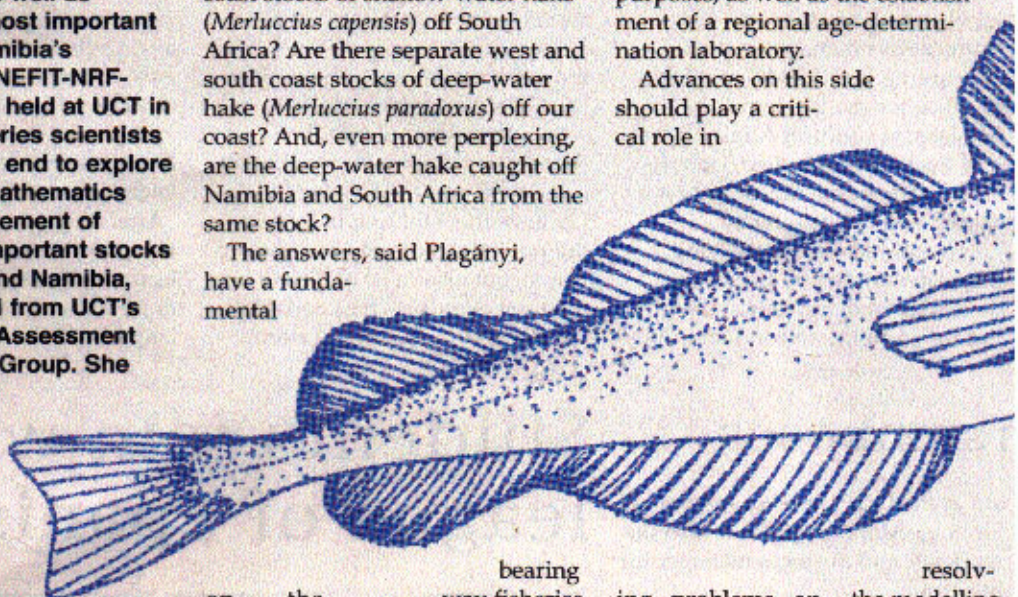
One stock, two stock whose stocks?

The humble hake, whether from deep-water or shallow-water stocks, is one of the great staples of the fishing industry in South Africa, as well as constituting the most important component of Namibia's economy. The BENEFIT-NRF-BCLME workshop held at UCT in January saw fisheries scientists dive into the deep end to explore the biology and mathematics behind the management of these two most important stocks off South Africa and Namibia, says Éva Plagányi from UCT's Marine Resource Assessment and Management Group. She compiled a report from which *Monday Paper* has gleaned the following.



These workshops, introduced by Professor Doug Butterworth (mathematics and applied mathematics), have been held annually since 2000, thanks to funders who included the Namibian and South African governments (there was even a leading parliamentarian present this year). Their aim is to review past assessments and management procedure evaluations for some local fisheries, and to make recommendations for future research.

Delegates to this year's event also reviewed progress on the operational management procedure (OMP) evaluations for Namibian fur seals. Seals thus constituted a complementary theme, given that they are a major predator of hake. Multi-species modelling initiatives thus also entered into the discussions.

The participation was not only local. This year the conference hosted seven of the world's leading minds in fisheries science: Drs James Ianelli, Joseph Powers and André Punt from the US, Professors Robin Cook and John Pope from the United Kingdom, Dr Tore Strømme from Norway and Dr Tony Smith from Australia.

The workshop's underlying theme was the question: one stock, two stocks, whose stocks? The debate raged on three fronts: are there separate west and south coast stocks of shallow-water hake (*Merluccius capensis*) off South Africa? Are there separate west and south coast stocks of deep-water hake (*Merluccius paradoxus*) off our coast? And, even more perplexing, are the deep-water hake caught off Namibia and South Africa from the same stock?

The answers, said Plagányi, have a fundamental bearing on the way fisheries scientists model and make management recommendations for these populations. Previous assessments of South African hake have been based on the assumption that separate west and south coast populations exist. But the workshoppers agreed it is more likely that there are single stocks of shallow-water and deep-water hake off our coast.

There are also indications that the deep-water variety off Namibia and South Africa may comprise the same stock, in contrast to assumptions in present management approaches that they are independent population units..

