

P1/6

Not to be cited without prior reference to the FRS Marine Laboratory, Aberdeen

FRV *Alba na Mara*

Cruise 1008A

REPORT

24 September – 2 October 2008

Ports

Loading: Fraserburgh

Unloading: Fraserburgh

Personnel

Mike Heath (In charge)
John Dunn
Natalia Serpetti
Chris Beattie (Univ. Aberdeen)
Emma Hazard (Univ. Aberdeen)

Project Codes: MF0758 (5d), AE11q (4d)

Equipment

MiniMuc corer
IOS box corer
Seabird CTD
SAIV CTD
Water bottles
Day grab / wooden table / sieving tables
Lowered camera frame
Zooplankton 'bongo' net and 1m towed net
On-deck incubation tanks
Roxann hydroacoustic system
Thermosalinograph system

Objectives

- 1) To collect seabed sediment cores and grab samples from a range of sediment types in an area up to 10km offshore between Catterline and Porthlethen off the east coast of Scotland.
- 2) Conduct experiments on the collected cores aboard the ship, involving incubating cores in a tank on deck, and measurements in the laboratory.
- 3) Collect hydrographic, water and plankton data and samples at each core collection site, and at the routine Stonehaven monitoring site.
- 4) Deploy a vertical dip camera frame at core and grab collection sites to obtain images of the seabed.

- 5) Carry out Roxann and thermosalinograph surveying within the study area
- 6) To re-lay a Datawell wave rider buoy off Aberdeen beach.

Narrative

The vessel sailed from Fraserburgh shortly before midday on 24 September and made a passage to Aberdeen Bay where the Datawell waverider buoy was deployed without difficulty. The vessel then anchored for the night and various of the coring and hydrographic equipment were tested.

The following day (25 September) *Alba na Mara* headed south into the study area, anchoring each night in Stonehaven Bay. On each of 6 days in the area, the vessel completed a full 12h programme of work with no loss of time due to weather, or equipment failures (Figure 1). Due to imminent bad weather the vessel headed north to Fraserburgh on the evening of 30 September rather than remaining at Stonehaven and making the passage on 1 October, arriving at 0100. However, this did not interfere with scientific work on samples, which continued aboard the ship during 1 October in Fraserburgh harbour.

The scientific programme was divided between 4 tasks: 1) collection of sediment cores with associated CTD data, and measurements on the cores aboard the ship, 2) collection of seabed video footage and grab samples, sieving of the grab samples through various sieves and analysis of the fauna collected, 3) daily completion of standard hydroplankton sampling (CTD, water sampling, zooplankton sampling) at the Stonehaven monitoring site (5km offshore from Stonehaven), 4) Roxann and thermosalinograph surveying.

The experimental measurements on each sediment core (permeability, oxygen uptake, nutrient fluxes and vertical profiles) took 2 days to complete. The collection of cores (Figure 2) was therefore staged through the survey since space, personnel and equipment limited the conduct of the experiments to approximately 9 cores at any one time, with a minimum of 3 replicates being required for each site. During the course of the survey measurements were completed on cores from 7 sites ranging from mud to mixed sand/gravel. An additional constraint was that the operation of the corer required as close as possible to slack tide conditions.

Video and grab sampling was carried out at 48 sites selected according to a stratified sampling scheme based on sediment classes defined from a previously conducted Roxann and QTC/Swath bathymetry survey (Figure 2). 3 grab samples were sieved through a 5mm mesh sieve and the fauna sorted and identified at sea. A further grab sample was sieved through 1mm and 0.5mm sieves and preserved for later analysis, and a subsample saved for grain size and elemental analysis.

Thermosalinograph and Roxann data were collected continuously throughout the cruise. In addition, detailed Roxann surveying was carried out on 30th September within 1nm x 1nm areas centred on two of the coring sites, with survey tracks at 100m spacing. The core sites selected were in areas of extremely diverse sediment and the data were collected to aid return to the site and reliable future sample collections.

Summary of Results and Conclusions

Core Sampling and Experiments

Five of the core collection sites were established locations which are visited at approximately 6 week intervals for core collections by the RV *Temora*, and are suitable for sampling with

the Minimuc corer. However, an objective of this survey was to additionally collect and study cores from sediment types which had so far not been successfully sampled by *Temora* due to the stony/rough nature of the seabed. For these more demanding sites the plan was to use the IOS box corer on loan from the NERC National Marine Equipment Pool. However, despite best efforts and the addition of extra weight we were unable to get the box corer to function satisfactorily, even in the most favourable soft sediments. We therefore reverted to using the more fragile Minimuc corer to collect from these difficult sediment types, with careful Roxann, video and grab sampling reconnaissance beforehand. By timing to coincide with slack water and skilful handling of the vessel by the ships master, we succeeded in collecting coarse sediment cores from 2 of these sites.

