

SANCOR: Summary report on marine research 1987

SANCOR

Summary report prepared for SANCOR by
the Chairmen of the Programme Committees

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PREFACE

The South African National Committee for Oceanographic Research (SANCOR) Programme is one of a number of cooperative research programmes which are managed by the Foundation for Research development (FRD) of the Council for Scientific and Industrial Research (CSIR). These programmes depend upon cooperation between scientists and engineers from various organizations and disciplines for the solution of diverse questions including many with important management applications.

During 1987 there were seven sub-programmes. These were: Benguela Ecology, Coastal Processes, Estuaries, Marine Linefish, Marine Pollution, Marine Sedimentology and the newly formed Ocean Engineering Programme. Both the composition of the suite of programmes within SANCOR and each individual programme are regularly reviewed to ensure that the most pressing marine research problems are being effectively addressed.

The chairman of each of the programme committees annually prepares a report on the activities and progress in the relevant sub-programme. These reports form the basis of this summary report. The summary report is supplementary to a volume, of which a limited number is printed, which is prepared annually and contains progress reports and final reports on all projects funded by SANCOR as well as many others which are voluntarily submitted to SANCOR.

Without the encouragement and financial support of the CSIR, the Department of Environment Affairs (DEA) and the Central Energy Fund (SEF) the comprehensive and important marine research undertaken in the SANCOR programme would not be possible. This support is gratefully acknowledged.

The marine community at large is indebted to all committee members, but particularly to the chairmen, for their considerable efforts and personal contributions in guiding the development and activities of SANCOR and its constituent programmes.

ABSTRACT

The South African National Committee for Oceanographic Research coordinates and administers a significant portion of the marine research conducted in South Africa under seven sub-programmes. These are: Benguela Ecology, Coastal Processes, Estuaries, Marine Linefish, Marine Pollution, Marine Sedimentology and the newly formed Ocean Engineering programme. This report includes brief statements on the activities of each of these programmes in 1987 and emphasizes important findings and conclusions.

The total budget for SANCOR for 1987 was approximately R 3 355 000.

OPSOMMING

'n Belangrike deel van mariene navorsing in Suid-Afrika word deur die Suid-Afrikaanse Nasionale Komitee vir Oseanografiese Navorsing in sewe sub-programme gekoördineer en geadministreer. Die programme is: Benguela-ekologie, Kusprosesse, Getyrviere, Mariene Lynvis, Seebesodeling, Mariene Sedimentologie en die nuut gevormde Oseaan Ingenieursweseprogram. Hierdie verslag bevat beknopte samevattinge van die aktiwiteite van elk van hierdie programme gedurende 1987 en beklemtoon belangrike bevindings en gevolgtrekkings.

Die totale begroting vir SANKON vir 1987 was ongeveer R 3 355 000.

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EXECUTIVE SUMMARY

The following is a summary of selected highlights and important findings extracted from the Chairmen's reports for 1987.

BENGUELA ECOLOGY PROGRAMME

SANCOR allocation for 1987 : R 807 745

Number of SANCOR-funded projects : 28

- The suite of 70 peer-reviewed papers resulting from the Benguela-86 Symposium during September 1986 was published as a book entitled "The Benguela and comparable ecosystems".
- Relationships are being established between environmental indices and fish catch and estimates of year class strength. One such is the inverse relationship that has been found between sea surface temperature west of the Cape and numbers of one year-old hake on the west coast.
- The fourth in the series of review articles on the Benguela - "The major fish and invertebrate resources" by Crawford *et al.* - was published in September 1987 in the prestigious Oceanography and Marine Biology Annual Review series.
- The presence of consultants from the United Kingdom and the United States - Dr Jolly (statistics) and Dr Peterson (zooplankton ecology) - has stimulated Benguela Ecology Programme (BEP) researchers during 1987. The enhanced statistical confidence on the biomass estimates resulting from Dr Jolly's work with the Sea Fisheries Research Institute (SFRI) enabled the resource managers to recommend the recent upward adjustments to the catch quota.

COASTAL PROCESSES PROGRAMME

SANCOR allocation for 1987 : R 598 000

Number of SANCOR-funded projects : 16

- Predation by birds, especially the oyster catcher was shown to be an important factor controlling intertidal communities without having a destabilizing effect on them. In contrast, in all cases studied, exploitation by man resulted in destabilization and sometimes alteration of the structure and dynamics of intertidal communities.

- Studies of mussel settlement indicated that it varies seasonally but that high spatfall does not occur every year. Clearing experiments indicated that after two years only 50 % cover is attained.
- Although sandy beaches and their adjacent surf zones may function as discrete marine ecosystems, they are also dependent on exchanges with dunes, estuaries and nearshore waters. Dune groundwater may play an important role in the productivity of the surf zone. The importance of the interaction between dunes and beaches is stressed.
- In contrast to exposed beaches which are wave-climate dominated and relatively insensitive to disturbance, the foredune area has been shown to be extremely sensitive.

ESTUARIES PROGRAMME

SANCOR allocation for 1987 R 503 765

Number of SANCOR-funded projects : 19

- Studies in eastern cape estuaries show that, provided the estuary mouth remains open, the biological communities of estuaries are not totally dependent on fresh water and can withstand periods of up to five years of minimal or no inflow. On the basis of this, recommendations are made regarding water releases necessary from dams to ensure the long-term viability of the estuaries.
- The importance of mud in determining the shape and behaviour of estuaries was determined during a comprehensive project on sedimentation in estuaries. This project also showed that the geological history of the estuaries is a sound indicator of present-day behaviour of these systems.
- Studies on the mangrove crab show that there is a larger stock than originally expected and that the minimum legal size could be increased.
- A highly successful one-and-a-half day mini-symposium on the management problems and research findings for the Swartkops Estuary brought together scientists, planners and managers. It transpired that most of the relevant research has now been done and that what remains to be done is the translation of research findings into management strategies.

MARINE LINEFISH PROGRAMME

SANCOR allocation for 1987 R 124 437

Number of SANCOR-funded projects : 7

- The proportion of endemic species in landings throughout South Africa has seriously diminished, in some cases to such an extent that it has been difficult to obtain adequate biological samples for researchers. Where possible these decreases have been quantified and related to the individual species potential yield. Some of the declining species identified are red steenbras, poenskop, Roman and red stumpnose.
- The result of this endemic depletion has seen a significant change in emphasis of the linefishery towards previously unacceptable species such as shark, barbel and less valued varieties of kob and redfish.
- Studies centred on marine reserves have indicated their positive value to certain linefish species, such as the Roman, with residency being an important criterion.
- Studies on sex reversal and the diversity of reproductive strategies evident in seabreams (Sparidae) have broadened to give attention to the impact of these strategies on the stock and its management.
- Over 20 000 fish comprising 245 species have been tagged and released in the nation-wide marine linefish tagging project run from the Oceanographic Research Institute. The resultant scientific database provides important quantitative data to the linefish community.

MARINE POLLUTION PROGRAMME

SANCOR allocation for 1987 : R 618 260

Number of SANCOR-funded projects : 12

- The Water Quality Criteria published in 1984 has been applied in two major disposal projects (Hout Bay, East London) and continues to be a major success. Requests have, however, been received that the criteria be updated to include vibrios and viruses for human health considerations.
- Human health, and the effects on it of sewage-contaminated sea water used for recreational purposes, has played a much larger role in the programme this year. Elevated bacterial levels and viruses

have been found in sea water adjacent to certain outfalls as well as in shellfish growing nearby.

- There is a dramatic increase in the effluents being discharged by canals and storm sewers due to the rapid urbanization at coastal sites. Studies in Algoa Bay and False Bay show that very limited mixing of surface discharges occurs with the nearshore waters and that contaminants remain at elevated levels close to the shore for considerable distances from discharge points.
- Studies in Durban Bay confirm that contaminants bound in sediments are much less accessible to organisms, even benthic fauna, than far lower concentrations in the water column.
- The determination of metal binding proteins is being investigated as an early indicator of pollution stress in organisms without the stress being noted by their having elevated metal levels.

MARINE SEDIMENTOLOGY PROGRAMME

SANCOR allocation in 1987 : R 130 000

Number of SANCOR-funded projects : 4

- The Mesozoic basins project has developed exciting concepts about the development of the post-Gondwana break-up of the Continental shelf and its sedimentary deposits.
- A full-colour geological map of the sedimentary environments of continental shelf and nearby deepsea floor has been published in the Annals of the South African Museum, Volume 98, Part 1, (R V Dingle).

OCEAN ENGINEERING

SANCOR allocation in 1987 : R 407 303

Number of SANCOR-funded projects : 8

- A definitive relationship has been established between the angle of incidence of waves entering the Agulhas current and the radius of curvature of the current which would increase the probability of the occurrence of extreme events.
- Cyclic loading tests on samples of calcareous formations have revealed a deterioration of bearing capacity with time. This work sheds new light on an important area of platform foundation design.

GENERAL

TERMS OF REFERENCE OF SANCOR

The terms of reference of the South African National Committee for Oceanographic Research (SANCOR) are to provide policy and scientific guidance in matters pertaining to oceanographic research in South Africa by designating priorities. Specifically it:

- takes cognizance of actions and developments affecting marine science and technology in southern Africa and promotes communication within the oceanographic community;
- reviews the objectives, priorities and progress of its constituent programmes;
- guides effort by deciding on the funding of its constituent programmes, keeping in mind also the need for balance both geographical and disciplinary;
- ensures that its research findings reach decision makers;
- keeps informed on international developments in marine science, *inter alia* by acting as national committee for SCOR and related international bodies.

SANCOR's 1987 membership is given on page 52.

