to impact a number of the rocky shore monitoring sites surveyed in October 1995. It was quickly realised that the October survey data could be augmented by having some immediate pre-impact photographs and data. Limpets were chosen as the indicator species to survey, given their known sensitivity to oil pollution and their importance in rocky shore community structure.

The Group commissioned OPRU to carry out quantitative surveys of limpet populations on the 16<sup>th</sup> and 17<sup>th</sup> February. Two teams of marine biologists carried out the surveys at 10 of the transect sites within the main body of Milford Haven. Three quadrats (0.1m<sup>2</sup>) were established at 3 or 4 selected stations along the transects. The quadrats were photographed and all limpets within the quadrats counted (separate counts for adults and juveniles < 10mm). Notes were made of any oiling on the site and the stations. The data and slides are available at OPRU for future monitoring. The photographs have been used in a SEEEC project to assess the effects of clean-up activity.

This work has been repeated in October 1996 as part of the SEEEC rocky shore project, using the Group's baseline data.

# DAUGLEDDAU ESTUARY AND MILFORD HAVEN WATERWAY

## ANNUAL SHELDUCK CENSUS - 1995

### 1. Introduction and Methods

The Daugleddau Estuary and Milford Haven Waterway hold nationally important numbers of shelducks during the winter months, and a small but significant summer breeding population. The number of breeding shelducks has been assessed at various times during the 1960's and 1970's, and full surveys have been carried out on an annual basis since 1991. In 1993, the annual summer Shelduck census was incorporated into the rolling programme devised by the MHWEMSG. The survey was repeated in 1995 by National Park staff using the Water Ranger's small rigid-hulled inflatable boat. Fieldwork was carried out in mid-June and at the end of July, during which the following information was collected:-

- location of pairs with broods
- numbers of ducklings in each brood
- other shelducks present; numbers and distribution
- location of high-tide roosts
- numbers and distribution of other birds.

All major pills, tributaries and embayments (with the exception of The Gann) were surveyed from the boat on rising/high spring tides.

### 2. Results

#### Shelducks

In June 1995, 13 pairs with broods were located, on the Western Cleddau (4), Eastern Cleddau (3), Carew River (2), Cresswell River (3), Pembroke River (1). A total of 109 non-breeding shelducks were present in June, the majority of which were on the Eastern and Western Cleddau and Cresswell River.

By the end of July, 5 additional broods had appeared on the estuary, on the Western Cleddau (2), Eastern Cleddau (1), Pembroke River (1) and Angle Bay (1). In addition, a crèche comprising young of different ages and sized, attended by 2 adult females was located in July on the Cresswell River. All non-breeding shelducks had by this time left the estuary system.

The total of 18 broods, (yielding 112 ducklings) was twice the number recorded in 1994, and approached the numbers recorded in the 1960's and 1970's. 1994 was a particularly poor year and the considerable improvement in breeding success recorded in 1995 will hopefully continue in 1996.



## **Other Estuary Birds**

During the first phase of the survey, a total of 735 waders and wildfowl (other than shelducks) were counted, representing 11 species. This total included 191 Canada geese, 193 mallard, 190 curlew and 110 oystercatcher. By the end of July, numbers of waders and wildfowl had risen to 2899, 1985 of which were curlew. Many of the curlew were almost certainly on migration and using the estuary system as a stop-over for resting and feeding. Other species present included common sandpiper (42), greenshank (7) and redshank (192). A total of 248 Canada geese were seen in the upper estuary. The majority of waders present were counted at high tide roosts.

### **3. Discussion of Results**

The data obtained on breeding shelducks indicate that 1995 was the best year since the start of the current sequence of surveys. Several factors may have contributed to a relatively successful season such as better weather in April and May, during the egg-laying and incubation period, and fewer ground predators. Fox numbers were thought to be lower in 1995 than in 1994.

### **4. Future Monitoring**

The census will be repeated in 1996, as part of the annual monitoring programme co-ordinated by the MHWEMSG.

A detailed account of the 1995 census is given in an unpublished report to the MHWEMSG and the Dyfed Wildlife Trust's Pembrokeshire Ornithological Research Committee.

**Jane Hodges  
Pembrokeshire Coast National Park Authority  
June 1996**

# MILFORD HAVEN WATERWAY AND CLEDDAU ESTUARY

## WILDFOWL AND WADER COUNTS 1995/96

### Executive Summary

#### 1. Introduction

The Cleddau Estuary and Milford Haven Waterway hold large numbers of waterfowl (wildfowl and waders) during the winter months, with numbers of shelduck, teal, dunlin, curlew and redshank reaching levels of "national importance" in most years.

Monthly counts of waterfowl are carried out throughout the autumn and winter as part of the national Wetland Bird Survey (WeBS). Since the winter of 1993 -94 these counts have also been incorporated into a rolling programme of research and survey initiated by the MHWEMSG.

