

AlterEco cruise#7: Cruise report

RV Princess Royal 12th March 2019

1. Project overview:

An Alternative Framework to Assess Marine Ecosystem Functioning in Shelf Seas (AlterEco)

The overarching aim of AlterEco is to develop a novel monitoring framework to deliver improved spatio-temporal understanding of key shelf sea ecosystem drivers. To achieve this, AlterEco will use marine autonomous vehicles to provide long-term, multi-variable ocean measurements that will help develop greater understanding of the physical and biogeochemical functioning of the continental shelf system. The project will enable a series of missions over a 14-month period with multiple vehicles on a region in the North Sea that undergoes considerable spatial and temporal variability.

The project has the following deliverables:

1. utilise the latest autonomous technology to provide sufficiently high temporal and spatial resolution of meso and sub-mesoscale processes to better understand the impacts of inter-annual variability on the functioning of the shelf sea ecosystem,
2. provide the tools necessary for informing operational forecast models of the stressors on and consequences of the environmental status of shelf seas,
3. provide a modular, integrated framework for an efficient, diagnostic monitoring regime for continental shelf seas that has global transferability.

2. Personnel on board:

Crew: Neil Armstrong (captain), Barry Pearson (engineer)

Science personnel (affiliation): Matthew Tobeman (PSO, SAMS), Estelle Dumont (SAMS) , Nealy Carr (NOC).

3. Cruise objectives:

This is the 7th of 9 planned AlterEco deployment/recovery cruises. Cruise objectives were to,

1. Deploy 2 Slocum submarine gliders: 345 (Cabot) and 304 (Ammonite).
2. Recover 2 Slocum submarine gliders: 305 (Dolomite) and 331 (Coprolite).
3. Deploy Nutrient enabled sea glider 602 (Scapa).
4. Collect CTD profiles and discrete water samples for calibration of glider sensors following deployment and prior to recovery.

Deployment, recovery, transect and waypoint locations are shown in figure 1.

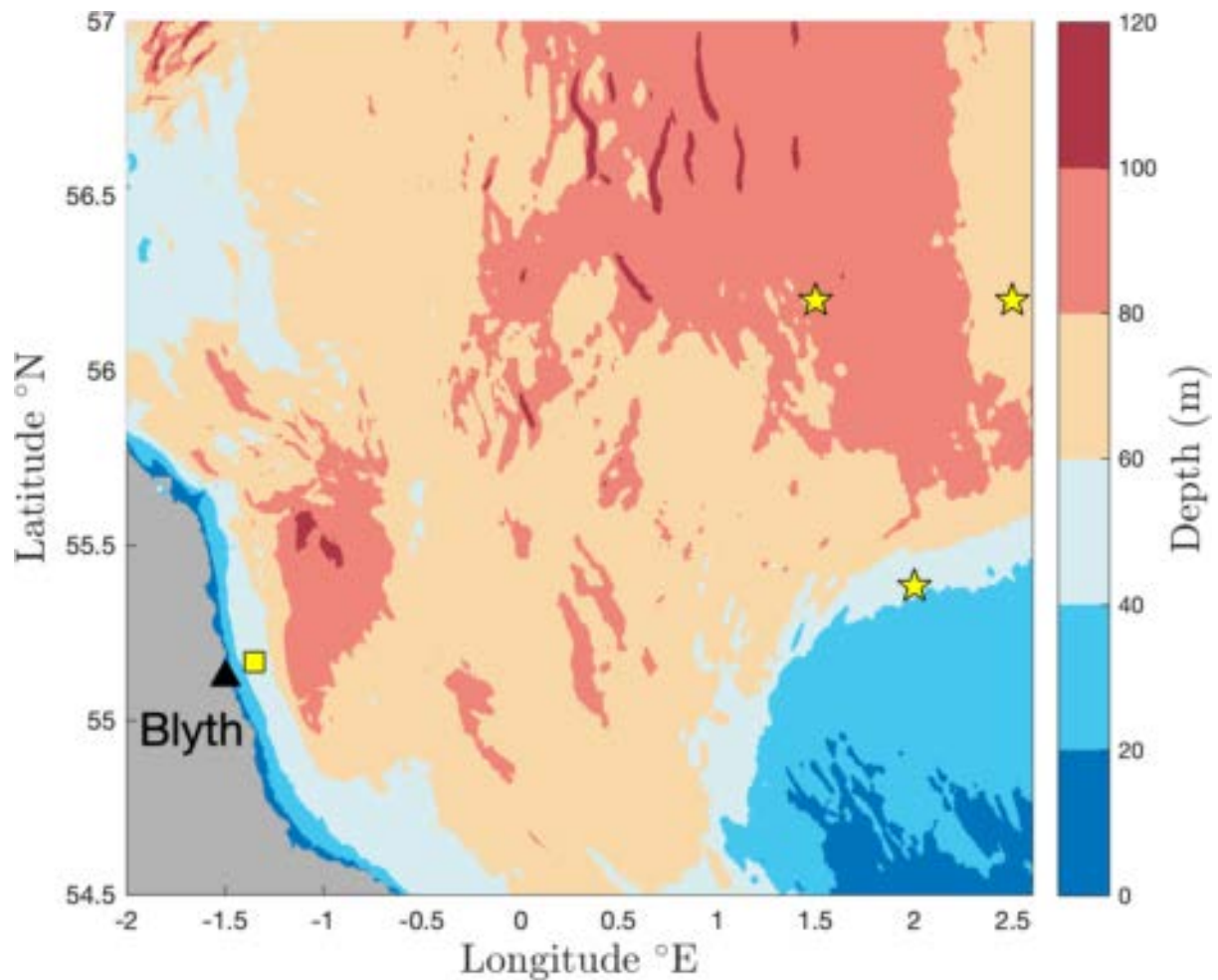


Figure 1: Nominal deployment/recovery site (yellow square) and planned survey location waypoints (yellow stars) Bathymetry (metres depth) indicates the coastline in black.

4. Cruise narrative (all times GMT 2019):

Monday 12th March

Pre deployment checks were successfully completed for gliders 345 (Cabot) and 304 (Ammonite).

Nutrient sensor was installed and pre deployment checks carried out for glider 602.

NOC Seabird 16+ stand alone CTD was attached to the SAMS CTD carousel.

Sunday 3rd December

Began Vessel loading ready for sailing at 06:30.

07:30 Departed Blyth harbour, sea state was relatively rough with ~1m swell, and moderate winds, with wind forecast to pick up through the day, however it was chosen to prioritise deployment to clear space on deck and to allow for glider trolleys to be used for storage upon

the recovery of the two Slocum gliders. Heading for latest position of Glider 331 : 55° 10.143' N , 01° 17.987'E

Event#1

08:00 On station at nominal deployment location of 55° 09.492 , 01° 18.407.

08:18 Glider 304 successfully deployed by hand using the glider trolley from the aft deck.

Event#2

09:03 Glider 345 successfully deployed by hand using the glider trolley from the aft deck at 55° 09.190' N , 01° 19.226' E

Event#3

10:00 Glider 305 sighted at 55° 09.106'N, 01° 16.894E.

10:04 Command sent to release nose cone

10:22 Nose released

10:31 Nose line grappled, attached to crane and glider lifted out of the water and successfully brought onboard with no damage.

Event#4

10:36 Glider 331 sighted at 55° 09.860' N, 1° 15 2.82E.

10:41 Command sent to release nose cone

10:54 Nose released

11:00 Nose line grappled, attached to crane and glider lifted out of the water and successfully brought on board with no damage.

Event#5

11:44 Sea glider 602 successfully deployed using greasy pin method from crane off aft deck at 55° 08.810'N, 01° 20.531'E.

Event#6

12:07 CTD conducted at 55° 08.955 01° 20.201. Water depth approximately 50m.

CTD carousel programmed to fire 3 bottles at first constant depth then and 3 further bottles at next constant depth . NOC Seabird 16+ stand alone CTD initiated to record T and S.

Bottles did not fire so CTD was redeployed.

This time bottles 3 and 6 did not fire but remaining 4 did so water samples taken from these bottles.

13:30 Back alongside at Blyth. Demobilised and washed down gliders and CTD. Gliders 305 (Dolomite) and 331 (Copolite) packed into boxes and loaded for transport to NOC Southampton.

CTD Summary.

Figure 2 displays temperature and salinity profiles from both the calibrated SB16 CTD and uncalibrated SB19 CTD. There does appear to be some stable temperature and salinity stratification, however when compared to that of the previous ALTERECO cruise. Changes in temperature and salinity with depth are very small.

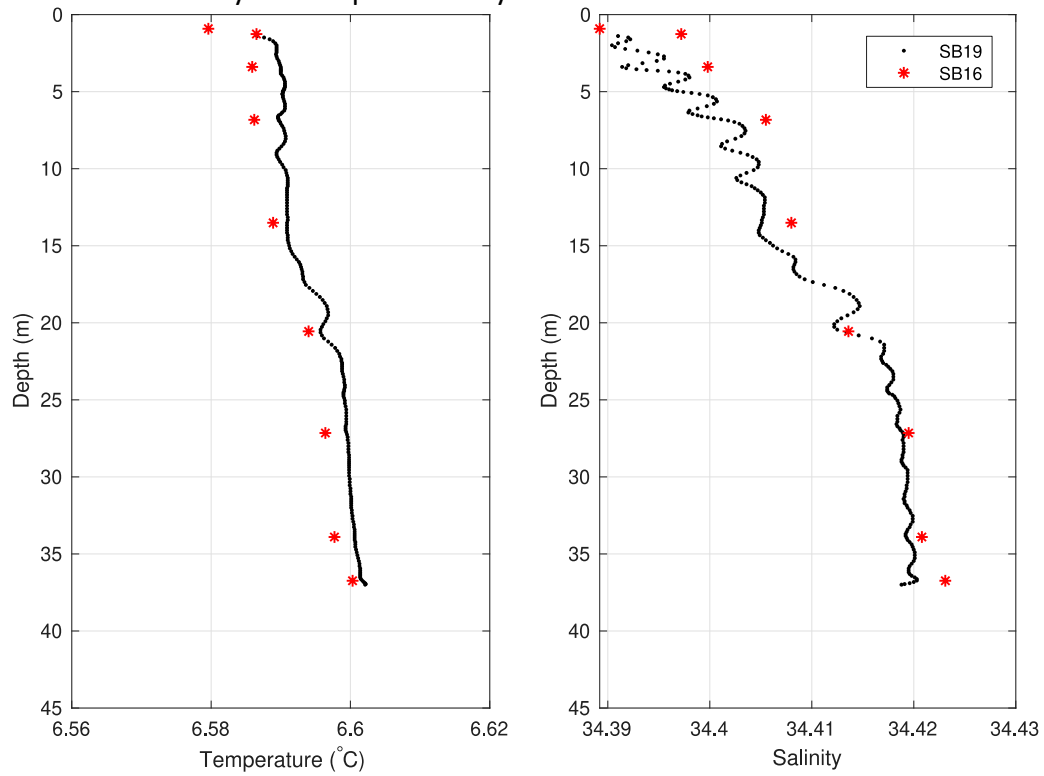


Figure 2: Temperature and salinity as a function of depth from the calibrated SB16 CTD (red stars) and uncalibrated SB19 CTD (black dots)

Figure 3 displays CTD depth as a function of time with the times of bottle firings shown, in order to confirm that the bottles were indeed fired at the required depth.

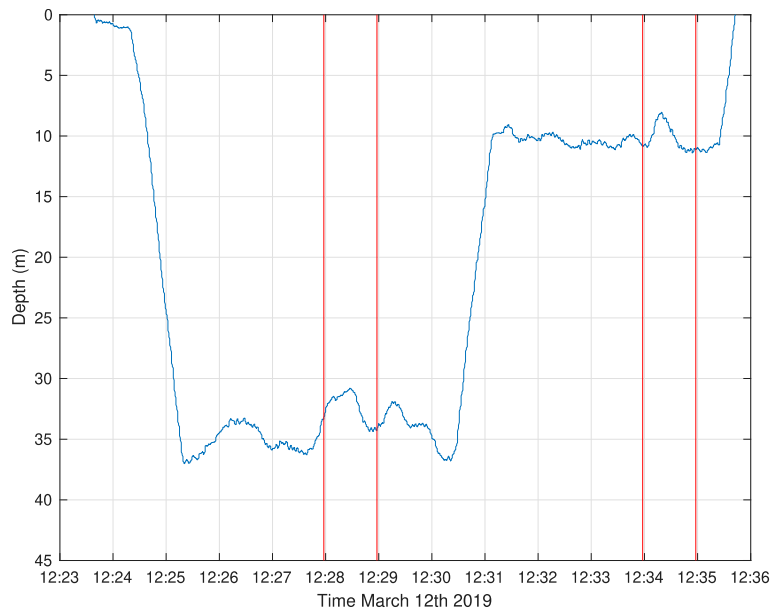


Figure 3 Depth as a function of depth for CTD carousel with, Niskin bottle firing times shown as red lines.

Tables 1 and 2 detail the water sample bottle numbers and the corresponding water depths for oxygen and salinity measurements.

Oxygen

Bottle Number	Temperature at Fix (Deg)	Depth (m)
228	6.5	10
432	6.5	10
330	6.5	10
327	6.8	35
432	6.8	35
330	6.8	35

Table 1 Oxygen sample bottle numbers, fix temperature and depth from which water was taken.

Salinity

Bottle Number	Depth (m)
42	10
43	10
44	35
45	35

Table 2 Salinity sample bottle numbers and depth from which water was taken.

