The economic cost of ignoring or misreporting empirical data: Case studies.

Last month we raised the issue of data reporting in fishery management. We claimed that the tendency of fishers, justified as it may be, to treat catch and operational information as privately owned intellectual property can and does damage their interests. We suggested that the lack of good and reliable data forces fishing management authorities to rely on ‘alternative” assessment methods in the form of increasingly complex computer models in which model fits and assumptions replace real data. The lack of reliable data, we claimed, also leads to an ultra conservative management approach in order to reduce biological risk to the resource. The cost of it is far exceeding, in our opinion, the real or perceived competitive benefit which might be derived from inaccurate reporting of data.

In the next few articles we give a number of case studies which demonstrate the point we are trying to make. These examples are case studies in which we were personally involved in our capacity as scientific consultants to the fishing industry. They are described from our subjective point of view. Many of the issues recalled here were and still are intensely debated. It is therefore more than likely that others involved in these debates will have different views and opinions. Nevertheless we have tried to be factual and impersonal, insofar as possible, in the presentation of the facts. Our purpose in presenting these case studies is to highlight the futility of failure to accurately record fishing data for the fisheries management authority, or alternatively to simply illustrate the pitfalls of paying insufficient attention to the strategic importance of data.

Pilchard fishing in Namibia

In 1994 a joint venture from South Africa and Namibia built a pilchard cannery at Walvis Bay, Namibia at the cost of about US$ 8 million. This investment decision was based on industry-wide pilchard catches of about 90 000 tons per annum since 1988. The decision-makers were apparently unaware at the time of biomass surveys indicating an alarming and persistent decline in resource biomass since 1991. As a result, the company was taken by surprise when in 1995, a year after the cannery was completed, the Namibian pilchard TAC was reduced from 125 000 tons to 40 000 tons. In 1997 a further 50% reduction in the TAC was introduced. Since then the average annual TAC has been about 30 000 tons, 30% of the production figure upon which the construction of the cannery was based. As a result the cannery is underutilised with a significant loss of money.

Simple attention to some of the details of the available scientific data, coupled with an understanding of some basic principles of the population dynamics of pilchard stocks may have led to a different decision. This is a very common mode of operation by fishing companies around the world, i.e. ‘first create the catching and processing capacity, and then try to get the fish to justify it’. In this case, as with other nations, this leads to undue pressure on scientists to produce more favourable assessments or on politicians to override conservative scientific recommendations. In the Namibian case there was another unfortunate development. As it became clear that Namibian scientists would not increase the pilchard TAC, applications were made for licences to fish pilchard in Angolan waters just across the border, in full knowledge that this was and still is part of the same pilchard resource.

Somatic growth rates in the West Coast rock lobster resource

West coast rock lobster growth rates have been recorded in South Africa since 1968. Up to 1987, 20 sites were sampled sporadically for growth. Growth rates are estimated by measuring, tagging and releasing a few thousand lobsters (mainly males) just before the moulting season. Tagged lobsters which are later caught commercially are measured for growth (carapace length). From 1987 on a more regular tagging programme was established at six or seven regularly sampled sites.

Lobster growth rates along the South African West Coast are known be strongly area dependent, and it was felt that it would not be statistically appropriate to use tagging results from pre-1987 samples. As such the growth rate index which was used in size-structured stock assessment models was based solely on post 1987 tagging data. In 1994, three changes to the way that the growth rate index was calculated were made.

- Firstly, the more scattered data from the much larger number (>20) of sporadically sampled sites for years 1968 – 1986 was incorporated into the analysis
- Secondly, it was decided, based on aquarium studies, that lobsters can actually shrink in size and so a decision was made to include all zero and negative growth rates values which previously were discarded in the calculation of average annual growth rates,
- Thirdly, until 1994 measurements were recorded to the nearest millimetre but thereafter measurements were recorded to the nearest tenth of a millimetre.

These changes in methodology introduced a number of problems. One is the difficulty of obtaining annual indices of growth rate when there are no records of growth rate for the majority of year and site combinations. Another follows from the simple act of including zero and negative measurements in the growth rate dataset. The concern is that historically, zero and negative growth rate records may have been lost, leading to a positive bias in the historic mean annual growth rate estimates.

A further potential difficulty with the inclusion of zero and negative growth at large values was that these may in fact be the result of a no-moult, since the lobster was either tagged, released and recaptured before moulting took place, or tagged released and recaptured after moulting had already occurred. This concern was raised by the industry but was rejected by the South African management authorities who informed them that the moult state was recorded by well trained inspectors when recaptured tagged lobsters were handed to them. Consequently the original tagging datasheets were examined and it was found that the moult state of tagged and recaptured lobsters was not recorded in real-time by inspectors, but was in fact judged from the recorded growth rate level. In short the moult state was an assumption and not based on independent empirical data.

In order to test the possibility that lobsters which had not moulted were included in the growth rate database, a statistical test of the relationship between time-at-large and growth rate was carried out. The statistical test revealed evidence for the dependence of growth rate on time-at-large, suggesting that lobsters which had not moulted were included in the database.

A number of methods were tested in order to exclude no-moult cases from the dataset. The method preferred by authorities involves excluding 70% of the data. The resultant plot of interannual growth rates shows high pre-1987 growth rates, and post-1987 growth rates which are some 70% lower.

To date there is still unhappiness in the South African west coast rock lobster industry about the growth rate index used in the assessment model. There has been no clear biological and/or ecological explanation for the large decline in somatic growth rates indicated by the available data, nor why this decline in growth rate seems to coincide with the time of a change in sampling methodology. From an economic point of view, the assumed decline in lobster growth rate in recent years has doomed the resource to a very unproductive state, with serious implications for the annual TAC. From a scientific point of view the loss of 70% of the data is of concern. From a logistic and monetary point of view, a large amount of effort and money has been wasted simply because data were not properly recorded and sampling methods have not been consistently applied.