#### 2. Methods

The dates of the counts are determined by WeBS to coincide with high tides. The estuary is divided into fifteen sectors and is counted by a team of observers. Counts normally take place within two hours either side of high tide when most species are assembled in high tide roosts. Sectors are counted by a combination of walking the shore and counting from fixed points depending on accessibility. Complete coverage of all sites was achieved between September 1995 to March 1996. Data for late July were collected by Jane Hodges (PCNP) during her Shelduck survey. In addition, a cold-weather count was undertaken on 1<sup>st</sup> January 1996.

The February 1996 count was due three days after the tanker, the Sea Empress, was grounded at the entrance to Milford Haven on 15<sup>th</sup> February. As a result of this spill, further additional counts were organised - daily counts of the threatened and affected embayments from the 16<sup>th</sup>, the whole estuary daily from 20<sup>th</sup> to 25<sup>th</sup> February and weekly counts thereafter until 31<sup>st</sup> March. These data were supplied to the Joint Response Centre.

#### 3. Results

During the peak period between November 1995 and February 1996 mean monthly totals of 5146 wildfowl and 6695 waders were present. The peak monthly count for wildfowl was 7913 in December, and for waders was 10,282 in January. Curlew (max. 1436 in January), Shelduck (max. 1047 in February), Widgeon (max. 3455 in December) and Teal (max. 2948 in December) exceeded levels of national importance. Dunlin were the most numerous wader, reaching a maximum of 4436 birds in February.

Fifty-five species of waterfowl were recorded (excluding gulls), including sixteen species of duck and twenty-three of waders. Divers, grebes, herons, cormorants and geese were also represented, together with mute swan, water rail and moorhen. Unusual species included smew, goosander and red-necked grebe, and pintail in larger than usual numbers (44 at the beginning of March).

The extra New Year count indicated that several wader species had declined during a cold spell.

After the oil spill, an increasing percentage of the birds were to be found in the upper embayments.

#### **4. Discussion**

##### **Cold Weather Observations**

A cold weather spell in November/December was almost entirely responsible for the increase in numbers of birds of various species in the Cleddau Estuary complex. Four species reached levels of national importance this winter, confirming that the Cleddau Estuary system is an important refuge during periods of cold weather. Teal, for example, reached their highest levels since 1990/91. With the peak numbers occurring in December, it is likely that many continued to move south or west as the cold spell continued. Other species, however, continued to increase in number until mid-January.

Wader numbers were low during the cold-weather count on 1<sup>st</sup> January, but by mid-January, numbers had recovered to their normal levels. Grey plover numbers were boosted to 180 in January, and knot to 85 in February; both species are scarce on the estuary. Redshank, however, continue to decline.

##### **Sea Empress Oil Spill**

The total number of birds on both the badly affected lower embayments and the relatively little affected upper parts declined immediately after the oil spill. Count totals were erratic during this period, probably because birds were unsettled as they tried to find clean feeding areas, and were probably also disturbed by cleaning-up operations in the lower embayments. They may have also investigated freshwater areas, where several oiled gulls were seen. Numbers returned to "normal" levels within a week, but with a large majority of birds settling in the upper estuary embayments.

Wildfowl were least affected as most tend to be in the upper embayments anyway. However, approximately 250 Shelduck left the estuary altogether, although 100-150 stayed in Pembroke River. Great crested grebes are normally found only in the lower embayments, but moved to the upper embayments after the spill. Several common scoter were also recorded, displaced by the oil from their normal wintering grounds in Carmarthen Bay.

Amongst the waders, turnstone, ringed plover and oystercatcher, which all favour the lower embayments, were most affected. Oiled birds were reported roosting in fields, or furiously trying to preen oil from their plumage at freshwater outlets at Angle Bay and other areas. Curlew also appeared to leave the estuary, temporarily.

Although over eight per cent of the birds present showed signs of oiled plumage, apparently very few were affected badly enough to be incapacitated. However, at least 16 mute swans were taken into care, while up to 27% of all gulls were reported oiled to varying degrees on 22<sup>nd</sup> February.

Interpretation of counts made after the spill is difficult because birds are naturally migrating through the system from mid-February onwards. This was most obvious with black-headed gulls. Up to 4,000 were counted at the end of February, but the varying proportion showing signs of oiling each day suggested that large numbers were moving through.

The lower embayments (below the Cleddau Bridge) were all badly affected by the oil, with Angle Bay, Sandy Haven and Castle Pill the worst affected. Large numbers of dead cockles were reported in both Angle Bay and Pembroke River. With waterfowl being at the top of the food chain in the estuarine system, monitoring of bird numbers and feeding areas will provide a good indication of the recovery and health of the system in future years. Detailed monitoring is recommended for the next few winters, including the monitoring of low water feeding areas to supplement the regular monthly high tide counts.