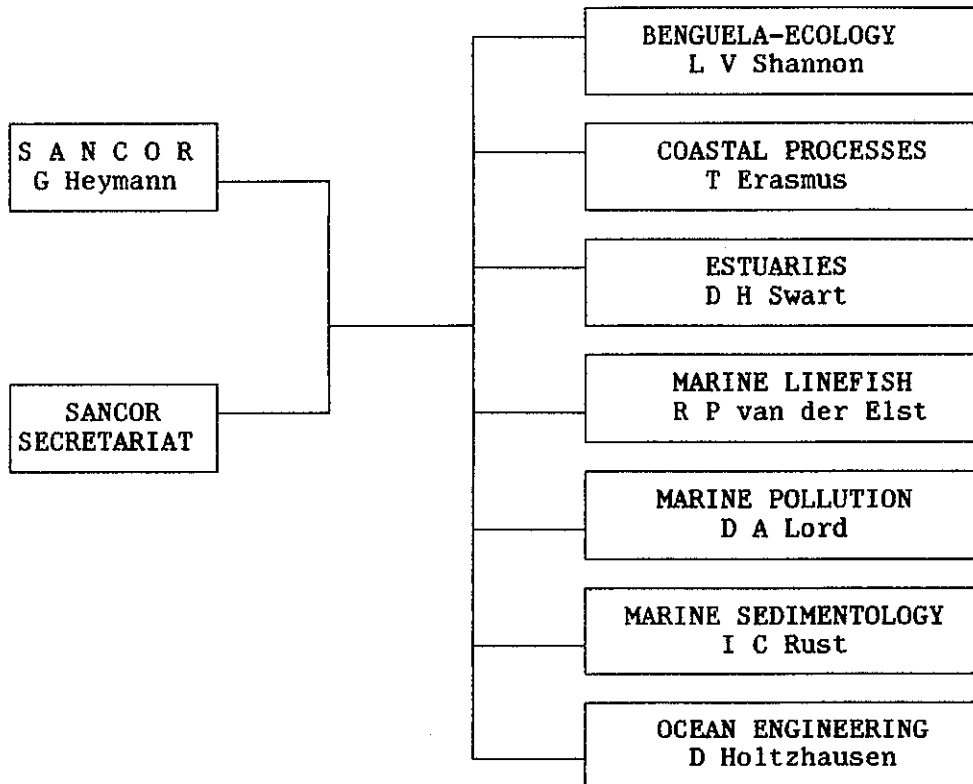
OBJECTIVE

The objective of the SANCOR Programme is to gain knowledge of the basic structures, processes and relationships in the marine environment around southern Africa in order to provide a fundamental scientific understanding and to facilitate:

- the efficient exploration, exploitation and conservation of living and non-living resources;
- the judicious management of the coastal zone;
- improved prediction of weather and climate;
- improved utilization of environmental information in maritime activities.

STRUCTURE

Overall policy and scientific guidance is provided by SANCOR itself. The committee structure for the management of the research activities within the seven sections of the SANCOR Programme is set out below (Chairmen as in 1987):



FINANCES

A summary of the SANCOR budget for 1987/1988 is as follows:

Income:

DEA	R 1 618 000	
CSIR	1 437 000	
SEF	300 000	
	<hr/>	R 3 355 000
		<hr/> <hr/>

Allocations:

Research Programmes:

Benguela Ecology	R	808 000
Coastal Processes		598 000
Estuaries		504 000
Marine Linefish		125 000
Marine Pollution		618 000
Marine Sedimentology		130 000
Ocean Engineering		407 000
Other Projects		18 000
Salary Bonus Payments		129 000
Programme Management (including secretariat salaries, meetings, publication costs, etc)		192 000
		<hr/>
		R 3 529 000
		<hr/> <hr/>

The discrepancy between expenses and income is due to overbudgeting, which, experience has shown, allows for the optimum use of the available funds and can be made up from savings on project costs. It should further be noted that the above figures will differ from figures quoted in the status reports. These differences are due to savings and salary adjustments for 1987 which have already been included in the above amounts - information which was not available when the status reports were written.

BENGUELA ECOLOGY PROGRAMME

INTRODUCTION

Following the successful completion of the first five-year phase of the BEP, phase two was launched in January 1987. The overall objective of the programme remains unchanged. However, in order to optimize on available skills and to channel marginal research towards meeting the objectives, research has been focused on improving knowledge of the dynamic processes controlling the distribution and abundance of standing stocks of key species in the Benguela. The primary research directions are to assess the distribution, abundance, movements, mortality and production of exploited resources (in particular pelagic shoal fish), to identify key factors affecting the above at different spatial and temporal scales and to assess the impact of these key factors on the resources. So, it's business as usual, but with more goal orientation.

28 projects were funded via SANCOR during 1987, of which 24 were completely new. The BEP is at present supporting totally or partially 35 participants, and, as during the first phase, the work is closely integrated with research undertaken within the Sea Fisheries Research Institute. As a result it is at times difficult to distinguish between SFRI and BEP activities. The combined effort is contributing to a pool of knowledge on which those responsible for managing the exploited resources of the Benguela region can draw.

SOME RECENT HIGHLIGHTS

The suite of 70 peer-reviewed papers resulting from Benguela-86 was published during September as a book entitled 'The Benguela and comparable ecosystems' (*S. Afr. J. Mar. Sci.* 5). The appearance of this comprehensive volume within twelve months after the symposium, was due to the sterling efforts of Dr Andy Payne, the editor-in-chief, and I believe it also reflects favourably on the authors, the referees, the cartographers and all those who helped with its publication.

The Monday lunch hour seminar series continued to provide an important forum for exchange of ideas. An effort was made midyear to restructure the seminars by placing more emphasis on discussion rather than presentation, and the intention is to make the occasions less formal. However, selection of suitable topics needed to stimulate discussion, as well as orchestrating this, remains difficult.

As a result of the effort which all participants put into Benguela-86 and the subsequent review process, no workshops or symposia were held

during the first half of 1987. However, a number of suitable workshop topics were identified, and since June seven workshops have taken place. Topics have ranged from modelling biological systems to shoal ecology and vertical exchanges in stably stratified water. The workshop on long term marine data series has highlighted the question of long records and monitoring, and served as a useful preliminary to the International Geosphere/Biosphere Programme (IGBP) related National Conference on Long-term Data Series Relating to Southern Africa's Renewable Natural Resources which was held in Pretoria during October. A further workshop on pilchard and anchovy in the top 10 m is planned for November.

During the past year (October 1986-September 1987) good progress was made with the establishment of relationships between environmental indices and fish catch and estimates of year class strength. The most promising of these appears to be an inverse relationship between Sea Surface Temperature (SST) in an offshore 5° square west of the Cape and numbers of one year old hake on the west coast of the Republic. Another interesting finding is a possible link between large scale physical forcing in the South Atlantic and the meridional displacement in catches of a number of species in the northern Benguela.

The fourth in the series of review articles on the Benguela ('The major fish and invertebrate resources' - Crawford *et al.* 1987) was published in the prestigious *Oceanogr. Mar. Biol. Ann. Rev.* series during September. It is a major work and is likely to be a benchmark paper for the next decade at least. The fifth article in the series, viz. on the inshore part of the system by Branch and Griffiths, has been completed and submitted for publication. Two further reviews (sea birds and mammals; sedimentology) are in the planning stage, although it seems unlikely that either will appear in print before 1989 or 1990.

In an attempt to address the question of fish behaviour (about which very little is known), a project which aims to describe spatial and temporal aggregating patterns in pelagic fish and to understand factors influencing the patterns has been initiated, and an experienced biologist, recruited from overseas, joined the project in June 1987. The statistical post which is an essential element unfortunately has yet to be filled. Notwithstanding this, it is most encouraging to see this key project get off the ground. This project was not the only one to receive an injection of new blood, however. One of the world's leading zooplankton ecologists, Dr W Peterson, has recently taken up a twelve month appointment in the BEP. Watch the progress in this field!

The final matter which I wish to highlight concerns the important role of Consultants within the BEP. Prof R Newell's input over the years is well known. More recently the group at SFRI working on the estimation

of anchovy spawner biomass using hydro-acoustic and egg-production techniques has received a tremendous boost by the acquisition of the services of a top statistical consultant (Dr G Jolly) for three months each year. The input of the consultant has considerably enhanced the confidence of the biomass estimates and it is largely due to this that the resource managers were able to recommend the recent adjustment to the catch quota.

PROBLEMS

With the start of phase two, the programme management structure was changed. The idea was to make more use of short-lived task groups and to phase out the concept of coordinating groups (which had proved only partly successful previously). At the same time the post of Liaison Officer was upgraded to Coordinator. Experience has shown that killing the coordinating groups has probably been a mistake, particularly as the time of the Coordinator available to the BEP has shrunk dramatically owing to other SANCOR commitments. The fact is that the coordination of the BEP is a full-time task. Without such a person it is just impossible to give sufficient attention to the stimulation of the required inter-person and inter-group interaction which is the life blood of a programme such as the BEP.

A complaint of particularly the younger programme participants was that they did not have sufficient say in the direction of the science. To remedy this, nominations for suitable persons to serve on a newly constituted scientific committee were invited and the members were subsequently democratically elected by ballot. The new Committee has met under the Chairmanship of Dr Larry Hutchings and the system seems to be working well.

At the end of the first phase of the programme two major gaps in our knowledge of the Benguela ecosystem were identified, viz. fish behaviour (on various time and space scales) and near surface currents. The first gap has received attention (see previous section) and the research now underway will go some way towards providing the needed information. The lack of a proper understanding of surface and subsurface circulation between Port Elizabeth and the Orange River remains a major problem area. The measurements of the type needed are difficult to make and are logistically expensive. It is my view that we shall not be in a position to address the question adequately until the advent of the Global Positioning System (GPS) and acoustic doppler profiling techniques locally.

The present level of funding (R 800 000 per annum, R 900 000 for 1988) is barely sufficient to meet the manpower costs during phase two. It

certainly gives no flexibility nor does it permit the financing of new activities (e.g. surface current measurements). Allowing for inflation the BEP is considerably poorer now than when the programme first started. Of particular concern, and this applies across the broad spectrum of South African marine science, is the question of replacing ageing equipment and the even greater problem of purchasing the new oceanographic technology. I believe that this is something which SANCOR needs to address as a matter of urgency, particularly with international isolation looming on the horizon.

A final problem which I should like to address concerns the place of the inshore exploited resources within the SANCOR family. In the BEP there has been a move over the years to give less and less attention to the inshore exploited resources, resulting in the ultimate exclusion of research on e.g. key seaweed species. As a result of this, I believe the programme is scientifically poorer. The distinction here between the terms of reference of the Benguela Ecology, Coastal Processes and even Line Fish programmes is in my opinion fuzzy. To me it makes sense to have all the research in the Benguela ecosystem (and the inshore region is an integral part of this) coordinated through a single programme, yet the present split in SANCOR funding/support makes this impossible. The problem needs to be resolved once and for all.

