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FRV *CLUPEA*

Cruise 1496C

REPORT

11 September - 26 September 1996

Personnel

N Bailey	SSO (in charge)
C W Shand	HSO
A R Weetman	ASO
C D Hall	SSO (part time - two days only)

Objectives

a) To obtain estimates of distribution and abundance of *Nephrops* in the Firth of Clyde and South Minch using underwater television.

b) To collect samples of the sediment at each TV station.

c) To use trawl caught samples of *Nephrops* to examine biological features at different sites throughout the survey areas and to collect samples for genetic analysis.

d) To make use of the TV survey to estimate the densities of whelks and to use the trawl surveys to collect biological data on the various species encountered. Data on other shellfish species of potential commercial importance will also be collected if time permits.

Out-time days per project: 16 days FAA1

Narrative

Scientific staff and gear were transported to Anstruther on 11 September, Mr J Kinnear (listed in the cruise programme) was unable to join the cruise for personal reasons. Loading of *Clupea* took place in Anstruther at 1400 hours and the remainder of the day was used to set up TV and data logging equipment. During 12 of September, nine TV stations were worked in the area between Anstruther and Arran followed by a trawl. *Clupea* returned to Anstruther at 1950 hours for C Hall to leave the ship. Over the next three days *Clupea* steamed in a clockwise direction around the Clyde collecting data at 28 TV stations, three of which were trawled. After completing three further Clyde TV stations on 16 September, *Clupea* steamed for the Sound of Jura via the Mull of Kintyre. A total of 10 TV stations (one trawled)were worked before deteriorating weather conditions curtailed activities and *Clupea* steamed for anchorage to the west of Jura arriving at 1900 hours. Owing to continuing bad weather in the Minch, work on the 18 September was conducted at eight stations in the Lynn of Morvern. With some moderation in the wind, it was then possible to carry out operations at 10 TV stations (one with trawling) on the Colonsay *Nephrops* grounds before *Clupea* steamed for Oban and the half landing on 20 September.

The survey resumed on 21 September at grounds to the south east of Tiree where four TV stations were covered. Another 10 TV stations (one with trawling) were worked to the northwest of Tiree before bad weather again necessitated a change to the survey design and *Clupea* was forced to

move to the Sound of Sleat on 23 September. Worsening weather meant that *Clupea* was unable to operate in the open sea areas and during the remainder of the cruise a total of 15 stations were covered in Lochs Huorn, Nevis, Torridon and around the Crowlin Islands. *Clupea* steamed for Fraserburgh and unloading was completed by 1400 hours on 26 September.

Data Collection

Objectives for the Firth of Clyde and Sound of Jura were fully met but deteriorating weather forced significant changes to the survey in the South Minch Area. It was unfortunate that areas to the south and west of the South Minch Functional Unit could not be sampled. The change of plan enabled some surveying of a number of sea lochs which have hitherto received little or no attention. The data gathered in these lochs provide information on creeled populations of *Nephrops*.

A total of 97 TV sledge runs each of 10 minutes duration were made during the survey. Of these, 92 produced pictures of *Nephrops* ground which were clear enough to analyse; all seabed operations performed well. Calculation of the area surveyed was facilitated by using an odometer to monitor the distance of travel of the sledge. Data on the precise height of the camera above the bottom could not be gathered owing to rangefinder failure. Preliminary counts were made at the time of the survey and more detailed analysis followed in the laboratory.

Sediment samples were collected at all TV stations where soft sediments were encountered, these have now been analysed in the laboratory using laser particle size analysis.

A 50 mm prawn trawl (BT 149B) was used to make 30 minute trawl hauls in each of the main areas surveyed. A total of eight hauls were made providing information on sex and size composition and on the reproductive state of the females. These data are incorporated into the estimates of stock biomass.

Summary of TV Survey Data Analysis

Using BGS sediment data in the design of the survey led to very good targeting of the soft mud *Nephrops* grounds. In each area, three survey strata were adopted - these were based on soft sediment classifications used in the Folk description. Estimates of mean *Nephrops* burrow density are given by stratum for each of the three main areas, in Table 1. Mean densities were raised to overall areas of the "mud" to provide abundance estimates.

In the Clyde, highest densities were recorded on the coarse mud sediments to the south of Ailsa Craig, the densities in 1996 were higher than those in 1995 leading to a fairly large increase in biomass. Much of the increase appeared to be due to small recently recruited *Nephrops*. In the South Minch, where density was generally lower than in the Clyde, there were also signs of stock increase which again is probably linked to improved recruitment. In both areas, variance was rather high and some caution is required in placing too much reliance on the magnitude of the increase.

The highest mean stratum density was recorded in the Sound of Jura (0.86 m^{-2}) on the coarse muddy sand. This area has previously been associated with dense populations of small animals.

N Bailey
13 August 1997

Table 1 Results by stratum for the 1996 Clupea TV surveys in A. Firth of Clyde, B. South Minch and C. Sound of Jura. For each stratum, the number of stations, mean density, variance and raised estimate of biomass is given.

A.

1996

Stratum	Area (km2)	Sample size	Mean Density burrows m-2	Observed variance	Abundance (millions)	Stratum variance	Prop. of Total variance
m	716.8	14	0.322	0.0100	230.912	367.10	0.0177
sm	698.6	14	0.594	0.3159	414.669	11011.84	0.5296
ms	664.6	10	0.703	0.2131	467.2138	9412.04	0.4527
Total	2080	38			1112.795	20790.98	1

B.

1996

Stratum	Area (km2)	Sample size	Mean Density burrows m-2	Observed variance	Abundance (millions)	Stratum variance	Prop. of Total variance
m	303.1	5	0.384	0.0254	116.3904	466.3	0.0038
sm	2740.6	10	0.433	0.1498	1186.68	112530.6	0.9197
ms	2027.6	6	0.317	0.0137	642.0733	9364.3	0.0765
Total	5071.3	21			1945.144	122361.3	1

C.

1996

Stratum	Area (km2)	Sample size	Mean Density burrows m-2	Observed variance	Abundance (millions)	Stratum variance	Prop. of Total variance
m	90	4	0.5	0.021	45	43.07	0.175252
sm	150	3	0.25	0.024	37.5	182.3	0.741781
ms	142	3	0.86	0.003	121.6	20.39	0.082967
Total	382	10			204.1	245.76	

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