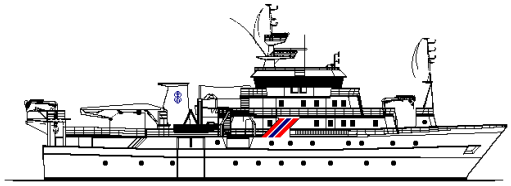
NANSEN PROJECT



Country: Namibia, South Africa

Research vessel: R/V DR. FRIDTJOF NANSEN

Survey number: 2011401

Number of days: 36

General objectives: Transboundary Survey between Namibia and South Africa with focus on the shared stocks of deep water hake.

	Port	Date	Coverage	Specific objectives
Departure	Cape Town	20 January	Namibia, South Africa	• To plan and conduct a transboundary survey from Port Alfred to Orange River to produce distribution maps and abundance estimates of the two species of hake to be later merged with similar data from a co-occurring Namibian national demersal survey, to enable complete mapping and assessment of shared stocks, thus providing a measure of the degree of sharing of the stocks at the time of the survey. • To collect data on the maturity stages of the hakes to check for possible spawning activity. • To collect other relevant data to better understand the environment impact on the distribution of hakes, and the fish community structure in the distribution areas of the hake
Arrival	Walvis Bay	16 February		

Cruise leader: Oddgeir Alvheim (cruise leader 10-27.01),Tore Strømme (cruise leader 28.01-16.02)

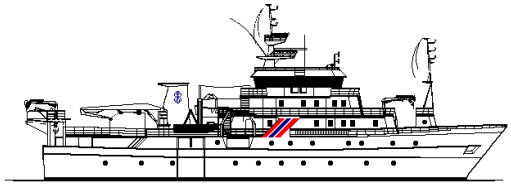
Participants:
From MCM, South Africa: Marek Lipinski (teamleader until 16.02), Sobahle (10.01-16.02)
Interns, South Africa: Jessica Escobar, Bernadine Everett (10-19.01). Andrew Swingler, Vicky Johnson (10-28.01), Danielle Boyd, Dylan Cooper, Kyle Cooper, John Dickens (10.01-16.02). Tammy Sawers, Nina Voogt (19.01-16.02). Melanie Smith (28.01-16.02)
From IMR, Norway: Oddgeir Alvheim (cruise leader 10-27.01), Tore Strømme (cruise leader 28.01-16.02), Tore Mørk (instrument chief), Jan Frode Wilhelmsen (10.01-16.02).

Summary of the results:

Biology

Dense concentrations of adult fish are found on the slope between Cape Agulhas and north to Saldanha Bay, similar to the general pattern of previous years. Dense concentrations of juvenile fish are found mid-shelf between St. Helena Bay and Hondeklip Bay perhaps in a more southern distribution focus as compared to previous years. The high densities of juvenile fish do not extend north of Hondeklip Bay, in contrast to the distribution pattern prior to 2008. No spill-over of juveniles north over the Orange Banks into Namibia was observed in line with findings since 2007, indicating that the years 2003-2006 when this was observed, represents a different environment regime.

The distribution of shallow water hake (*M. capensis*) is more uniform and at generally low level except for aggregations of juvenile fish in the shallow waters off Cape Agulhas and Hondeklip Bay. The density estimates from the point samples have been converted into biomass estimates by length classes. The similar data from the Namibian trawl survey running in the same period have



been processed following similar procedures. There is an increased share of fish in Namibian waters from 20 cm length onto about 60cm much in line with previous years. For the 30-35cm length class the share in Namibian waters is more than 60% and around 50% for the 40-55cm length class. This is in line with the general share pattern observed in the period 2003-2009, with 2010 as an anomaly giving a much higher relative share in South African waters. Beyond 60cm the Namibian share is decreasing and from approximately 65cm more than 85% of the fish is found in South African waters. This is the same general trend as from previous surveys. In this survey very few fish of length less than 20cm was found in Namibian waters. This is consistent with the finding that there is no fish spilling over the Orange Banks from South Africa into Namibia, in contrast to what was observed in the years 2003-2006.

