INTERACTIONS AND SPATIAL DYNAMICS OF RENEWABLE RESOURCES IN UPWELLING ECOSYSTEMS: THE IDYLE PROGRAMME IN THE BENGUELA

Pierre Fréon[1], John Field[2], Frank Shillington[3], Carl Van der Lingen[4], and the whole IDYLE team

[1] IRD, France, MCM and Oceanography Department UCT, Cape Town, South Africa

[2]Zoology Department, UCT, Cape Town, South Africa

[3]Oceanography Department, UCT, Cape Town, South Africa

[4] Marine and Coastal Management, Cape Town, South Africa

Objectives of the programme

The scientific focus of the IDYLE programme is to understand how the adaptive strategies of the different species of fish and their dynamics are structured by the presence of inshore upwelling and the resulting ecosystem patterns. We focus on mesoscale dynamics of the environment, reproductive strategies, spatial strategies (macroscale) and on pelagic fish aggregation patterns, as well as on trophic strategies within the framework of ecosystem dynamics. Knowledge of these adaptive strategies is naturally applicable to the sustained development and viability of fisheries in upwelling regions.

The programme is based and developed in the Benguela upwelling ecosystem, where important knowledge has been accumulated. Generic tools are designed or adapted in order to allow the rapid transfer of methodology and results to other areas. IDYLE is a follow-up to the VIBES (VIability of exploited pelagic fish resources in the Benguela Ecosystems in relation to the environment and Spatial aspects, 1997-2000) project, which was primarily directed towards coastal pelagic resources and their management. Training will constitute a major aspect of this programme at both bilateral (France/RSA) and regional scales.

IDYLE is a collaborative programme between IRD (Institut de Recherche pour le Développement), MCM (Marine and Coastal Management Branch; Department of Environmental Affairs and Tourism), UCT (University of Cape-Town) and other universities/institutes in the region (Table 1). IDYLE is funded by these institutions and additional French funding, and is closely associated with the Benguela Ecology Programme (BEP-V) and affiliated to the BENEFIT regional programme.

Activities

The multidisciplinary focus of IDYLE will result in the implementation of different models that provide dynamic representations of an ecosystem. These will permit a better understanding of the impacts of: (1) the spatial structuring of the environment on the dynamics of populations; (2) interspecific relationships within the ecosystem; and (3) spatio-temporal structuring on the management of exploited resources. The IDYLE programme is subdivided into five scientific projects:

- 3D-Hydrodynamic modelling of the physical processes related to the transportation and the retention of eggs and larvae;
- IBM modelling of the coupling between the recruitment processes and the dynamics of the environment (in collaboration with the GEODES programme);
- Ecosystem modelling of the spatio-temporal dynamics of populations and the definition of ecosystem indices;
- A GIS approach to interactions in an exploited pelagic ecosystem (Fig. 1); and
- Retrospective analysis of the relationship between recruitment and spatial dynamics and other biological and environmental parameters.