The management implications of a shared single stock represent a particularly tricky negotiating exercise with few clear international precedents or guidelines, noted Plagányi.

"Everyone agreed that hake scientists and population geneticists had to collaborate closely to address stock structure issues, especially those related to trans-national-boundary questions."

The workshop also addressed the question of reliable hake ageing information when conducting assessments. The availability and quality of these data is problematic in Namibia and South Africa, spawning calls for a workshop for the exchange of samples for testing purposes, as well as the establishment of a regional age-determination laboratory.

Advances on this side should play a critical role in resolving problems on the modelling front. Until then, the assessments in both countries were deemed "in transition", making it difficult for the scientists to comment on the seriousness of possible recent declines in all these hake stocks.

But the "meat of the meeting" was dipping into technical details of the hake assessment models.

"Though perhaps difficult to digest for junior and less quantitatively-inclined scientists, there were admirable attempts to allow them to follow and participate in the discussion. This was aided by daily question-and-clarification sessions with queries ranging from 'what is a fish?' to 'why should the lower bound imposed on the residual standard deviation for the CPUE data be increased appreciably?'," Plagányi quipped.

The apparent recent downturn in hake stocks was undoubtedly the main issue troubling managers and industry representatives at the meeting. The primary reason for this dip in South Africa appears to be some weaker than normal cohorts entering the fishery in the late 1990s.

Towards the end of 2002, a three-year phase-down policy (3 000 ton

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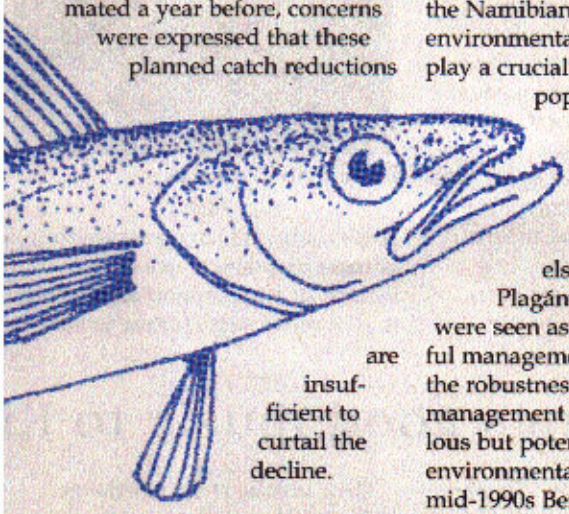
per year reduction, or a 2% per annum decrease) was agreed on by managers for South African hake. However, given that this downturn now appears to be greater than estimated a year before, concerns were expressed that these planned catch reductions



are insufficient to curtail the decline.

Nevertheless, said Plagányi, other factors such as industrial stability also need to be considered in making a decision. Following careful simulations to check for any possible long-term damage to the resource, it was concluded that it is safe to continue with the current phase down plan, provided allowance is made to perhaps adjust the extent of the reduction at a later stage.

Given the high inter-species predation rates among the two hake species, coupled with high rates of cannibalism and seal predation, the workshop recognised that discussions on multi-species and ecosystem effects were vital. From the Namibian seal perspective, environmental and feeding factors play a crucial role in influencing the population dynamics.

"It was encouraging to see that novel ways of including this information in the assessment models are being explored," Plagányi noted. "OMPs were seen as a particularly useful management tool to ensure the robustness of the outcomes of management decisions to anomalous but potentially devastating environmental events such as the mid-1990s Benguela *Niño*."

Fortunately, the environmental conditions closer to UCT were most favourable, she added, and the group took a break from the esoteric debates by visiting Kalk Bay, armed with an impressive list of research recommendations – 45 in all.

"I was reminded that the real challenge of our science lies in translating it into a form that best ensures stability in both our fisheries and the environment, and hence a better future for all." **MP**

Hake workshoppers: (From left, front) Prof Robin Cook, Dr Jim Ianelli, Dr Tore Strømme, Dr Tony Smith, Dr Joseph Powers and Prof John Pope. (From left, middle) Dr Moses Murangirire, Paul Nichols, Pakamani Buthelezi, Horst Kleinschmidt and Assoc Prof André Punt. (From left, back) Dr Hashali Hamukuaya, Dr Jean-Paul Roux, Dr Johann Augustyn, Prof Doug Butterworth and Titus Iilende.