The fish is located mid-shelf off Port Nolloth and Hondeklip Bay, between 180 and 240m bottom depth in line with the previous years. A new aggregation of baby hake was this year observed off Cape Agulhas, perhaps derived from spawning on the south coast. Although most of the 'baby hake' is pelagic, its consistent presence in the bottom trawl in this area, and not outside, indicate that these are aggregation and nursery areas for the very young deep water hake. It is not mixed with shallow water hake at these locations.

Since 2009 small patches of baby hake has been observed off the Cape Peninsula (2009) and off False Bay (2010), and now (2011) off Cape Aghulhas. This indicate that there could be a minor nursery area in this region, but that it is not stable and of less importance as compared to the main area off Port Nolloth**.**

The non fishable biomass in South Africa varies between 200 000 and 300 000 tonnes while in Namibia the range is 50 000 to 100 000 tonnes. The combined estimates of fish less than 36cm from the two countries varies from 268 thousand tonnes to 362 thousand tonnes in the period 2003-2011, which indicate a fairly stable system consistently providing new recruits into the adult biomass. The 2011 country-combined estimate of 341 thousand tonnes is in the upper range in the observed period. Added that the 2010 estimate was the highest recorded, 362 thousand tonnes, this indicate that recruitment in the transboundary deep water hake stock has been higher than average in the later years.

The fishable biomass, shows a relative stable level in the years 2003, 2005 and 2006. The gradual increase in the biomass 2007-2009 seems to indicate close to a linear relationship between the two countries' share of the biomass. In 2010 there was further increase of the biomass of M. paradoxus since the previous year. However this all over increase of about 10%, showed up as a 40% increase in South African waters compensated by a 27% decline in Namibian waters. As pointed out in the 2010 cruise report this pointed to a major shift in the distribution of the deep water hake stock at the same time as it was in an expanding phase. In 2011 the relationship between fishable biomass in South Africa and Namibia is back at the long term linear trend, at the same time as the combined fishable biomass is the highest recorded in the time series, i.e. 267 thousand tonnes. In the first years of the timeseries (2003, 2005, 2006) the average fishable biomass was estimated to 120 thousand tonnes. In 2008-2009 the estimate was around 200 thousand tonnes while in 2010 and 2011 the estimate is 226 and 267 thousand tonnes respectively. This indicates a very favorable growth of close to or more than 100% in the population of adult fish over an 8 year period. While the increase in South Africa has been from about 80 thousand tonnes to roughly 140 thousand tonnes, i.e. 75 %, the similar increase in Namibia has been from 45 thousand to 130 thousand tonnes, i.e. an increase of 188%. From a biological perspective this seems to indicate a healthy stock that is in a growing phase at the same time as it is gradually expanding geographically beyond its pristine area (South Africa) into a frontier area (Namibia).

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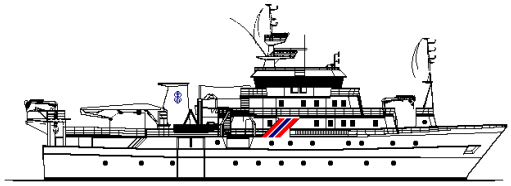
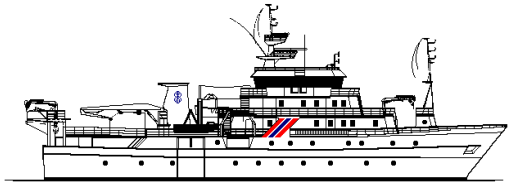


This time series does not include the south coast of South Africa which was only surveyed once with Dr. Fridtjof Nansen, in 2011. It would be interesting to see if a similar positive trend, i.e. signals of an expanding adult stock could also be observed in the Africana timeseries in the same period (2003-2011) on the south coast as well.