As expected the coarse sands were the most permeable and the muds the least. Cores from the mixed sand/gravel site had very variable permeability depending on the incidence or otherwise of a layer of mud some 5-10cm below the surface. Oxygen consumption was higher in the muddy sediments than in the coarse sands, but lower than 6 weeks earlier in the year. However, surprisingly the highest oxygen consumption rates were recorded in some of the mixed sand/gravel cores. There was also high variability between cores from these sediments, and the highest oxygen consumption rates probably coincided with the incidence of benthic macrofauna in the cores, such as polychetes. Analysis of samples saved from the experiments to determine nutrient fluxes and profiles will be carried out on return to Aberdeen.

Video and Grab Sampling

Video and grab samples were collected from all 48 of the planned sites. Full faunal analysis of the 5mm sieve samples was carried out aboard the ship, and the results showed very marked spatial patterns with fauna of the muddier sediments north of Stonehaven being dominated by holothurians, ophiuroids and echinoderms, whilst the harder, rougher sediments in the south were dominated by cnidaria (soft coral), hemichordate and crustaceans (Figure 3). These data will be used to estimate the bioturbation of sediments and the effect on nutrient flux rates.

Daily Hydro-Biological Monitoring

Standard hydro-biological sampling at the Stonehaven monitoring site was completed each day. The purpose of the daily sampling was to quantify the variability in monitored parameters over the routine weekly sampling interval. Analysis of the zooplankton and phytoplankton samples will be carried out on return to the Laboratory. Preliminary analysis of the CTD data indicated a declining temperature and rising salinity during the study period. As the tides progressed from neap to springs during the week, near-surface concentration of phytoplankton chlorophyll present at the start of the period dissipated and was mixed through the water column. At the same time, near-seabed turbidity increased and was mixed up to the surface (Figure 4).

Overall, the cruise was extremely successful, and excellent data on sediment biogeochemical processes were collected.