**Annie Poole**

**WeBS Co-ordinator for Pembrokeshire  
Pembrokeshire Ornithological Research Committee  
Dyfed Wildlife Trust  
June 1996**

## FINANCIAL SUMMARY

Balance Brought Forward	<b>£67,976</b>
Contribution Due 1996/97	<b>£37,700</b>
	<b><u>£105,676</u></b>

### Expenditure

Environment Agency lab costs	£25,000.00
Metal analysis of samples inter tidal sediments	£6,000.00
OPRU remaining costs of Rocky Shore Transects Survey	£6,423.00
Post Spill Rocky Shore Transect	<u>£2,369.98</u>
	<u>£39,792.98</u>

### Commitments

1. Contaminant Sourcing	£5,000
2. Sediment Sink - tenders to be awarded later (estimated cost)	£20,000
3. Sediment Hotspots overall cost depending on scope of work (estimated cost)	£20,000
4. Post Sea Empress finger printing of hydrocarbons	£3,000
5. Database maintenance [provisional]	£1,000
6. Admin. support	£2,000
7. Water quality monitoring to 1 <sup>st</sup> April 1997	£4,500
8. Wetlands bird survey Dyfed Wildlife Trust	<u>£1,000</u>
	<u>£56,500</u>

Total Expenditure/Commitments **£96,292**

**To be carried forward** **£ 9,384**

## **FUTURE WORK PROGRAMME**

The Group confirmed the recommendation of the Project Group on 29<sup>th</sup> August 1996 that the following projects would receive priority from funding in the next twelve months.

On receipt of all the contributions, further decisions will be taken from projects listed in the timetable.

The Project Group's recommendations are as follows:-

1. Contaminant Sourcing	£5,000
2. Sediment Sink - Tenders to be awarded later estimated cost	£20,000
3. Sediment Hotspots overall cost depending on scope of work estimated cost	£20,000
4. Post Sea Empress Fingerprinting of Hydrocarbons	£3,000
5. Dyfed Wildlife Trust wetlands bird survey	£1,000
6. Water quality Environment Agency (to 1 <sup>st</sup> April 1997)	£4,500

Tender documents are being prepared for issue in the near future for the contaminant sourcing, other tender documents to be drawn up on receipt of fresh funding.

**PROJECTED TIMETABLE**

**MILFORD HAVEN WATERWAY ENVIRONMENTAL MONITORING STEERING GROUP  
PROGRAMME OF WORK**

ACTIONS	Priority	Cost £000's	1996	1997	1998	1999	2000	FUTURE
1 Database	1	1	██████████		-----	-----	-----	
2 Administrative support	1	2	██████████		-----	-----	-----	
3 Water quality monitoring	1	4.5	██████████		-----	-----	-----	
4 Seabed sediments								
(i) Biology (5year repeat at selected sites)	1				-----	-----		
(ii) hydrocarbon analysis. Part of SEEEC Project (repeat of Groups 93 survey financed by EA/WO)	1		██████████			-----	-----	
5 Inter tidal sediments								
(i) Biology (5 year repeat at selected sites)	1					-----	-----	
(ii) metals analysis	1	6	██████████				-----	
(iii) hydrocarbon analysis EA	1						-----	
6 Sediment "Hotspots" (priorities to be decided from 4 & 5 above)	1	20	██████████					
7 Suspended sediment analysis (linked to 6 above)	2			-----	-----			
8 Sediment sinks (linked to 6 above, done with 7)	1	20	██████████					
9 Wildfowl and wader populations (PORC)								
(i) wintering	1	1	██████████	-----	-----	-----	-----	
(ii) breeding shelduck census (PCNPA)	1		██████████	-----	-----	-----	-----	
10 Contaminant sourcing								
(i) water quality input budgets	1	5	██████████					
(ii) linked to results of 6	1			-----	-----			
11 Use of Skomer as "reference"	1		-----	-----	-----	-----	-----	
12 GIS system development	2				-----	-----		
13 Rocky shore and seabed monitoring								
(i) inter tidal survey	1						-----	
(ii) seabed survey	1	12		██████████				
14 Salt marsh monitoring	2				-----	-----		
15 Eel grass beds (review following SEEEC report)	2				-----			
16 Post-spill impact surveys (ad hoc)	1	3	██████████					
17 TBT contamination	2			-----	-----			
18 Bioaccumulation	2			-----	-----			
19 Dredging impacts on sediment transport (MAFF-MHWEMSG to assist)	2							
20 Recreation use survey	3							
21 Bait digging/changes in community structure (linked to results of 5(i) and 15)	2			-----	-----	-----		
22 Intertidal terrestrial invertebrates	3							
23 Review of reports for decision for future research					██████████			

**KEY:**



1996 Work



Possible/suggested period for work in future years given current priorities