THE FUTURE

The suite of projects currently underway is likely to provide resource managers with the sort of information which is needed in the shorter term. Likewise several of the projects hold considerable promise from the purely scientific point of view and I can foresee that phase two will contribute as much or even more to the fundamental understanding of upwelling ecosystems as did the work during the previous five years - provided that the 'market orientated' syndrome at present prevalent in South Africa is not allowed to pervade our thinking.

It is likely that activities within the World Ocean Circulation Experiment (WOCE), the Joint Global Ocean Flux Study (JGOFS) and IGBP will be relevant to the work of the BEP during the next decade, and I believe that some of the programme participants will be in a position to make major contributions to activities within JGOFS and IGBP in particular. This should be actively encouraged, and the funds found to facilitate it.

L V SHANNON

CHAIRMAN: SANCOR BENGUELA ECOLOGY PROGRAMME COMMITTEE

BENGUELA ECOLOGY PROGRAMME: PROJECTS 1987

<u>Projects and project leaders</u>	<u>Duration</u>
Community Structure and Energy Flow in Inshore Ecosystems (G M Branch, UCT)	1981 - 1987
Benguela Pilchard and Anchovy Growth (J G Field, UCT)	1984 - 1988
Prey Identification Service (G J B Ross, PEM)	1986 - 1989
Benguela Resources Population Modelling (D S Butterworth, UCT)	1987 - 1991
Benguela Systems Analysis (A): Whole System Approach to the Pelagic Fishery (J G Field, UCT)	1987 - 1991
Benguela Systems Analysis (B): Historic Ichthyoplankton Analysis (J G Field, UCT)	1988
Sediment History Phase 2 (R V Dingle, UCT)	1987 - 1988
Sound Scattering from Fish Targets (P Denbigh, UCT)	1987 - 1988
Benguela Aggregating Behaviour of Pelagic Fish (G B Brundrit, UCT)	1987 - 1989
Benguela Survey Strategy Evaluation (D S Butterworth, UCT)	1987 - 1992
Clupeoid Piscivory and Year Class Strength (J G Field, UCT)	1987 - 1988
Spawning Patterns of Anchovy off South Africa (D S Butterworth, UCT)	1987 - 1988
Carbon and Nitrogen Isotope Ratios: Indicators of Food Sources and Habitats of Pelagic Fish in the Benguela Ecosystem (A Winter, UCT)	1987 - 1988
Food Chain Studies (M I Lucas, UCT)	1987 - 1991
The Role of Benthic Fauna in Recycling Nutrients (P Cook, UCT)	1987

BENGUELA ECOLOGY PROGRAMME: PROJECTS 1987 (Continued)

<u>Projects and project leaders</u>	<u>Duration</u>
Benguela: Agulhas Bank Studies (R Carter, NRIO)	1987 - 1991
Euphausiids as Predators, Competitors and Prey of Fish (J G Field, UCT)	1987 - 1988
Experimental Design and Budgeting Models Based on Ecophysiological Projects in the Benguela Region (J G Field, UCT)	1987 - 1991
Grazing by Microzooplankton (J G Field, UCT)	1987
Physical Structure of an Upwelling Filament (F A Shillington, UCT)	1987 - 1990
"Kinematika van die Benguela-opstuwingsfront" (W S Barnard, US)	1987 - 1989
Impact of Human Activities on the Shore (G M Branch, UCT)	1987 - 1989
Benguela Squid Ecology (M R Lipinski, UCT)	1987 - 1991
Dolphins as indicators (J D Skinner, UP)	1987 - 1989
Benguela Piscivorous Fish (J G Field, UCT)	1987 - 1989
Foraging Ecology and Reproductive Success of Cape Gannets (W R Siegfried, UCT)	1987 - 1991
Monitoring of Anchovy Recruitment and Penguin Populations in the Benguela Ecosystem (W R Siegfried, UCT)	1987 - 1991
Trophic Role of Larger Jellyfish in the Benguela Ecosystem (J G Field, UCT)	1987

COASTAL PROCESSES PROGRAMME

The objectives of the Coastal Processes Programme are to identify the key processes which operate in the coastal zone, to define the factors and understand the mechanisms that control them and to contribute information required for the judicious development, management and conservation of the coastal zone and its resources. In order to accomplish this the programme encourages research projects not only in the major coastal systems - sandy beaches, dunes, rocky shores, inshore waters - but also promotes research in several geographical areas around the coast, thereby ensuring the distribution of knowledge and expertise around the coastline.

In 1987 the programme distributed R 598 000 to 16 projects. Of this 37 % went to the Eastern Cape (6 projects), 27 % to the Western Cape (6 projects), 25 % to the Natal region (3 projects) with 11 % of the funds going to one project comparing beaches along the entire coast. These allocations indicate a tendency for a more equal distribution between the various areas in comparison with previous years. Sandy beaches and dunes received 44 % of the funds, rocky shores 33 % and open coastal waters 18 % while socio-economic projects had 5 % of the funds. It is also worth noting that the manpower costs of all these projects amounted to approximately 71 % of the total funds.

FINDINGS AND HIGHLIGHTS

Eight final project reports were received during the year. One of these projects resulted in the publication of the benchmark book on the sea fishes of Southern Africa. Despite this achievement, it can be said that ichthyology in South Africa is still much concerned with the essential tasks of alpha-level systematics and surveying our enormous fish fauna. Improved sampling will yield more species new to science and/or southern Africa. There is also a need for a systematic approach to the phylogenetic relationships of larval fish.

Three of the final reports cover aspects of rocky shores. From the project on the ecological role of birds in the rocky intertidal zone it was concluded that predation by birds, especially the oystercatcher, is an important factor controlling the structure and dynamics of intertidal faunal communities, without having a destabilizing effect on them. In contrast, in all cases studied, exploitation by man resulted in destabilization and sometimes total alteration of the structure and dynamics of the community. The research also showed that intertidal community structure and functioning are modified by nutrient enrichment from bird guano.

The second rocky shore project covered the reproductive ecology of an intertidal seaweed of economic importance - *Gelidium pristoides*. Reproductive stages are present throughout the year but conditions for the establishment of juveniles are optimal during the last quarter of the year. This study also showed that the harvestable biomass is highest during late summer and that agar production and quality are also maximal during this time. Two harvests per year, one in December and another in March would be both commercially profitable and ecologically sound. Clipping of seaweed should minimize limpet mortality during harvesting. However, only a very small percentage of *Gelidium* tufts are attached to limpets with even less being associated with limpets small enough to be dislodged during harvesting.

The third rocky shore project studied the exploited intertidal organisms of Natal in an attempt to quantify harvestable yields. Mussel densities vary seasonally depending on the season of juvenile settlement but man's over-exploitation in some areas may lead to those areas being closed to exploiters. Clearing experiments indicated that after two years only 50 % cover is attained. Mussel settlement is seasonal but high spatfall does not occur every year.

One of the four final projects on sandy beaches investigated the growth requirements of the surf zone diatom, *Anaulus* in a cross gradient apparatus. *Anaulus* turned out to be slow growing. High concentrations are not 'algal blooms' but are the result of current conditions and are therefore not sewage related.

The second final project on sandy beaches investigated surf zone dynamics. Besides an impressive list of refereed publications from this project, the following salient features of beaches may be highlighted as relevant to management and planning the use of sandy coastline areas:

- * sandy beaches and their adjacent surf zones may function as discrete marine ecosystems, but they are also open and dependent on exchanges with dunes, estuaries and nearshore waters;
- * they are rich and productive and include three major food chains;
- * their chemical and biological processes are wave-driven and any regime altering the wave climate will change the beach;
- * most beaches do not have commercially exploitable populations but support fish which is an important recreational resource;
- * dune ground water may play an important role in the primary productivity of this zone;

- * the interactions between dunes and beaches are important; and
- * exposed beaches are relatively insensitive to disturbance whereas the foredunes are extremely sensitive. When the allocation of coastal resources is considered a primary aim should be conservation of coastal dunes and beach areas should be utilized for recreational purposes only.

The project on the control of metabolism in the sandy beach mollusc *Bullia digitalis* studied for the very first time an animal's adaptations to fluctuating temperatures as opposed to warm or cold adaptations. These molluscs of the Benguela upwelling regions are adapted to a fluctuating temperature with a very flat metabolic rate: temperature curve that can be explained by some of the properties of the enzymes in the metabolic chain. They can also exploit a variety of nutritional sources.

The fourth completed project on sandy beaches covered the surf zones of Natal. This project concentrated on the faunal components of the system and reported that detritus feeders were the most abundant group of animals but that there is not enough food for all the fish in the area and fish must therefore subsidize their diet from other regions.

Special sampling techniques were developed to study the animals in this high energy environment. The wave and sediment climate were the dominant factors determining the faunal communities of the surf zone. Although turbulence was the most important physical parameter influencing density and biomass, the presence of coarse sediments could override turbulence and result in low biomass and density values. Polychaetes were dominant on sheltered beaches while crustaceans and molluscs were of similar importance on exposed beaches. Sand replenishment exercises did not significantly affect the benthic communities. The low detritus input into the surf zone is probably a major cause of the relatively low macrofaunal biomass of the Natal beaches. It is concluded that the sand substratum is far less productive than the rocky reefs and it is therefore recommended that future work concentrate on hard substrata.

Of the 18 projects that received funds in 1987, 12 are still ongoing. Due to staff changes two projects did not start as planned.

Four projects to the value of R 118 000 are ending in 1987. They covered such diverse fields as limpet recruitment, the wave forces at Walker Bay, the surf zone primary producers and the taxonomy of the benthic algae of Natal. The final reports on these will be submitted in 1988.

The two projects on socio-economic research on coastal resources act as pilot studies to ascertain how the programme should deal with this type of study in the future.

The Sixth National Oceanographic Symposium (6NOS) was a major stimulus for the programme and a large upsurge in the number of applications for funds for 1988 has resulted. The value of such a symposium is immense. Besides 6NOS, Natal and the East Cape regions held inter-institute/interdepartmental discussions to facilitate interaction and awareness between the various scientists of each area. These meetings will in future be held on a regular basis (once a year) and should serve as an important science forum.

During the year meetings on socio-economic research and algal taxonomic research were held to discuss the direction and funding of this work.

The pre-screening of the proposed new projects for 1988 worked well and not only avoided overlap but also facilitated cooperation between researchers.