Mike Heath
9 October 2008

Seen in draft: A. Nichol, Master, Alba na Mara

Figure 1. Daily survey tracks in the study area, 25-30 September 2008

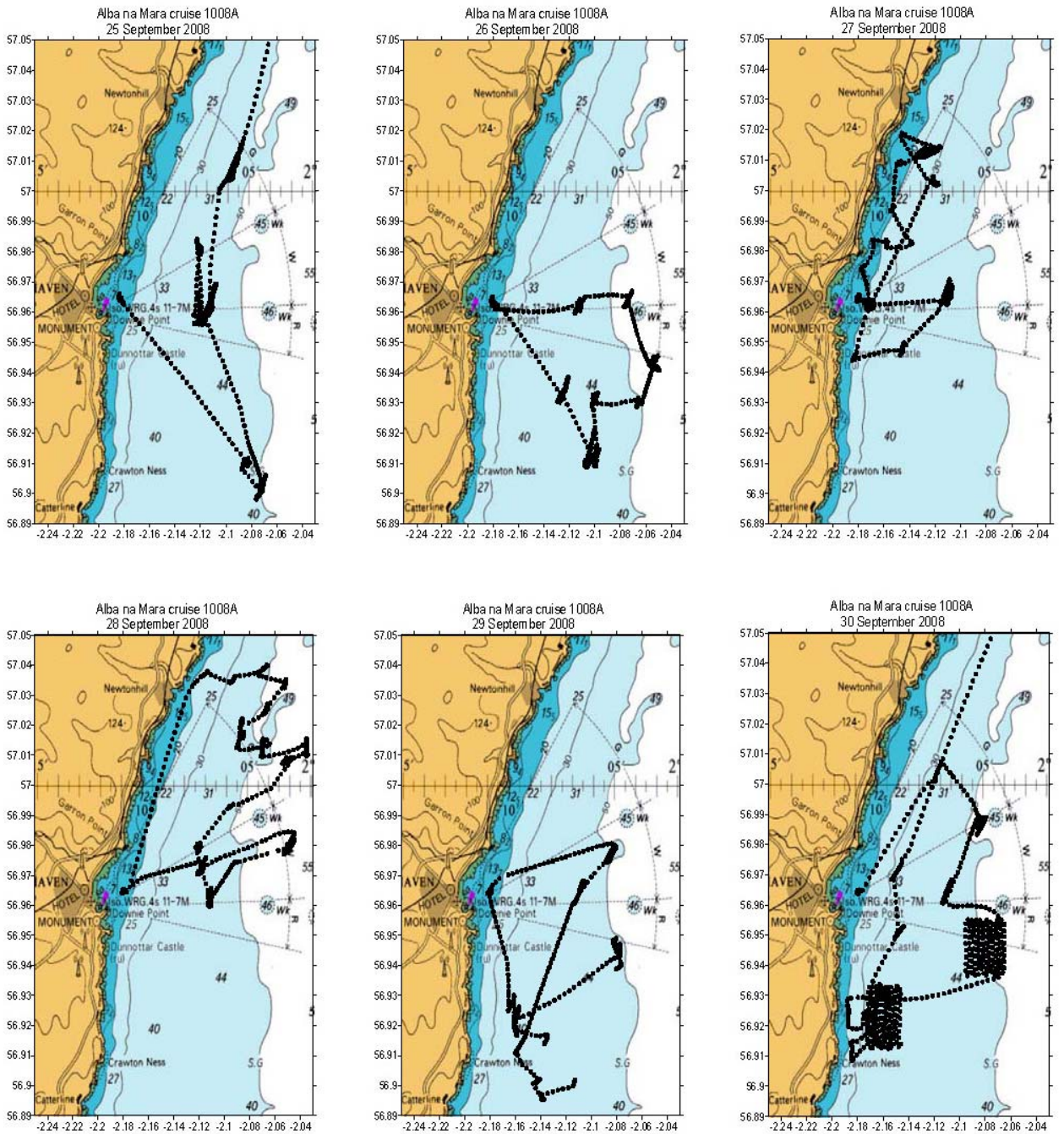


Figure 2. Locations of core collection, and video/grab sampling locations.

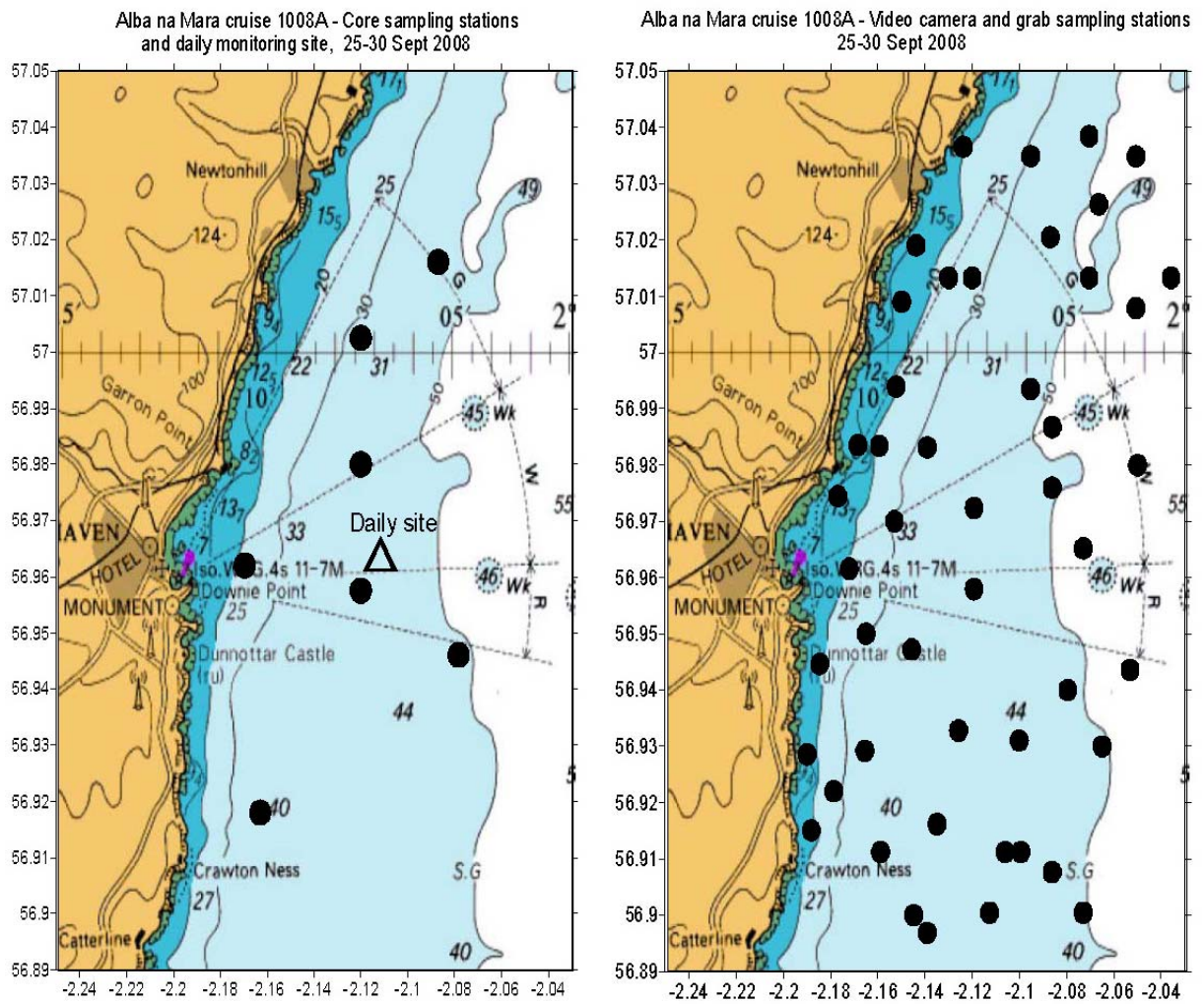


Figure 3. Distributions of benthic macrofaunal groups from taxonomic analysis of 5mm sieve samples of sediment from grab sampling. Maps show numbers of specimens from each group per 3 grab-loads of sediment.

