Is the scientific information base for the management of tunas adequate?

Victor R. Restrepo and William W. Fox, Jr.[1]

Information base from a multitude of sources: RFMOs

All of the major commercial tuna stocks are highly migratory and are exploited by many countries in the high seas and within EEZs, using a variety of fishing gears. International legal instruments (particularly the United Nations Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, UNFSA), rationally call for fishing and coastal countries to collaborate in the management of these stocks through regional fishery management organizations (in this case, so-called Tuna Regional Fishery Management Organizations, or T-RFMOs). It goes without saying that if regional cooperation is needed for tuna fishery management, regional cooperation is also needed for tuna fishery science and assessment. This includes the essential collection and collation of all relevant fishery data so that the stock assessments address all sources of fishing mortality on the stocks.

The information base for the management of tuna stocks thus includes a variety of data from a variety of sources. The conventions (multi-lateral treaties) for each of the T-RFMOs have different articles that dictate which data are collected, and how they are to be shared and analyzed within each T-RFMO. Some of the most prominent differences in the information base are as follows:

> Basic Statistics Data-richness: The level of detail contained in the basic fishery data is important in terms of the degree of complexity that the stock assessment models can track. In general, operational data (e.g., set-by-set catch, fishing effort and size composition) will allow for the use of more complex (and "more realistic") models; highly aggregated data (e.g. quarterly catch and effort totals by large region) will be more limiting in terms of the models that can be used. The IATTC and WCPFC (via the SPC) have access to operational-level data, especially for the industrial purse seine fisheries. In contrast, the IOTC and ICCAT assessments tend to work with aggregated (in time and area) official statistics.
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> Data verification: Much of the data used by the RFMOs are from logbooks that are filled either mandatorily or voluntarily by the skippers. Validation of these data varies greatly for different fisheries. IATTC has run for years a 100%-coverage observer program for large-scale purse seiners. While the program was originally established to quantify dolphin mortality, it has proved to be an invaluable, independent source of detailed information about tuna catch operations. WCPFC is beginning to implement an observer program of 100% coverage for large-scale purse

[1] Dr. Victor Restrepo is Chair of the ISSF Scientific Advisory Committee. Dr. William Fox is Vice President & Managing Director for Fisheries, WWF-U.S. and also serves as Vice Chair of the ISSF Board of Directors.

seiners that operate on the high seas or on several EEZs. In contrast, IOTC and ICCAT do not have similar programs and validation of fishery statistics depends almost entirely on National MCS programs. Observer programs for other fisheries such as longline fisheries are more difficult to implement, especially on smaller vessels that do not have space to accommodate human observers. Sampling coverage and data validation of artisanal fisheries (which can make up for a substantial fraction of the catches, e.g. in the Indian Ocean Tuna Commission (IOTC) area) is quite different from that for large-scale industrial fisheries.

Ancillary data: Stock assessment models can greatly benefit from the incorporation of data other than basic fishery statistics that can help explain the dynamics of the fisheries and of the tuna populations. For example, large-scale tagging programs provide information about growth, spatial structure, movement and mortality. