

CRUISE REPORTS "DR. FRIDTJOF NANSEN"

BENEFIT SURVEYS

Cruise Report No x/99

**Recruitment studies on hake and pilchard
28 September - 18 October 1999**

by

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1.1 Objectives

An overall goal of BENEFIT is to improve the knowledge and understanding of the important commercial stocks, their environmental condition and the linkage between environmental processes and growth, distribution and abundance of the fish stocks.

The present survey is the third investigation of a BENEFIT project with the specific objective to investigate the spatial distribution of spawning hake in the Benguela ecosystem and to explore the mechanisms which contributed to retain the eggs and larvae within the upwelling ecosystem. This includes the physical environment with the current circulation and the physical properties of the eggs and early larval stages.

1.2 History of the project and specific objectives of the fourth survey.

The recruitment studies in Namibian waters started with a pilot study on spawning hake (*Merluccius capensis*) in September/October 1995 (Sundby and O'Toole 1995). The objective of the project was to investigate how the physical and biological properties of hake eggs and larvae interact with physical setting of the Benguela Current to retain the offspring within the Benguela ecosystem. It was found that the cross shelf circulation and slow ascending speed of the eggs played an important role in the onshore transport from the offshore deep spawning areas to the onshore juvenile feeding areas. The pilot study was followed by a larger survey in South African and Namibian waters in October 1997. In September/October 1999 the third survey of this first project was carried out (Sundby *et al.* 1998).

The main objective of the present cruise was to follow up by a similar study how the pilchard (*Sardinops sagax*) with its specific spawning behaviour and specific egg properties, different from hake, are adapted to retain their offspring with the Benguela ecosystem. The second objective of the cruise was to conduct deep sea sampling of deep water hake (*Merluccius paradoxus*) in order to identify possible areas of spawning in Namibian waters.

1.3 Participation

The scientific staff during the cruise was:

:

From Namibia:

Johnny Gamatham, Paul Kainge, Heidrun Plarre, Malakia Shimanda and Rudi Cloete (from 9 October).

From Norway:

Berit Endresen, Reidar Johannessen, Tore Nilsen, Erling Kåre Stenevik, Svein Sundby.

1.4 Narrative

The vessel left Cape Town on 29 September, 20:00 hours, one day after schedule. This was because the circulation pump of the cooling unit (which supplies the density gradient column with temperature controlled water) had to be replaced. The delay was also partly due to various technical problem after docking. The work started in the offshore region to the north of the South African-Namibian border where the vessel arrived on 1 October, 03:00 hours. From this region the work switched between offshore deep bottom trawling in search for mature *Merluccius paradoxus* and inshore pelagic trawling and plankton hauls in search for spawning and early stages of pilchard. The first part of the survey was terminated off Cape Cross in the morning of 8 October when the vessel headed for Walvis Bay for shift of the crew. In the evening of 10 October the work was resumed at Cape Cross. The survey continued to Kunene River where the second part of the survey was terminated on ... October. During the third and last part of the cruise focus was put on sampling pilchard larvae and juveniles in the onshore central parts of the area of distribution. The ship arrived Walvis Bay on October.

CHAPTER 2 MATERIAL AND METHODS

2.1 Physical measurements

The survey started 29 September 1999 off Orange River and terminated ... October 1999. The entire Namibian coast was covered during the cruise. Figures 2.1 and 2.2 show the stations.

2.1.1 Wind data

Wind speed and direction were measured continuously while the vessel was underway and entered manually when the ship was on station. As during the cruise in 1998, there were problems with the manually entered wind direction in the station data on the CTD stations. Wind direction was manually entered from the bridge in 10ths of degrees while the programme interpreted the entry as degrees. From CTD station 847 the wind direction was entered manually from the bridge in degrees. The continuous recordings stored by the weather station are, however, correct, and the UMS programme was used to display wind vectors along the ships course.

2.1.2 Current data

Data collection

Data processing

2.1.3 Hydrography

A Seabird 911 CTD was deployed to collect data on temperature, salinity and oxygen. CTD were taken on all stations except on pelagic trawl station PT 518. Rosette bottle samples for calibration of oxygen were taken in two depths on each station. Samples

for calibration of salinity were taken from one depth on each station. The oxygen and salinity samples were analysed on board.

2.2 Plankton sampling

2.2.1 Multinet plankton sampler

Eggs, larvae and zooplankton were sampled with Multinet plankton sampler from Hydrobios. The plankton sampler has 5 nets with a mesh size of 405 micrometers. A flow meter was mounted in the entrance of each net. A Scanmar depth recorder with acoustic transmission to the vessel was mounted on top of the Multinet. At most of the stations the nets sampled in 50 m depth intervals when bottom depths were more than 260 m. When bottom depths were less the deepest net sampled from 10 or 20 m above the bottom to the nearest 50 m depth interval (e.g. from 180 to 150 m depth). The plankton sampler was retrieved at a speed of 0.5 -1.0 m/sec while the vessel maintained a speed of 2 - 2.5 knots.

2.2.2 Methot fish larvae sampler

2.2.3 Processing of samples

2.3 Trawl sampling

2.4 Buoyancy measurements of fish eggs and larvae

CHAPTER 3 RESULTS