SHORTCOMINGS

A proper understanding of the functioning of a system is only possible after studying its most important processes. This implies that physical, chemical and biological processes should be studied within the same geographical area and within the same spatial and time scales. Such a goal is virtually impossible where cooperation between various institutes, disciplines and researchers is entirely voluntary without a facilitator actively managing for maximum interaction and specific common goals. I believe we have most of the expertise in the main study areas that can be effectively harnessed in such a co-ordinated programme for a specific area. However, without such a co-ordinator/facilitator, the various projects do not show the degree of integration and support they should. It cannot be expected from the chairman or the present 'honorary' regional co-ordinators to facilitate the closer cooperation that can be achieved under an appointed person. The new committee may like to pursue this further in future.

This does not imply that problems can be solved only if a co-ordinator leads a team or that good science can only be produced by an interdisciplinary team. Excellent work is at present being done by individual scientists or small groups. I do believe though that the type of problem facing our coastline is seldom of a nature that can be solved by one discipline only.

FUTURE PROSPECTS

The ongoing projects cover several disciplines and are well distributed around the coast. Twenty two new project proposals were received but only a few will be funded due to a limitation in available funds. This does ensure that only high quality proposals that fit the programme will be funded.

There is a definite awareness of the need to relate research to management problems in the coastline. With the increased human pressure on the sensitive coastal area and limited research funds, it can be expected that the relevance of a project to human needs will be an important funding factor in the future. The following criteria used by the Coastal Processes Programme give a feel for the type of project that may expect to be funded: how well the proposal fits the aims of the programme, the scientific quality of the proposal, the management needs for such a project, the track record of the applicant, the realism of the application and the urgency of the work.

The many new projects and new ideas about the programme and how it should meet its obligations auger well for the future.

ACKNOWLEDGMENTS

I was fortunate to be the programme chairman for the past 5 years, and as my term of office terminates this year, I would like to thank the participants and especially the secretariat for their support and guidance during this period. I believe we have a good programme with quality science, enthusiastic scientists and a very capable management force. It was a pleasure to be part of this team.

T ERASMUS

CHAIRMAN: SANCOR COASTAL PROCESSES PROGRAMME COMMITTEE

COASTAL PROCESSES PROGRAMME: PROJECTS 1987

<u>Projects and project leaders</u>	<u>Duration</u>
Coastal Natal Benthic Algae (R N Pienaar, Wits)	1982 - 1987
The Ecophysiology of the Primary Producers and Microbes in Sandy Beach Surf Zones (G C Bate, UPE)	1987
Comparative Studies of South African Beaches (A McLachlan, UPE)	1987 - 1989
Recruitment of Intertidal Limpets and its Relevance to Harvesting (W R Siegfried, UCT)	1987
Walker Bay Coastal Processes - Base Line Physical Study (L Lenhoff, NRIO)	1986 - 1989
The Biology of Carrageenan-producing Red Seaweeds in the Benguela Region (J J Bolton, UCT)	1987 - 1991
Wave Force Measurements at Walker Bay (J A Zwamborn, NRIO)	1987
Intertidal and Nearshore Benthic Ecology of Walker Bay (C L Griffiths, UCT)	1987
Dune/Beach Interactions (A McLachlan, UPE)	1987 - 1989
Walker Bay Coastal Processes: Synoptic Coastal Measurements (D H Swart, NRIO)	1986 - 1988
Community Structure of Eastern Cape Mixed Shores (C D McQuaid, RU)	1987 - 1989
Littoral Invertebrate Resources of Natal (Phase I - Mussel, Oyster and Pyura) (A J de Freitas, ORI)	1987 - 1990
Social Responses to and Uses of Natural Resources on the Natal Coast: A Study of Resource Use and Management (J F Butler-Adam, UDW)	1987 - 1988
Ecology of Rocky Shores and Reefs along the Eastern Cape Coast (B L Robertson, UPE)	1986 - 1988

COASTAL PROCESSES PROGRAMME: PROJECTS 1987 (Continued)

<u>Projects and project leaders</u>	<u>Duration</u>
Algoa Bay Programme: Physical and Chemical Processes (E Schumann, UPE)	1986 - 1988
Sediment Dynamics of the Coastal Zone near the Sundays River Mouth (I C Rust, UPE)	1986 - 1989

ESTUARIES PROGRAMME

STATUS

The SANCOR Estuaries Programme has been running since the re-organisation of SANCOR-programmes towards the end of 1981. For the first five years (1982 - 1986), its activities were directed by the research outline given in the programme document, which was published in February 1983 (*S A National Scientific Programmes (SANSP) Report No 67*). In a review of its objectives in preparation for the second five-year term of the programme, the programme committee last year concurred that the broad outline of the research framework, as given in the abovementioned document, is still valid. This objective for the programme can be summarized from SANSP Report No 67 as follows:

'The objectives of the SANCOR Estuaries Programme are to provide a scientific understanding of estuaries - in particular of the interactive physical, chemical and biological processes within them, of their interactions with their fringe areas and with their adjacent marine and terrestrial environs and finally of human impact upon them - thereby contributing information required for their wise management.'

In re-affirming the research direction of the Estuaries Programme, a number of points were highlighted, namely:

- * the estuaries serve as but an interface between the catchment/river on the one hand and the sea/beaches/dunes on the other, such that research in the estuaries should never be seen in isolation;
- * the understanding of the present-day processes in estuaries must be based on an understanding of processes over geological time-scales, including fluctuations in sea-level;
- * the closely interactive nature of the various processes operative in estuaries encourages the need for a broadly based multi-disciplinary approach. It also implies that estuarine phenomena should be studied on a time-scale which takes cognizance of the hydrological time scale, with fluctuations varying from days through seasons and years to decades. Obviously practical considerations give rise to logistic problems at both ends of the time scale range;
- * the previous point serves as motivation for the establishment of a routine monitoring programme in selected key systems, which can serve to establish the ranges within which estuarine processes

naturally fluctuate, with emphasis on long-term trends and the effect of episodic events. Such monitoring should not be confused with estuarine research, it will serve but as one of the inputs available to estuarine scientists.

* The impact of man (either directly on the estuary or indirectly on the various other components of the large ecosystem) plays a profound role in the behaviour of estuaries. Items which can be specifically highlighted are:

- estuary mouth management, either to maintain sufficient water depth to sustain water-borne activities or to prevent excessive flooding on the flood plains;
- the effect of the construction of dams on the estuarine balance, specifically since more and more dams are of necessity constructed lower down in the catchments;
- human activities in estuarine flood plains, such as construction of bridges, levees, encroaching housing developments and other;
- activities on adjacent coasts and in or around dune fields in the vicinity of the estuary mouth;
- changing land use practices are materially changing the run-off patterns from catchments and the associated sediment yield.

* although the need for some sort of classification of estuaries was highlighted, one should also recognize that each estuary is in its own way unique. However, it is feasible to accept that there is much to be gained from research with as wide a base as possible, concentrated in selected key systems, which could be either typical of a broad group of estuaries or atypical, to establish ranges;

* the main purpose of any classification should be to improve our understanding of estuaries and their environments, which according to the programme document, is the main aim of research in estuaries. This improved understanding can then form the basis of the advice given by estuarine scientists to planners, developers and managers.

After the initial chairmanship of Prof G de F Retief of the University of Stellenbosch, the Estuaries Programme has for the last four years been chaired by Dr A E F Heydorn of the National Research Institute for Oceanology. Under his chairmanship the Estuaries Programme was built

out from what was initially a collection of biological projects to a cohesive programme with a strong multi-disciplinary base. Although it is clearly recognized that the gradual shift in the composition of research under the auspices of the Estuaries Programme is a team effort for which each member of the Programme Committee deserves credit, the achievements of the Estuaries Programme over the past four years have been a reflection of the enthusiastic chairmanship of Dr Heydorn.

In the light of the preceding, it is interesting to compare the applications for funding for 1988/89 with the granted funds for 1987/88 by using the broad groupings identified in the programme revision.

Type of research	Granted 1987	Applications 1988/89	Granted 1988/89
	(in units of 1 000 Rands)		
Human influence on estuaries	15	115	55
Biological processes and population dynamics	114,1	93	78,4
Energy production and productivity studies	98,8	29,5	27,0
Physico-chemical and geological processes	135,5	239,4	181,2
Multi-disciplinary research	120,4	231,8	159,4
Low-level monitoring	20	-	-
Total	503,8	708,9	501,0

The broad trends outlined in this table represent a continuation of a shift towards studies of a physico-chemical/geological nature and with a multi-disciplinary approach, which has been evident for a few years now and which was highlighted in last year's chairman's report.

The regional distribution of projects (see Table on page 24) reflects a good geographical spread.

FINDINGS

The following are projects which have come to end during the past year and some of their main findings.

* Oil influence on phytoplankton by Bate, UPE

It would appear that the effect on estuaries of hydrocarbons from outboard motors and road runoff is less than initially surmised,

Region	Organisation	No. letters of intent 1988/89	Granted for 1988/89	
			No. of applications	Monies granted (in R1000 units)
Natal	NPB	1	1	1,3
	ORI	1	1	44,0
	UDW	1	-	-
	NRIO	2	2	60,5
	UN	6	3	77,8
	Total	11	7	183,6
Eastern Cape	NRIO	1	1	25,0
	RU	1	1	9,3
	UPE	6	5	174,7
	Total	8	7	209,0
S/W Cape	RU	1	-	-
	UCT	4	2	55,0
	NRIO	5	3	53,4
	Total	10	5	108,4

certainly at their present levels. Intensified industrialization and a more intense recreational use of estuaries may, however, necessitate a more in-depth look at this finding.

* Langebaan Lagoon key organisms by Branch, UCT

Although physical processes play an important role in the behaviour of estuaries, Branch showed in Langebaan, on the basis of a study of five key organisms, that these organisms exert a strong biological control in every instance, showing that the exploitation of these species, or any human activities that would alter species density, will influence many other elements of the biological community.

* Mangrove Crabs, Phase I by De Freitas, ORI

Studies on the mangrove crab *Scylla serrata* have improved the understanding of the population dynamics and growth characteristics for this species. It was shown that there is a larger stock than was originally expected and that the minimum legal size could, on the basis of the results, be increased.

* Responses of south-eastern Cape estuaries to freshwater flows by Allanson and Read, RU

In the light of the increasing demand on the freshwater resources in the country, the conclusions and recommendations reached in the study on freshwater requirements of the estuaries in the south-eastern Cape are of particular importance. It is shown that, as long as the estuary mouth remains open, the biological communities of estuaries are not totally dependent on fresh water and can withstand long periods (up to five years) of minimal or no inflow, although the truly euryhaline estuarine component is either reduced or absent. On the basis of the extensive findings of this project, recommendations are made regarding the nature of releases necessary from dams to ensure the long-term viability of the estuaries, which will be of great benefit to the Department of Water Affairs (DWA) and which can find application elsewhere in the country as well.

* Palmiet chemistry by NRIO

In contrast to the previous study, the NRIO study at the Palmiet, the site for a major water impoundment, concentrated on physico-chemical aspects of the system. By comparison of the degree of stratification of the estuary and salinity and nutrient levels, marked seasonal variations were identified. Again, however, the results are of benefit to the DWA planners, specifically for blackwater systems.

* Research on sedimentation in estuaries by Rust, UPE

The comprehensive research project on sedimentation in estuaries undertaken by the Geology Department at UPE, has run over the full duration of the SANCOR Estuaries Programme to date. Although it is not definitive in its final synthesis of physical processes in estuaries, it has given a very clear picture of the nature of sediment behaviour in eastern Cape estuaries. As such, it has become a model for similar studies elsewhere in the country, notably in Natal. The study has highlighted the importance of mud in determining the shape and behaviour of estuaries. This aspect needs more detailed study though. It was clearly shown that the geological history of the estuaries is a sound indicator of present-day behaviour of these systems. The future direction of this type of research would be to couple to a greater extent the geophysical behaviour of estuarine systems with actual measurements of hydrodynamic forcing mechanisms.

The above findings highlight two aspects:

- One cannot generally look at research in estuaries from the viewpoint of only one discipline. Estuaries are what they have become due to a complex interaction of physical, chemical, biological, botanical and geological processes in and around the estuary itself and the estuary serves amongst others as an interface between the terrestrial and marine components of the ecosystem, and
- The nature of research projects conducted in the Estuaries Programme is such that high quality research of a fundamental nature is used to draw conclusions which can be used immediately by planners/managers.

HIGHLIGHTS

The massive and tragic floods in Natal in September were by far the most momentous event during the year. The Estuaries Programme recognizes the over-riding importance of episodic events in the development of estuaries. Against this background a concerted effort was launched immediately to survey and measure the extent of the floods and their effect on the Natal estuaries and coast. The results will be reported in 1988.

There are however a few additional aspects I should like to mention under this heading.

The promulgation in December 1986 of the coastal regulations which control activities in a coastal strip of one kilometre, focuses sharply on the need for properly founded scientific advice to planners. As shown above, projects emanating from the Estuaries Programme have fulfilled such a need. It is, however, clear that we should strive to maintain this emphasis, namely, sound fundamental research which can then be readily translated to management advice, also in future. This again shows that it is irrelevant to try to separate the so-called basic or fundamental research from applied research in this type of endeavour.

At the Sixth National Oceanographic Symposium at Stellenbosch in July 1987, stimulating interchange of ideas was possible on a wide front of oceanographic research, but specifically also on research in estuaries. Two aspects which were highlighted are the fact that the research needs to take cognizance of the wide range of time scales operative in estuaries, and the fact that the best document available at present to planners on the status of estuaries is the *SANSP Report*, No. 130, 'An assessment of the state of Estuaries of the Cape and Natal in 1985/86'.

The nature of studies aimed at elucidating processes in estuaries, with a view to categorizing types of estuaries or estuarine processes, should be such that the ultimate goal is to improve the information given to decision makers. Until such time the SANSP document will be used.

Immediately preceding the SANCOR Estuaries Programme Meeting in September 1987, a one-and-a half day mini-symposium was held in Port Elizabeth to bring together scientists, planners and managers to discuss the planning and management problems and research findings for the Swartkops Estuary. A report is soon to appear in the *SANSP Report* series. The meeting was highly successful in making the various groups aware of the requirements and results of one another. It transpired that most of the relevant research had been done and all that is still required is a translation of the research findings to management strategies.

SHORTCOMINGS

Various shortcomings/areas for possible increased focus have already been described. I would just like to raise one additional issue here. The funding in the SANCOR Estuaries Programme represents less than one-third of the total funding for estuarine research in the country. The Department of Environment Affairs is channelling funds for such research through SANCOR, but also other agencies such as the CSIR and Universities. I feel that we could improve the level of achievement in the SANCOR Estuaries Programme in particular and in the country in general if more interchange of ideas/results is achieved. This should be a broad aim of the Estuaries Programme Committee over the next few years.

PROSPECTS

The project proposals for 1988/89 show a clear tendency for interdisciplinary research and a focusing of attention on a few key systems, such as the St Lucia system, the Sondags and the Kromme. A mini-symposium along the same lines as the Swartkops one will be held in 1988 in collaboration with the Scientific Advisory Council for St Lucia (SCADCO), to serve as a further basis for better coordination of research in that very complex system.

A project investigating the feasibility of a long-term monitoring programme for estuaries, which will not be funded by SANCOR, will be concluded by the middle of 1988. With the continuing funding of estuarine research at around the present level it should, over the next five years, be possible (via an integrated approach) to substantially

widen our base of understanding of estuaries, particularly as seen against the background of the possible initiation of a long-term monitoring programme.

D H SWART

CHAIRMAN: SANCOR ESTUARIES PROGRAMME COMMITTEE

ESTUARIES PROGRAMME: PROJECTS 1987

<u>Projects and project leaders</u>	<u>Duration</u>
ROSIE 2: Research on Sedimentation in Estuaries (Phase 2) (I C Rust, UPE)	1984 - 1987
The Role of Birds in the Swartkops Estuary Ecosystem (D Baird, UPE)	1984 - 1987
A Study of the Mangrove Crab <i>Scylla serrata</i> Forskal - Phase 2 (A J De Freitas, ORI)	1987 - 1989
Aeolian Processes, Bot River and Klein River Estuaries (I L Van Heerden, NRIO)	1985 - 1987
The Importance of Shoreline Vegetation and Macrophytes in the Dynamics of Silt in St Lucia (C M Breen, UNP)	1987 - 1989
The Penaeid Prawn Fisheries of Natal with Particular Reference to St Lucia and Richards Bay (A T Forbes, UND)	1987 - 1989
Socio-economic Factors Affecting Estuarine Degradation (R Stauth, UCT)	1987 - 1989
The Fish Communities of Southwestern Cape Estuaries (G M Branch, UCT)	1987
Salt Marsh Energy Flow Studies (D Baird, UPE)	1987 - 1989
Productivity of Mangrove Swamps (T D Steinke, UDW)	1987
Modern Sedimentary Environments of the Natal Coast (T R Mason, UND)	1985 - 1988
Continuous Low-Level Environmental Observations (CLEO) in Estuaries (D H Swart, NRIO)	1987
Langebaan Production and Decomposition (G M Branch, UCT)	1986 - 1987
Sedimentation Rates in Natal Coastal Rivers (P Badenhorst, NRIO)	1986 - 1988
Applications of the One-dimensional Hydrodynamic and Water Quality Model to Selected Estuaries (P Huizinga, NRIO)	1986 - 1989

ESTUARIES PROGRAMME: PROJECTS 1987 (Continued)

<u>Projects and project leaders</u>	<u>Duration</u>
Recruitment of Ichthyoplankton into the Swartvlei Estuary (A K Whitfield, RU)	1986 - 1988
St Lucia Changes (Ecosystem Change in Relation to the Hydrological Regime of Lake St Lucia) (R H Taylor, NPB)	1986 - 1989
Potential Energy Production Processes in Some Estuaries of the Eastern Cape (B R Allanson, RU)	1986 - 1987
Sundays River Processes (T Wooldridge, UPE)	1986 - 1989

MARINE LINEFISH PROGRAMME

STATUS

Since its inception in 1978, this programme has seen to the formulation of objectives and coordination of projects specifically aimed at facilitating optimal exploitation of South Africa's marine linefish stocks by providing a scientific basis for their judicious management. Furthermore, the programme strives to ensure reasonable geographic distribution of research effort and promotes the focusing of attention on certain key species as identified by the 'Visboekie' - viz. *SANSP Report No 70*. To date this has involved the study of some 27 species of linefish, investigating not only their life histories, but also placing emphasis on those parameters that are of direct consequence to resource management.

The programme is necessarily goal orientated and involves, to a considerable degree, interaction with the resource users. This is achieved through close liaison with representatives of fishery organizations - both commercial and recreational - and also through the direct involvement of thousands of fishermen throughout South Africa in various research projects.

The objectives of this programme were reviewed during the Linefish Workshop 1985 and a number of specific requirements were identified:

- * Information on species parameters fundamental to stock assessment (e.g. length composition of catches, growth and mortality rates), including comparable data from different geographic regions.
- * Long time series of Catch-per-unit-effort (CPUE) and mean length/mass of catches both nationally and regionally, as a basis for detection of trends in the fishery and for stock assessment.
- * Absolute catch estimates for each sector of the linefishery (commercial and recreational) on a regional basis.
- * Assessment of trawl and other net catches of linefish (e.g. kob) and the implications for linefish management.
- * Information on the life histories of poorly known species and groups (e.g. Serranidae and Sciaenidae).
- * Life history information not yet available for priority species (e.g. residency, migration, dispersive phases and nursery areas).

- * Ongoing assessment of the effectiveness of marine reserves for linefish conservation.
- * Ongoing taxonomic research on problem groups.

The most important overall trend evident in this programme has been the change in emphasis from life history studies to quantitative stock assessments. This has been due, firstly to the completion of biological studies on the majority of target species, secondly to the increasing need for quantitative management advice, thirdly to the specific objectives formulated during the 1985 Workshop and fourthly to the effective involvement of applied mathematicians in all the projects.

The geographic distribution of linefish projects is considered to be optimal and the entire South African coastline now receives attention from one or more linefish researchers. During the year there has been excellent liaison between projects, partly due to workshops and symposia, but also through the efforts of individual workers. Staff from marine linefish projects contributed substantially to the Alternative Life Styles symposium (June 1987: Grahamstown) and to the 6th National Oceanographic Symposium (July 1987: Stellenbosch). Furthermore, two workshops of specific concern to this programme were arranged. The first was an age determination and growth workshop (August 1986: Grahamstown) at which latest techniques in this field were discussed and implemented by a number of SANCOR projects. A second workshop considered techniques in stock assessment and especially the application of general fisheries models to linefish problems in particular (February 1987: UCT). These workshops contributed to the development of centres of expertise which during 1986/87 resulted in more efficient use of facilities and staff such as, for example, age determinations at RU, applied mathematics at UCT, prey identification at PEM, tagging at ORI and catch statistics at ORI and SFRI.