Considerations of the survey results, *M. paradoxus* 2003-2011

The findings from the survey 10 January-16 February 2011 combined with similar findings from the Namibian survey in the period 14 January-19 February and from the previous surveys confirms the general features as regards the distribution of *M. Paradoxus* :

- Minimal spawning takes place at this time of the year, confirmed through few signs of maturing gonads.
- The early pelagic stage is mainly confined to the central-outer part of the shelf off Port Nolloth in a small area off the Cape Peninsula.
- Juveniles between 15 and 24cm are mainly concentrated on the shelf between Hondeklip Bay and St. Helena Bay. In contrast to some earlier years there are no spill over of juvenile fish northwards over the Orange Banks into Namibia. The main interface between Namibia and South Africa seems to be along the slope. The same pattern occurred in the period 2007-20010 while in the preceding years there was a continuous channel of fish extending into Namibia over the Orange Banks during the January surveys. There might though be a seasonal pattern not revealed in the timeseries as all surveys are in January-February.
- The massive migration towards the slope starts in the 25-29cm group and when the fish is bigger than 30cm this movement is mainly completed.
- The adult fish is found from Cunene in the north and southwards beyond Cape Agulhas. The biggest fish, bigger than 70cm is, in consistency with previous surveys, only recorded in South Africa.
- The main part of the juveniles is at the time of the survey in 2011 located in South Africa which holds about 70% of the non-fishable biomass (fish smaller than 36cm) while the fishable biomass (bigger than 35cm) is about evenly shared between the countries, (52% in South Africa).
- The regional standing stock has been on a rising trend in the last five years. The regional estimate of fishable biomass has increased from 110 thousand tonnes in 2006 to roundly 270 thousand tonnes in 2010, representing a 145% increase. The increase has been stronger in Namibia (200%) as compared to South Africa (105%) indicating that the stock is spreading out geographically.
- Generally for all years; for the size range 55 to 60cm fish length there is an increased share of the biomass in Namibian waters compared to smaller and bigger fish classes, perhaps indicating a periodic immigration from south in terms of the life cycle.
- From 2009 to 2010 there has was recorded a major shift in the distribution of adult hake between the two countries, as the share in South Africa increased to 75%. In 2011 the pattern is back to the normal around 50%.
- The south coast of South Africa was in 2010 covered for the first time as part of the BCC surveys on transboundary stocks in order to have full synoptic survey and to investigate to what extent the southern stock component showed connectivity to the fish on the west coast. The deep water hake in this region was estimated to 100 thousand tonnes, which represents 15 % of the total paradoxus 2010 estimate and 18% of the South African estimate.
- The deep water hake in this region consisted in 2010 mainly of fish in the size range 35-70cm. The young fish less than 36cm (“non-fishable biomass”) on the south coast comprises less than 5% in terms of biomass of this fish in South African waters. This indicates that the southern component is mainly supplied by recruits from the west coast. The whole region from Port Alfred



to the Cunene could therefore be understood as an integrated connected system as regards one unit stock of deep water hake.

- Blue Sea and “Dr. Fridtjof Nansen” use identical trawls and similar survey design and sampling protocol. The catchability coefficient in the biomass estimates applied is 0.8. Since the catchability coefficient of the trawl used on Dr. Fridtjof Nansen and Blue Sea has not been calibrated against absolute densities in the path of the trawl, the biomass estimates given here should not be considered as absolute biomass, but as indices of biomass. Thus the essential information is in relative comparisons and trends.

Report: status: final References:

NORAD - FAO PROJECT GCP/INT/003/NOR CRUISE REPORTS "DR. FRIDTJOF NANSEN" EAF - N/2011/1. **2011 BCC Survey No.1.Transboundary Survey between Namibia and South Africa with focus on the shared stocks of deep water hake. Cruise report No 1/2011. 10 January – 16 February 2011.** Bergen, September 2011

Constraints/Comments: