

Monitoring the Marine Environment

By Gernot Otte, GTZ-Marenpro

The Namibian rock lobster (*Jasus lalandii*) stock has shown slow recovery over the past three years, resulting in an increased quota allocation of 250 tons for the 1995/96 lobster season and 260 tons for 1996/97.

The low quotas of the early nineties caused great concern in the small harbour town of Lüderitz in southern Namibia, where rock lobster fishing was one of the economic pillars of the community. For a time the decreasing stock was linked to diamond mining activities along the lobster reefs. This created conflict between the mining and fishing industries and made the Lüderitz community aware of marine environmental matters.

The drastic decrease in rock lobster quotas coincided with an increase in diamond mining activities in the tidal and subtidal zones and on the offshore rocky reefs, which are the prime habitats of rock lobster. Frequent observations by lobster fishermen of juvenile lobster being pumped with diamond-ferrous sediment by diamond divers sparked the conflict.

The conflict made the public and the two industries aware of the possible impact of their activities. The ministries involved were asked to investigate whether and to what extent marine mining activities could be detrimental to the marine environment and its living resources.

The lobster industry urged the Ministry of Fisheries and Marine Resources, which is responsible for the management and sustainable use of Namibia's marine resources, to protect the lobster resource from, as they saw it, the destruction or depletion by the diamond divers. With the assistance of the German government, preliminary investigations started in 1993 under the Marine Environmental Monitoring Project (Marenpro).

Diamond extraction

In shallow waters from the intertidal zone down to a depth of about 35 metres, which include the lobster reefs, the diamond containing sediment is siphoned from grooves and crevices in the rocky seabed by powerful vacuum pumps on small vessels or from the beach. Divers operate the suction heads of the pumps.

Around the reefs and in subtidal areas with a flat sandy or muddy sea bottom the diamond-rich sediment is pumped on board by large airlifts operated from the ship by steel wire ropes.

More offshore, in water depths of more than 100 m the

soft sediment consisting of sand, clay and mud is pumped by remote-controlled vacuum pumps, fitted on crawlers, onto sea-going vessels. The diamonds are extracted on board. The mined sediment is then dumped back into the surface waters, leaving long visible tails of turbid water behind the vessels.

Land-based mining can also have an impact on the marine environment. Around Oranjemund for example, the beach line is being pushed up to 400 m out towards the ocean through huge artificial sand dams. The diamonds are then extracted from the impounded and drained bedrock. These dams are later destroyed by wave and wind action and the sand transported along the coastline by the northerly sea current.

At Elizabeth Bay, south of Lüderitz, inland ore bodies are mined. However, the extracted sediment is pumped onto the beach within the bay, thereby extending the beach-

line towards the sea and causing water turbidity in the bay. This may under certain weather conditions also be transported northwards along the coast past the northern bay point. Within the bay, the bottom fauna (mainly bivalve species) cannot cope with the disturbance caused by the shifting and resorting of the dumped sediment and seems to have disappeared completely.

Observations by research divers under the Marine Environmental Monitoring Project and analysis of the available relevant data ruled out mining activities as having significant direct effects on the lobster population off the south coast of Namibia. This view is supported by the fact that at the time of the collapse, the mining activities were confined to the reef areas and caused environmental degradation only in those areas.

Climatic changes

Moreover, the same pattern of decline and growth rate inhibition was observed in rock lobster populations in protected areas and lobster reserves, such as Ichaboe Island and Lüderitz Bay. These are totally or partially closed to fishing and mining. A similar decline was noted in South African waters. South African investigations showed that environmental degradation from mining in rocky areas was restricted to the areas being mined and that the rehabilitation of the damaged areas was rapid.

Further research showed that substantial global climatic changes in the Benguela ecosystem could have been the



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main reason for the decline. A strong warm water intrusion from Angola into the cold water system of the Benguela Current in 1988 is indicated as the main culprit.

Diamond mining is not the only mining activity on the Namibian continental shelf. There are ongoing explorations for oil and gas reserves in the well-known Kudu gasfield in the south and more recently along the entire coastline.

There is also interest in the technical feasibility and economic viability of mining phosphorous-containing sediment and other minerals from the seabed.

These industrial activities can damage the marine environment and change the fragile ecology. Precautions should be taken and the effects of the activities monitored continuously to counteract with control measures before damage sets in and becomes permanent.

Impact assessments

Namibia's new environmental assessment policy and mining legislation reflect these concerns. By law an environmental impact study has to be prepared and funded by the license holders before any mining activity is allowed. The process should be guided, administered and reviewed by an environmental commissioner and an environmental board. This board will consist of senior technical staff from relevant ministries and specialised experts, non-governmental organisations and representatives of the private sector. The results of an impact assessment will be discussed at various levels before a decision is taken. The draft Environmental Management Bill allows dissatisfied persons, communities or companies the right to appeal against decisions of the environmental board or to contest these in a court of law.

Before licenses are granted, oil exploration and drilling companies have to prepare a detailed oil spill contingency plan for the worst case scenario which can happen during operations, namely an extensive oil spill in coastal waters. Only with such a plan in place can the right measures be applied and the damages to the marine and coastal environment be minimised.

In the case of the lobster versus diamond mining conflict, no intensive marine environmental monitoring and biological research was done during and after the warm water inflow in 1988. This and a general lack of reliable scientific data on the physiological and biological environment of the Benguela system make it impossible to quantify the impact of mining activities on the living marine resources or to differentiate these effects from naturally induced influences and variations in the system itself.

Lack of historical data remains a bottleneck in the new environmental policy and legislation. Without reliable scientific data of past conditions, an environmental assessment or impact assessment can only be based on the present poor knowledge and understanding of environmental processes in the Benguela system.

Any new diamond concession holders will in future have to present detailed information about their planned activities and prepare comprehensive studies about known and possible direct and indirect short- and long-term effects of their activities on the marine ecology.

However, little is known about the oceanographic system and the biology and behaviour of rock lobster and its larvae.

They drift around the South Atlantic for up to 300 days of their planktonic life stage before settling down on suitable habitats in the lobster reefs to start their bottom dwelling life cycle. It then takes at least another five to six years until they grow to the legal size for exploitation by the fishing industry.

More research

Much more basic research has to be done on the Benguela current and its flora and fauna, let alone the commercial resources, before scientifically reliable and "environmentally safe" impact assessments of new industrial activities in the sea can be achieved. It would be necessary to do a one-time assessment before the industrial activities start and to monitor their effects on a permanent basis during operations. It may even be necessary to follow-up certain impacts after the activities have stopped. Some may have unpredictable long-term effects on the ecosystem and its living resources.

This is especially important with the present strong expansion of marine diamond mining activities along the Namibian coast as these may increase the still limited effects of the existing activities on the lobster habitats considerably. They may also have an accumulating or boosting effect on adverse natural influences, such as warm water intrusion, oxygen deficiency and changes in species composition. The lasting and indirect influence on breeding and spawning, larval recruitment and development, mortality and settling behaviour of the lobster larvae is not yet known. More research into the marine environment is essential to understand the ecological system of the Benguela Current and its dynamics. Only then can human induced impacts be identified, quantified and differentiated from natural impacts through environmental assessment studies and through monitoring of the industrial activities, and damages to or the destruction of valuable and economically important ecosystem can thus be avoided.

The Ministry of Fisheries and Marine Resources, with the help of German technical assistance through Marenpro, aims at setting up an efficient environmental monitoring system for the Namibian shelf seas. This system shall be extended to the entire Benguela ecosystem in the near future in collaboration with its neighbouring countries, South Africa and Angola, which share the same resources.

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