The Linefish Programme continues to function well and, in addition to good inter-scientist cooperation, there also remains very satisfactory contact with resource users and those responsible for management. Many of the projects' staff serve in advisory capacities on a number of regional and national resource management committees so that much of the SANCOR funded research finds direct applicability.

HIGHLIGHTS

- During the course of 1987, three projects were completed, another nine provided statements on progress and achievement, while several non-SANCOR projects also contributed substantially.

- A number of important conclusions emerge and significantly many are common to projects from different regions, suggesting they may be indicative of the entire South African linefish resource.
- Foremost is the confirmation that the proportion of endemic species in landings throughout South Africa has seriously diminished. In many cases this has been quantified and related to the individual species' potential yield, revealing that several species are inherently vulnerable due to their slow growth, specific reproductive strategies and restricted distribution. Such valued fish as red steenbras (*Petrus rupestris*), poenskop (*Cymatoceps nasutus*), Roman (*Chrysoblephus laticeps*) and red stumpnose (*C. gibbiceps*) have reportedly declined, while galjoen (*Coracinus capensis*), Hottentot (*Pachymetopon blochii*) and bronze bream (*P. grande*) are seen to be yielding catches close to the Maximum Sustainable Yield (MSY).
- A number of depleted endemics have reached such low numbers that this has seriously impeded the researchers' ability to obtain adequate biological samples. Workers have been most persistent and resourceful however and significant progress was reported for the red steenbras, musselcracker and bronze bream.
- The result of this endemic depletion has seen a significant change in emphasis of the fishery toward previously unacceptable species. This is evident countrywide, with sharks, barbel and less valued varieties of kob and redfish assuming greater proportions of the total catch. While most of these species are shown to be under-exploited, their total yield is not necessarily very large. Low reproductive rates of shark and barbel, for instance, could limit future dependence on these species.
- From these studies it has become apparent that the fundamental principles underlying the new linefish management plan of 1985 were correct, viz. the protection of South African endemics in favour of less vulnerable pelagic species. A number of projects specifically addressed these new regulations and presented positive recommendations for 'fine tuning' the plan in order to derive optimal benefits. In the case of galjoen, for example, it was shown that long-term natural fluctuations in stock could be accommodated in more flexible legislation.
- Good progress was also reported for studies centred on marine reserves and their value to linefish resources. Positive results for certain species were detected at de Hoop, Tsitsikamma and St Lucia Marine Reserves. An important criterion was shown to be residency, especially in the case of the Roman, for which the reserves option holds considerable promise.

- Considerable attention has also been focused on the kobs and related species. The geelbek (*Atractoscion aequidens*), a highly seasonal species, was studied both in the eastern Cape and Natal - results of both projects indicating that this fish undergoes seasonal spawning migrations.
- The phenomenon of sex reversal and the considerable diversity of reproductive strategies evident in the important family of seabreams (Sparidae) continued to be a focal point in several projects. Most studies have been of a descriptive or histological nature, but increasingly attention is also being given to the impact such strategies may have on the stock and its management. Several papers dealing with this topic were read at symposia during the year and the subject has also been the basis of some international cooperation. Clearly it will remain an important field of study for some time.
- In addition to the highlights of individual projects, milestones were also attained in two projects of a cooperative nature. The nationwide marine linefish tagging project at ORI, with its 1600 participant members, attained a total of 20 000 fish tagged comprising 245 species. Not only is this a considerable tonnage of fish released, but it has led to the creation of a scientific database that now provides important quantitative data to the linefish community. Similarly, the National Marine Linefish Catch Statistics (NMLCS) Programme flourished and during 1986 saw the documentation of 195 000 recreational angler and 505 407 commercial fishermen's outings. The seemingly unattainable objectives of this NMLCS Programme identified by SANCOR in 1978 have, to a large measure, been achieved and various projects now benefit from the scientific data reports that are being produced. It was also, in a large measure, due to the NMLCS Programme that linefish researchers were able to contribute substantially to the long-term data series conference in October 1987 at the CSIR Conference Centre in Pretoria.

FUTURE PROSPECTS

While there are obviously shortcomings in this programme, these are not considered to detract from the overall good progress made during 1986/87. It is clear that the Marine Linefish Programme is satisfactorily meeting its objectives and that the outstanding issues present a challenge for the future.

The persistent dearth of information on the early life history of fishes needs to be addressed, and the start made with this during 1986 requires

consolidation. Based on available results, it has become apparent that there is considerable species fluctuation within otherwise seemingly stable fisheries. This suggests that species interactions could be influencing the fishery. Consequently, additional attention could be given to studying 'entire fisheries' wherever these can be identified.

Previous strong motivations to instigate an economic evaluation of the linefishery should be revised, possibly by integrating with several of the socio-economic studies currently underway. Future demands placed on South Africa's marine linefish resources are believed to be growing at approximately 6 % annually - and this requires careful setting of objectives and a considerable refinement of the scientific advice presently available for resource management. It may indeed become necessary to direct research attention to alternative fish enhancement techniques, such as fish aggregating devices (FADS), artificial reefs and re-stocking programmes.

This programme is scheduled for review of its progress and objectives at the end of 1989.

R P VAN DER ELST

CHAIRMAN: SANCOR MARINE LINEFISH PROGRAMME COMMITTEE

MARINE LINEFISH PROGRAMME: PROJECTS 1987

<u>Projects and project leaders</u>	<u>Duration</u>
* West Coast Shark Fishery (C L Griffiths, UCT)	1987 - 1989
South Coast Reef Fish Project (C D Buxton, RU)	1985 - 1987
Catch-statistics Sampling Strategy Evaluation (D S Butterworth, UCT)	1983 - 1988
South Coast Game Fish Project (G J B Ross, PEM)	1983 - 1987
Port-Alfred Ski-boat Fishery (Phase 2) (T Hecht, RU)	1987 - 1989
* A Study of Deep Reef Sport Fishes of Natal - Serranidae and Sciaenidae (R P van der Elst, ORI)	1985 - 1988
* South Coast Musselcracker and Bronze Bream (C D Buxton, RU)	1985 - 1987
Biology and Ecology of Geelbek (Phase 2) (T Hecht, RU)	1986 - 1987
System Standardization (R P van der Elst, ORI)	1987
Descriptions of Linefish Larvae (G M Branch, UCT)	1987

* Funded by SEFREF

MARINE POLLUTION PROGRAMME

INTRODUCTION

During the last five years, the nature and content of the SANCOR Marine Pollution Programme (MPP) has changed markedly; away from largely a series of monitoring projects, to its present form where emphasis is on the understanding of physical, chemical and biological (including micro-biological) processes occurring where wastes are discharged to sea.

The balance of activity has also changed in response to demands, with the heavy emphasis in Natal being reduced, and greater emphasis in the Western Cape. The three major centres (Natal, East Cape, and Western Cape), all have well established research groups.

What has not changed is the conclusion that estuaries and coastal waters receive the vast majority of contaminants introduced into the marine environment, and that it is possible to identify a number of sites around the South African coast which have been adversely affected to some degree by such wastes. Equally it is possible to report that conditions in open ocean waters are essentially very healthy, although it has sadly become impossible to find any organism which contains fatty tissue and lives in the world's oceans, devoid of the persistent synthetic chlorinated hydrocarbons.

SCIENTIFIC PROGRESS

A major involvement of the MPP with the development and monitoring of discharges from the Richards Bay pipeline nears completion. The two pipelines commenced operation in May 1985, generally at lower levels than the design capacities of 5 200 tons/day of gypsum and 110 000 m³/day of mixed industrial effluent respectively. Initial monitoring shows that benthic conditions near the ends of the pipeline are not markedly changed, although gypsum has been observed by divers close to the diffuser of the dense line. A single occurrence of very high trace metal levels in a sediment sample taken close to this diffuser has been associated with undissolved gypsum.

Measurements of trace metals and microbiological parameters in the water column have shown no exceedence of Water Quality Criteria outside of the mixing zones.

Studies using rafts moored in and out of the effluent plume and designed to act as settlement panels to allow a time series analysis of fouling

communities have proved successful. Initial results indicate considerable organic enrichment of the water column in the vicinity of the plume as evidenced by luxurious algal growth. Bio-accumulation studies using mussels suspended in the plume showed little enrichment of trace metals, but of additional interest, a similar study in Durban Bay where sediments are heavily contaminated by trace metals, also showed no measurable bio-accumulation. This latter study once again confirms the fact that when metals are bound in sediment, their release to the water column can generally only occur via substantial disturbance of the sediment (for example, dredging), or by the sediments becoming anoxic. The Durban Bay results mirror those obtained from sediments contaminated (both naturally and artificially) with arsenic. Using burrowing prawns as the test organism, it has been clearly shown that arsenic bound in 'stable' sediments is largely unavailable to even benthic fauna, yet far lower concentrations in the water column are demonstrably toxic.

These general conclusions are not in complete agreement with the findings of a recently completed project involving the determination of metal binding proteins (MBP) in a number of marine organisms. In these studies, the presence of MBP has been found even where residue levels are low. This implies that such an organism is under stress without this stress being noted by elevated metal levels. This important physiological indicator of stress still requires verification as to what stress levels are harmful.

The measurement of sublethal, or subacute toxicity has advanced substantially. Various test organisms are now in regular use in South Africa; these include fish eggs, mussel larvae, and various amphipods. The important aspect of these tests is that reproductive success is being assessed, while test procedures are such that year round availability of organisms exists. The extrapolation of such laboratory toxicity results to field conditions still presents a necessary, but complicated task. The effort required to undertake such field studies is enormous and toxicity testing represents a rapid and reliable method of screening effluents before submitting the worst of these to further and more detailed scrutiny.

The prediction of initial dilution from deepsea outfalls is now a routine matter, with results of calibration studies indicating that the still water dilution predictions which have been used to design new outfalls, are in fact conservative. Interest is now being diverted to understanding the mixing of effluents within nearshore waters, where effluents are discharged via canals or storm sewers. This practice is unfortunately undergoing dramatic increase due to rapid and substantial urbanization at coastal sites. Initial results from studies in the Algoa Bay and False Bay areas show that very limited mixing of surface discharges occurs with nearshore waters with contaminants remaining at

elevated levels close to shore for considerable distances from discharge points. Studies of such discharges will form a substantial part of the Marine Pollution Programme for the next few years.

Human health, and the effects on it of the use of sewage contaminated sea water for recreational purposes, has played a much larger role in the programme this year. Results clearly show elevated bacterial levels close to 'bad' outfalls, while viruses have also been found in these waters as well as in shellfish growing nearby.

Water Quality Criteria, published in 1984 and representative of the community's collective wisdom of tolerable concentrations of contaminants in the marine environment, has been a resounding success. It has been applied in at least two major disposal projects (Hout Bay, East London). Since their preparation there have been two calls for reassessment of published criteria, both for microbiological characteristics. These recommendations are based on human health considerations and in turn recommend the inclusion of vibrios, and viruses in the criteria, rather than using only the indicator bacteria, faecal coliform. The shortcomings of using indicators rather than etiological agents themselves are well known and accepted, but it is worth noting that the US Environmental Protection Agency (EPA), after recently completing a very major study on health aspects of sewage contaminated sea water, have expanded their list of microbiological criteria of faecal and total coliforms, but with the inclusion only of entero-cocci. The persistent organic contaminants, in particular the synthetic chlorinated hydrocarbons, continue to be found in almost all marine samples. This signifies the effective distribution of these materials throughout the world's oceans, although coastal systems still consistently contain higher levels. Unfortunately, these materials are still available for use in Southern Africa, albeit under controlled conditions, and their continuing presence and lack of decrease with time requires continued monitoring.

The MPP was well represented at 6NOS. The distribution of pollution associated papers among the various sessions allowed for a fruitful association with those not normally aware of the MPP work.

CONCLUSION

The future of the Marine Pollution Research Programme will always be dictated to by the nature and degree of development which occurs along the coast. In particular, attention must be paid to the intermittent and diffuse sources to the sea (such as storm water discharges). These have escalated enormously during the last 3-5 years, and the collection and treatment of such wastes on land is fairly impractical.

Consequently the least damaging methods of discharge must be examined. In addition, these discharges all have potential effects on human health due to microbiological characteristics, hence the scrutiny given to their discharge, particularly when this occurs close to bathing beaches.

During 1988, the MPP should arrange a symposium to address the advances made since 1984, and would be well advised to include appropriate sessions on public perception of marine pollution, associated research, and the effects of controls.

Within the last few years the community has been unfortunate to lose a number of senior chemists who were major participants in this programme. Their immediate replacement is unlikely, and it will be imperative for the MPP to give particular attention to analytical skills within the community, and to recommend some rationalization of analytical skills among the participating laboratories.

D A LORD

CHAIRMAN: SANCOR MARINE POLLUTION PROGRAMME COMMITTEE

MARINE POLLUTION PROGRAMME: PROJECTS 1987

<u>Projects and project leaders</u>	<u>Duration</u>
Monitoring Environmental Effects of Richards Bay Pipeline (A D Connell, NRIO)	1985 - 1988
Juvenile Ichthyofauna and Sessile Marine Organisms as Indicators of Water Quality - Phase 2 (R P van der Elst, ORI)	1987
Marine Viral Pollution: Phase 2 (W O K Grabow, NIWR)	1987 - 1990
Chlorinated Organics Eastern Cape (D A Lord, UPE)	1985 - 1987
Studies on Specific Toxic Metals in Polluted Areas on the Natal Coast (T P McClurg, NRIO)	1985 - 1988
Pollution Monitoring - Granger Bay (H F-K O Hennig, NRIO)	1986 - 1989
Toxicity Testing with Mussels (<i>Perna perna</i>) (A D Connell, NRIO)	1986 - 1988
PCB's as Marine Geochemical Tracers (D A Lord, UPE)	1986 - 1989
Chlorinated Hydrocarbons in the Natal Marine Environment (R R Sibbald, NRIO)	1986 - 1988
Port Elizabeth Harbour Trace Metals (D A Lord, UPE)	1987 - 1989
Pollution Loading of False Bay (A C Brown, UCT)	1987 - 1988
Load of Health-related Micro-organisms in Effluents discharged into False Bay (G Tredoux, NIWR)	1987 - 1990

MARINE SEDIMENTOLOGY PROGRAMME

STATUS

During the past year serious discussions were held on at least two occasions concerning the status of marine sedimentology in South Africa. These discussions resulted from the deep concern expressed at a Marine Sedimentology Programme (MSP) Committee Meeting held on 28 September 1986 regarding the escalating attrition of marine sedimentologists, especially those associated with marine sedimentological research in South Africa. The first of the discussions took place during an open meeting at UCT, 3-4 June 1987, and the second took place during the last session of 6NOS.

It is difficult to identify the precise source of this general concern, unease and malaise which seemed to afflict and permeate the MSP during the past year. Perhaps the unexpected departure of senior co-workers at UCT, coupled with the absence on sabbatical leave and the subsequent resignation of Prof R V Dingle, can be seen as major contributing factors. Other aspects which have been mentioned include the notion of an apparent lack of clearly defined objectives for marine geoscience as a whole; the shortage of research leaders with suitable academic qualifications; the fragmentation of existing research groups and the inevitable costly duplication of facilities and equipment; the lack of a ship for the special requirements of marine geoscience, specifically sedimentological work; and lastly, inadequate funding. The uncertainty regarding the replacement of Prof Dingle at UCT certainly exacerbated the general level of concern. Likewise the substantial reorganization within the CSIR has caused adverse ripple effects at NRIO with regard to its marine geoscience unit. Fortunately the marine geoscientists working at the Geological Survey appear not to have been affected by these upheavals.

The consensus during the June discussion was that UCT should continue to function as the prime centre for South African marine geoscience, and that the existing cooperation between the Geological Survey and UCT be strengthened as much as possible; that the marine geoscience activity at NRIO be seconded to and integrated with the Marine Geoscience Unit (MGU) at UCT, and that special efforts be undertaken to reactivate an esprit de corps amongst marine geoscience workers in general. Special mention was made during the discussion of the concept of minimum critical mass (considered to entail 7 to 8 senior researchers per group), as well as the coordination and integration of groups working outside the UCT area (the groups at UPE and UN).

At 6NOS these matters concerning marine sedimentology in particular and marine geoscience in general were raised during the open discussion on

the future of oceanographic research in South Africa but for a variety of reasons this failed to make any impression on the gathered scientists and administrators.

At the Executive Committee for Oceanographic Research (EXCOR) meeting on 9 September 1987 when the full extent of the attrition among marine sedimentologists was revealed, it was decided to terminate the MSP at the end of 1987 and find ways and means during its last normal programme committee meeting to allocate remaining viable marine sedimentology operations to other applicable programmes. The existing programme Chairman and coordinator are to maintain a watching brief for as long as is required by the Chairman of SANCOR, but the committee is to disband.

Whether this was a wise decision under the circumstances, only time will tell.

In its existing form the programme lasted 6 years and never failed to run interesting projects of a fundamental scientific nature. The very high academic status of the programme was highlighted by a comprehensive FRD grant awarded to Prof R V Dingle. Some 24 papers in journals, 29 theses and projects for higher degrees (8 MSc, 3 PhD and 18 Hons) and numerous presentations at symposia and other meetings have been produced. Direct SANCOR funding during this time has entailed R 726 611.

FINDINGS AND HIGHLIGHTS

A full colour geological map of the continental shelf and nearby deepsea floor has been completed and is in the process of being printed. (R V Dingle (1987) 'Deep sea sedimentary environments around South Africa (S E Atlantic and S W Indian Ocean)', *Annals of the South African Museum*, Vol 98, Part I and maps. Cape Town).

Research on pore-water geochemistry of the diatomaceous muds (Ridgway) has been terminated and a short report documenting the state of the art and the practical problems related to work of this nature has been prepared.

Work on the deep-sea basins and the manganese nodules (Rogers) continued, but as before research cruises have been plagued by bad weather and instrument malfunctions.

Excellent progress has been made on the Mesozoic basins project (Friedinger) and some exciting concepts regarding the development of the post-Gondwana break-up continental shelf and its sedimentary depositories have been developed. This work, which is mainly a re-appraisal of archival data from the Southern Oil Exploration

Corporation (SOEKOR) and other sources, has shown how important it is to coordinate and re-interpret existing data.

SHORTCOMINGS

The comment which appeared often in these annual reports, namely the need for better ship facilities, better and more reliable equipment, and more technical support, is still applicable for the period under review - a perusal of cruise reports TBD 491 and TBD 496 provides as good examples as any regarding these matters - but the entire situation is now probably of mere academic importance. One impression remains: the tenacity, ingenuity and determination of the research teams to make the best of each opportunity. It's not often that scientists will be willing, even eager, to conduct research under such conditions.

The narrow spectrum of leaders in this area of research has long been recognized but nothing was done about this; the present low ebb where the marine sedimentological research activity finds itself can to a large extent be attributed to the lack of sufficient breadth and back-up in marine geoscience research in general.

FUTURE

Regardless of the foregoing gloomy report, several exciting proposals for new sedimentological research in the sea have been received for support in 1988. The performance of marine sedimentologists at 6NOS - not all of them associated with MSP - had indicated a wide spectrum of operations, ranging from deep ocean basin studies to sedimentological work in the surf zone and on the beaches, and this bodes well for the general future of this field of study, but it is obvious that better coordination and control is required before the previous momentum will be regained.

How this will be achieved in the absence of a SANCOR 'home programme' now that the MSP is to be disbanded remains to be seen.

In conclusion I want to place on record my deep appreciation of the excellent cooperation and support I received from fellow scientists and administrators during my tenure as Chairman of the Marine Sedimentology Programme.