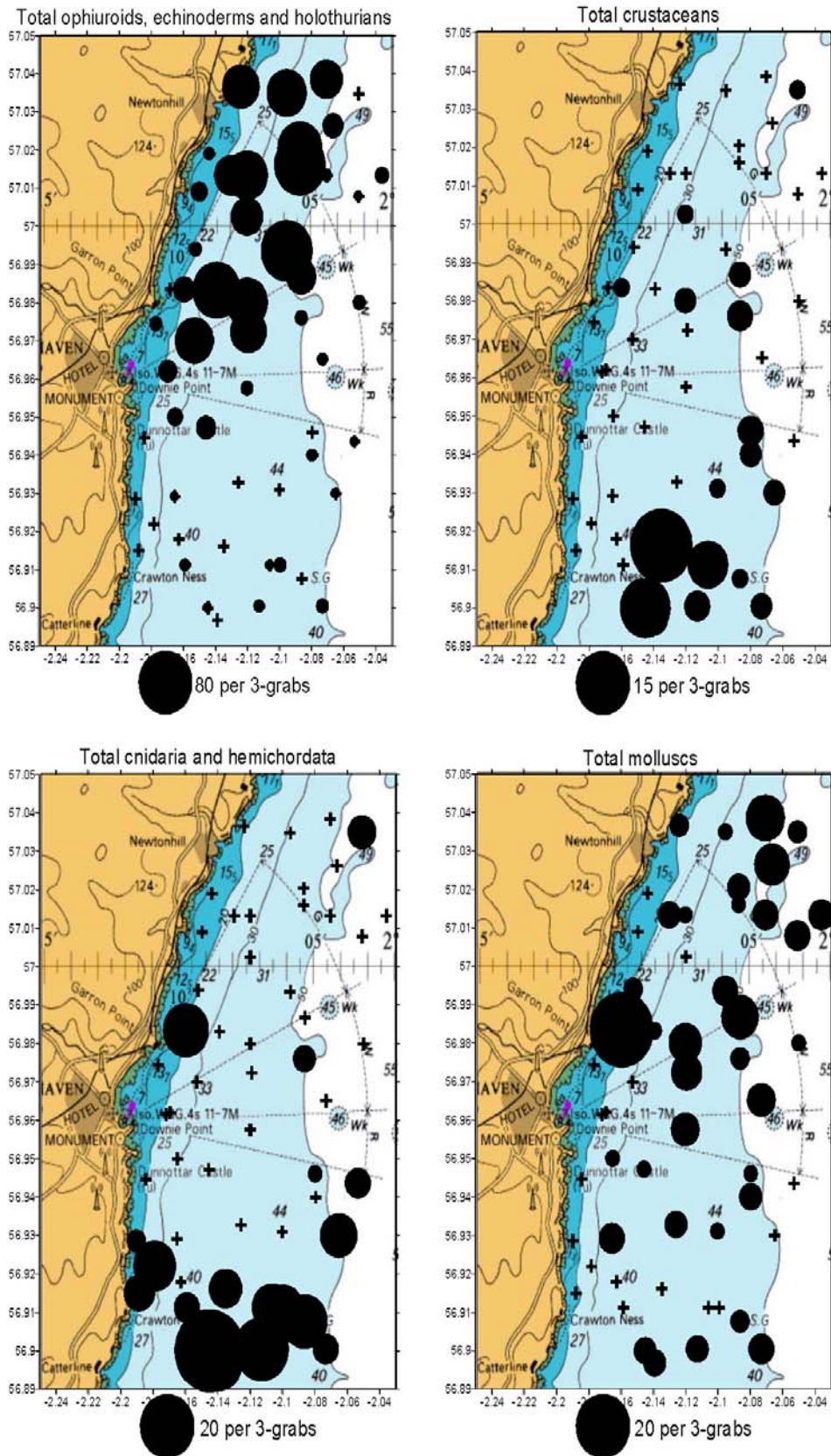


Figure 4. Changes in the depth distributions of temperature, salinity, chlorophyll fluorescence and turbidity at the daily monitoring site over the 6 days that the vessel was within the survey area.