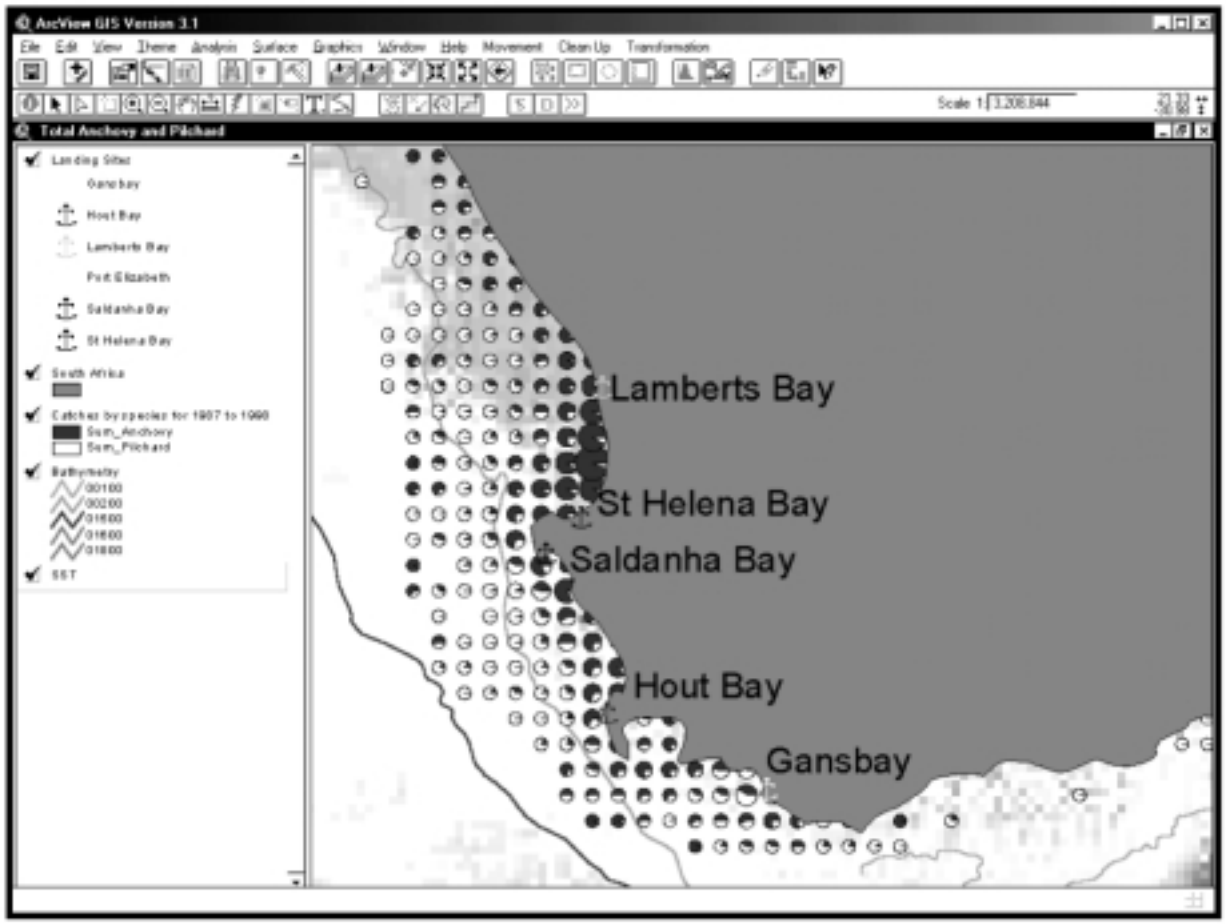

Fig. 1

Expected results

Improvement in Knowledge - the programme will improve understanding of the dynamic functioning of coastal upwelling ecosystems in view of their management. More specifically, it will contribute to identifying the causative roles of fisheries and the environment in relation to the large changes in abundance and spatial distribution of major fish species observed during past decades. We believe that results from this research will enable us to answer some important questions relating to the influence of the various strategies developed by the dominant species on ecosystem structure. The strategic choices in terms of pelagic fisheries management (quotas, control of fishing effort, marine reserves, ecosystem approach) in this kind of environment will benefit from the results of this study.

Products - the following products should be available at the end of the programme:

- a high-resolution 3D hydrodynamic model of the Benguela, implemented from the ROM code and easily transposable to other ecosystems;
- a generic IBM model of the dynamics of early life history stages in relation to the environment;
- a generic IBM model of specific interactions;
- the definition of new ecosystem and environmental indices;
- a CD-ROM on available environmental data (COADS, series of processed remote sensing images);
- software for quantifying upwelling and retention indices using satellite data;
- a South African fisheries GIS, easily transposable to other ecosystems;
- an atlas of pelagic fisheries off South Africa;

- a CD-ROM of a bibliographical database of publications (including grey literature) on the Benguela, linked to documents primarily held at MCM (Cape Town), NatMIRC (Swakopmund) and the Centre for Mediterranean and Tropical Fisheries Research in Sète; and
- publications in the primary literature.

Training - the IDYLE programme has four components:

- On-the-job training - French scientists work in close co-operation with students from the Benguela region. South African scientists co-supervise French students, and small working-groups will ensure regular interaction between the different participants and students;
- Intense training sessions - at least twice a year short training sessions on marine ecology and statistics will be organized in co-operation with partners (targeting scientists and students);
- Student exchanges - exchanges of students have been implemented between South Africa and France or other countries in order to exchange methodological advances;
- Implication of young scientists in national and international Working Groups - IDYLE is involved in several scientific groups (GLOBEC/SPACC, PNEC, SCOR-IOC WG 119) and promotes the involvement of young South African scientists in these research associations;
- In order to strengthen regional participation in the different research and training activities of the IDYLE programme, IDYLE is fostering specific actions and means to build links with research institutions and universities from Namibia and Angola.

Co-ordination and duration

The IDYLE programme started at the beginning of 2001 and will continue until the end of 2004. Co-ordinators of the Programme are listed in Table 2; at the end of 2003 all French scientists will be back in France. For more information access: http://sea.uct.ac.za/marine/idyle/.

Figure Legends

Figure 1. ArcView GIS output showing anchovy and pilchard (= sardine) catches by area over the period 1987-1998.

Table 1. Countries, institutes and number of scientific staff (in brackets) participating in the IDYLE Programme.

Country (Scientific staff)		Institute (Scientific saff)	
South Africa	(13)	MCM	(8)
		UCT	(4)
		OceanSpace	(1)
France	(9)	IRD	(9)
Namibia	(1)	MFMR	(1)
TOTAL	(23)		(23)

Table 2. Co-ordinators of the IDYLE programme.

Name	Title	Discipline	Institute
Pierre Fréon (programme director)	Dr	Ecology, fish behaviour	IRD
John Field	Prof	Ecology	UCT
Frank Shillington	Prof	Physical oceanography	UCT
Carl van der Lingen	Dr	Fisheries Biology	MCM