I C RUST

CHAIRMAN: SANCOR MARINE SEDIMENTOLOGY PROGRAMME COMMITTEE

MARINE SEDIMENTOLOGY PROGRAMME: PROJECTS 1987

<u>Projects and project leaders</u>	<u>Duration</u>
Cape Canyon: Structure, Sedimentology and Oceanography (R V Dingle, UCT)	1987 - 1988
Late Quarternary Palaeo-oceanography and Palaeo-climatic History of the Southwest Indian Ocean adjacent to Southern Africa (A Winter, UCT)	1984 - 1987
Mesozoic Basins of the Northern Agulhas Bank and Southern Cape (R V Dingle, UCT)	1985 - 1988
Sedimentology of the South-eastern Cape Basin (A Winter, UCT)	1985 - 1987

OCEAN ENGINEERING PROGRAMME

BACKGROUND

At the request of SANCOR in 1985, the South African National Engineering Committee for Oceanic Research (SANECOR) investigated the need for a national research programme in ocean engineering which led to a recommendation at the 37th Meeting of SANCOR in August 1986 that such a programme should immediately be established. SANCOR accepted this recommendation provided that real research be undertaken and not merely short-term contract studies directed at the finding of immediate answers.

At a meeting on January 27, 1987, attended by representatives of the Department of Mineral and Energy Affairs, CSIR, SOEKOR, Central Energy Fund (SEF) and the University of Stellenbosch, it was agreed in principle that funding for the programme should consist of an amount of R 100 000 per annum provided by SANCOR and R 300 000 per annum provided by the SEF for a period of five years.

This funding was subsequently confirmed on condition that the SEF funds be utilized only for projects falling within the interests of SOEKOR. Mr D Holtzhausen of SOEKOR was appointed responsible engineer for the programme. It was agreed that the R 100 000 provided by SANCOR should be managed in conjunction with the SEF funding but could be used for any project approved by the programme steering committee.

During the first half of 1987 a broad programme description was drawn up and an invitation to participate in the programme was advertised through SANCOR and Civil Engineering newsletters. A programme steering committee under the chairmanship of Mr D Holtzhausen of SOEKOR was appointed for a three year period.

Project applications were received initially on NP10 forms and supported later by scope of work documents for SOEKOR approval. By mid 1987 research funding had been allocated and progress meetings have since been held quarterly in the form of a morning technical session followed in the afternoon by a steering committee meeting. The first formal progress report was submitted to SEF in February 1988.

PROGRAMME FRAMEWORK

No formal programme description document has as yet been compiled, however the following brief summary reflects the general philosophy of the programme steering committee:

Programme objectives:

- To establish a group of researchers engaged in ocean engineering research who can fulfill the role of 'receivers of technology' through interaction with those involved in the Moss gas Project. (This continuing learning process is specifically a research activity and is not to be aimed at primarily providing short term answers.)
- To improve knowledge and understanding of the environmental and resulting loading conditions, hydrodynamics, structural dynamics and geotechnics of marine structures to be used in the Moss gas Project, which would assist designers in arriving at more economical and safer structures.

Programme content:

In the short term effort is focused on those areas where there is limited information in the South African context, i.e.:

- an understanding of environmental loading conditions and related geotechnics in the area of the FA Platform (the first one off Mossel Bay);
- improvement in wave/weather/current prediction capability for the construction phases of the platform and pipeline;
- establishment of a comprehensive environmental and structural monitoring programme on the FA Platform;
- other short term hydrodynamic, structure dynamic and geotechnic research as the need may arise.

Longer term research can include the following:

- consolidation of the environmental and loading conditions data base and improvement of predictive capabilities;
- processing of data from instrumentation on the first platform and pipeline;
- monitoring of material behaviour under South African conditions accompanied by research in this field;
- fatigue and stress corrosion under South African conditions;
- foundations;

- instrumentation;
- structural forms best suited to South African conditions;
- economics (e.g. the international energy situation and its implications for the South African industry).

Research areas should also later be identified where contributions can be made in a more global, innovative sense.

STATUS

Programme funded research falls into three general categories:

Environmental loading conditions (SEF funded)

Projects include research on wave/current interaction with special reference to the significance of extreme events and the refinement of design and construction parameters; improvement in sea state prediction capability by the upgrading of windfield input data and the development of a new coupled, discrete sea state prediction model, and a feasibility evaluation of a radar sea state and surface-current monitoring system (CODAR).

Bearing capacity of piles under local conditions (SEF funded)

Two projects are supported in this category:

- the development of an improved numerical model for pile analysis with specific reference to non-linear soil/pile interaction; and
- research on the pile bearing capacity of cretaceous formations at the FA site under cyclic loading conditions.

Structure dynamics (SANCOR funded)

These relatively long term projects cover the determination of hydrodynamic forces on large volume offshore structures, composite structures and slender systems such as marine risers and pipelines. Work is focused on the improvement of existing models and coefficients, the examination of numerical anomalies and the accuracy of linearized solutions to those problems which are essentially non-linear.

HIGHLIGHTS AND FINDINGS

Although the programme has only recently been established several significant findings have already emerged:

In the work on wave/current interaction a definitive relationship has been established between the angle of incidence of a wave field entering the Agulhas Current, the radius of curvature of the current and total reflection of this wave field within the current. For a given set of conditions the resulting caustics occurring in the reflection zone would increase the probability of occurrence of extreme events. Ray tracing techniques have already clearly illustrated the mechanism of wave reflection under varying current and wave conditions.

Cyclic loading tests on samples of calcareous formations similar to those found at the FA site have revealed a deterioration of bearing capacity with time similar to problems encountered in the North Rankine Oilfield off N W Australia. Very little is generally known about the geotechnical properties of such sediments under repeated loading conditions and although the FA Platform foundation design has conservatively accommodated the widest possible range of expected bearing strengths this work will nevertheless shed new light on an important area of platform design.

SHORTCOMINGS

The programme has already effectively met its primary objective of consolidating the small but nevertheless enthusiastic core of ocean engineering research expertise in South Africa and bringing this group into close contact with the Moss gas development team.

As the programme is still in the inception phase it would not seem realistic to analyse shortcomings at this stage. However a problem which will most certainly have to be addressed within the next year is the fact that funding is fixed at a prescribed amount for five years with no provision made for inflation.

PROSPECTS

Proposals for monitoring at the platform are presently being considered by SOEKOR's consultants.

A number of the parameters are considered to be mandatory (i.e. wind speed and direction, air temperature, barometric pressure, relative humidity, wave height and period) and will be included in the platform

development costs. Proposals for additional meteorological data and undisturbed sea state and current measurements near the platform are still being considered.

A great deal of very valuable data will be generated by the monitoring programme over a number of years, and in some cases, for the life of the platform. Every effort should thus be made to arrange multidisciplinary projects which can make optimum use of these data.

G DE F RETIEF

SANCOR OCEAN ENGINEERING PROGRAMME COMMITTEE

OCEAN ENGINEERING PROGRAMME: PROJECTS 1987

<u>Projects and project leaders</u>	<u>Duration</u>
Wave/current interaction (G de F Retief, US)	1987 - 1989
Numerical model of piles (G de F Retief, US)	1987 - 1989
Bearing capacity of offshore piles (K Knight, KDM)	1987 - 1989
Sea State Model Verification (K S Russell, NRIO)	1987 - 1991
Sea State Model Development (G de F Retief, US)	1987 - 1989
Hydrodynamics of offshore structures (J A Zwamborn, NRIO)	1987 - 1990
Dynamics of slender systems (H T Pearce, UCT)	1987 - 1988
Forces on pipelines for local conditions (J A Zwamborn, NRIO)	1987 - 1990

SANCOR MEMBERSHIP, 1987

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Mr F P Anderson	NRIO, CSIR - SCOR member
Dr C J Coetzee	Directorate Science Planning, Department of National Education
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Prof J G Field	UCT - SCOR member
Mr N D Geldenhuys	Environmental Conservation Branch, DEA
Dr R Kleywegt	Geological Survey
Mr A M Little	Natal Town & Regional Planning Commission
Dr D A Lord	UPE - Chairman Marine Pollution Programme
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Prof I C Rust	UPE - Chairman Marine Sedimentology Programme
Dr L V Shannon	SFRI - Chairman Benguela Ecology Programme
Prof W R Siegfried	UCT - Chairman SASCAR Southern Ocean Programme
Mr G H Stander	SFRI, DEA
Dr D H Swart	NRIO, CSIR - Chairman Estuaries Programme
Dr D F Toerien	NIWR, CSIR
Mr R P van der Elst	ORI - Chairman Marine Linefish Programme
Capt C J H Wagenfeld	South African Navy

LIST OF ACRONYMS

6NOS	Sixth National Oceanographic Symposium
BEP	Benguela Ecology Programme
CLEO	Continuous Low-Level Environmental Observations
CODAR	Radar sea state and surface-current monitoring system
CPUE	Catch-per-unit-effort
CSIR	Council for Scientific and Industrial Research
DEA	Department of Environment Affairs
DWA	Department of Water Affairs
EPA	Environmental Protection Agency
EXCOR	Executive Committee for Oceanographic Research
FADS	Fish Aggregating Devices
FRD	Foundation for Research Development (CSIR)
GPS	Global Positioning System
IGBP	International Geosphere/Biosphere Programme
JGOFS	Joint Global Ocean Flux Study
KDM	Knight, Dames & Moore
MBP	Metal Binding Proteins
MGU	Marine Geoscience Unit
MPP	Marine Pollution Programme
MSP	Marine Sedimentology Programme
MSY	Maximum Sustainable Yield
NIWR	National Institute for Water Research (CSIR)
NMLCS	National Marine Linefish Catch Statistics
NPB	National Parks Board
NRIO	National Research Institute for Oceanology (CSIR)
ORI	Oceanographic Research Institute
PEM	Port Elizabeth Museum
RU	Rhodes University
SAICCOR	South African Industrial Cellulose Corporation
SAM	South African Museum
SANCOR	South African National Committee for Oceanographic Research
SANECOR	South African National Engineering Committee for Oceanic Research
SANSP	South African National Scientific Programmes
SASCAR	South African Scientific Committee for Antarctic Research
SCADCO	Scientific Advisory Council
SCOR	Scientific Commission on Oceanic Research
SEF	Central Energy Fund

SEFREF Sea Fisheries Research Fund
SFRI Sea Fisheries Research Institute
SOEKOR Southern Oil Exploration Corporation
SST Sea Surface Temperature
UCT University of Cape Town
UP University of Pretoria
UPE University of Port Elizabeth
UDW University of Durban-Westville
UN University of Natal
UND University of Natal (Durban)
UNP University of Natal (Pietermaritzburg)
US University of Stellenbosch
WITS University of the Witwatersrand
WOCE World Ocean Circulation Experiment

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