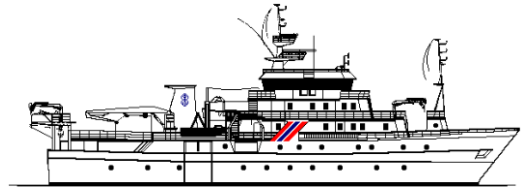


Country: Angola				
Research vessel: R/V DR. FRIDTJOF NANSEN				
Survey number: 2012403				
Number of days: 27				
General objectives: Survey of the fish resources of Angola				
	Port	Date	Coverage	Specific objectives
Departure	Luanda	2 April	Angola	<ul style="list-style-type: none"> To survey, map and describe the distribution, composition and abundance of the main demersal species, with special emphasis on sea breams (Sparidae), croakers (Sciaenidae), grunts (Haemulidae), groupers (Serranidae), hakes (Merlucciidae), cephalopods and shrimps (<i>Parapenaeus longirostris</i> and <i>Aristeus varidens</i>) on the Angolan shelf and slope (down to 800 m), from Cunene River (17°14'S) to Tombua(15°40'S), and from Benguela (12°35'S) to Congo River (06°00'S) using bottom trawl and the swept-area method. To collect biological data such as length, weight, sex and maturity stage of <i>Dentex macrophthalmus</i>, <i>D. angolensis</i>, <i>Pagellus bellottii</i>, <i>Umbrina canariensis</i>, <i>Merluccius polli</i>, <i>M. capensis</i>, <i>M. paradoxus</i>, <i>Brachydeuterus auritus</i>, <i>A. varidens</i>, <i>Parapenaeus longirostris</i> and <i>Chaceon maritae</i>. To collect the stomach contents for some species such as <i>U. canariensis</i> and <i>B.auritus</i> and <i>Merluccius polli</i> for subsequent analyses in the INIP Lab. To monitor the general hydrographical conditions using CTD-sonde on each trawlstation and map the temperature, salinity and oxygen. To carry out a monitoring line at Cunene River using INIP's new standard hydrographical profiles for collection of temperature, salinity and oxygen, water nutrients and phytoplankton.
Arrival	Luanda	29 April		
Cruise leader: Diana Zaera				





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Participants:

From INIP, Angola: 01.04-23.04: Silvi Nsiangango (local cruise leader), Antonio Bucu, Fátima Delicado, Domingos Pedro, María Margarida, Nilsa Alves, Eridson Sequenha, Noémia Nganga, Enoque Canganjo, Bernardo Fernandes. 25.04-29.04: Silvi Nsiangango (local cruise leader), Antonio Bucu, Fátima Delicado, María Margarida, Noémia Nganga, Marisa Macueira, Gisela Ramos, José Francisco Amaro, João Morais, Pedro Tchupalanga
From IMR, Norway: Diana Zaera (cruise leader), Arved Staby, Jan Frode Wilhelmsen, Ole Sverre Fossheim.

Summary of the results:

Between the 1st and 29th of April the demersal resource survey off Angola was carried out onboard the R/V "Dr. Fridtjof Nansen". The whole coastal area was covered (from Cunene River to south of Congo River), except from the area between Tombua and Benguela, which is unsuitable for trawling due to poor bottom conditions. The area was divided in shelf (20-200m) and upper slope (200-800m). Due to time constraints the number of trawl stations taken in the northern region was reduced by around 30-35%.

In total, 171 trawl stations were carried out, of which 166 were valid and used in the biomass estimation. To map the oceanographic conditions 172 CTD stations were taken.

Hydrographical conditions

The demersal surveys, carried out in March/April, typically coincide with the late phase of the wet season, which generally correspond with low salinity in the surface waters on the shelf off northern and central Angola due to the freshwater coming from the coastal rivers.

Such conditions did not prevail during the 2012 survey.

In general oceanographic conditions can be summarized as follows:

- 1) high inshore surface temperatures, oxygen and salinity,
- 2) low offshore salinity corresponding with high temperatures,
- 3) down sloping isotherms shorewards,
- 4) a thermocline above 50 m inshore.

These characteristics suggest a southward intrusion of Equatorial waters (Ostrowski 2007), corresponding with coastal downwelling conditions. The relatively shallow thermocline depth (often less than 30 m) however suggests that the remote forcing of coastally-trapped Kelvin waves was relaxing.

Biomass estimates

Time series from 1985 to 2012 of the biomass estimates for the most important species on the shelf and slope in the central and northern regions of Angola are presented in the final report. The southern region is not included, as the surveys in this region have not been properly standardized throughout the years. However, the effort, *i.e.* the number of stations by stratum on the southern shelf, has been relatively similar between 2000 to 2010, making comparable the estimates in this period. In addition and due to difficult trawling conditions on the southern slope, the estimates for this region are not reliable as the number of tows is low.

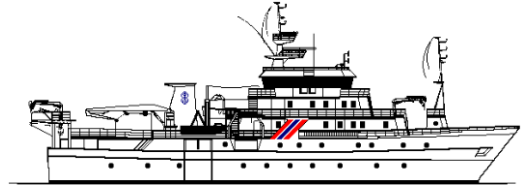
General trend

Angola has high marine biodiversity, both in terms of fish and invertebrates species. These species, despite having low individual biomasses, together constitute an important fishery. Abundance trends within stocks of low biomass may show great variation from year to year due to low frequency of occurrence and large variability (patchiness) in catch rates. This is reflected in high CV values for some of the biomass estimates. Both high and low biomass estimates with individually large CVs may not necessarily reflect realistic changes in biomass, and we have therefore chosen to look at the overall trend in catch rates for this year and compare it with the





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catch trends for the last ten years, when the survey methodology has been kept fairly constant. The pelagic species: *Trachurus capensis*, *T. trecae*, *Sardinella aurita*, *S. maderensis*, *Sardina pilchardus* and *Engraulis capensis* have been excluded from the analyses as these species are schooling pelagic species and may be caught in great numbers, when caught, misleading the overall tendency for the demersal species.

Seabreams

The 2012 seabreams' biomass estimate in the southern region was 8 700 tonnes. Their abundance continues the decline trend observed every year since 2007. *D. macrophthalmus* was the species which contributed the most to the estimate. The combined seabream estimate for the northern and central region was 21 700 tonnes (Table 6.1), a slight increase from 2011, but otherwise similar to the estimates since 2006, indicating a stable abundance.

However, biomass estimates for this period are still lower than estimates from the latest 1990s'. *D. angolensis* and *D. macrophthalmus* were the most abundant seabream species.

Hakes

M. capensis is generally the dominant hake species in the south, and it is a stock shared with Namibia. The proportion of *M. polli* in the region varies and this year it was not caught, while *M. paradoxus* was only caught at depths greater than 600m. This year's estimate of 3 500 tonnes (*M. capensis*) is in line with last year's estimate and confirms the declining trend observed with exception of an outstandingly high biomass in 2009 (31 000 tonnes). *M. polli* is the only hake species found in the central and northern regions, and its biomass was estimated in 13 940 tonnes, which is twice as high as the 2010 and 2011 estimates. This may suggest that the species is back to pre-2006 levels, when the biomass was above 14 000 tonnes.

Shrimps

The two commercially important shrimp species, *P. longirostris* and *A. varidens*, are never found in high densities south of Tombua. Neither in 2006 nor in 2007 these species were caught and since 2009 only *A. varidens* has been found in the southern region, with the highest biomass (600 tonnes) observed in that year. This year the biomass was estimated in 25 tonnes, which is the lowest estimate in the time series. The biomass of *P. longirostris* for the central and northern regions combined was 3 970 tonnes. This is around two to three times higher than the estimates from the last five years. The CV for 2012 is not any higher than for previous estimates, indicating that the increase in biomass may be realistic. The combined estimate for shrimps is slightly higher than in 2010 and 2011, but similar to estimates from 2006 to 2009.

Grunts

Commercially important grunt species are *P. incisus* and *P. rogeri*, which were caught in low quantities and a few stations in the southern region. The biomass estimate of grunts in the central and northern regions in 2012 was 20 540 tonnes, the highest since the mid-80s, and twice as high as the 2010 estimate (10 873 tonnes). The CV for the estimate is however high (1.64), though accordingly the increase should be treated with caution.

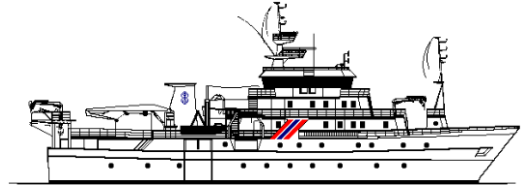
Croakers

South of Tombua estimates of croakers have varied considerably between surveys during the last years. However, the 2010 estimate of 320 tonnes is the lowest in the time series following a decreasing trend since 2007. Nevertheless the 2012 biomass estimate of 3 700 tonnes is comparable with the one in 2007. The biomass estimate for the central and northern regions, mainly *U. canariensis*, *A. aequidens*, *P. senegalensis* and *P. typus*, was about 8 070 tonnes, similar to the 2010 estimate and a slight decrease since 2011. *U. canariensis* contributed about half of the biomass (4 125 tonnes). The estimates since 2003 have been similar (with few exceptions) but are somewhat lower (about half) than the estimates from the mid-1990s





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(1994-1998).

Groupers and snappers

Groupers and snappers were not caught in the region south of Tombua. In the central and northern regions the biomass estimates for both groups are relatively imprecise as suggested by the high CVs. The biomass estimate for groupers (1 250 tonnes) was similar to the estimate from 2005 and 2008, but had a much higher CV in 2012 than in the previous years.

Snapper's biomass declined to 8 tonnes (270 tonnes in 2011), but most CVs for this group are above 2, which makes it impossible to identify any trend, and reach a conclusion on the current state of this group.

Pelagic species

For the pelagic species, the estimates of the biomass are characterized by the high variability throughout the years, particularly for clupeids (sardines), carangids (mainly horse mackerels), hairtails and barracudas. The bottom trawl is not an adequate sampling gear for these species; therefore their estimates do not allow a reliable trend. More adequate results are achieved from the acoustic surveys conducted earlier this year.

Report status final References:

NORAD - FAO PROJECT: CCP/INT/003/NOR, Cruise reports "Dr. Fridtjof Nansen". D. Zaera, A. Staby and S. Nsiangango. **Survey of the demersal resources of Angola. 2-29 April 2012.** Institute of Marine Research, Bergen and Instituto Nacional de Investigaçã das Pescas, Angola. 2012

Constraints/Comments:

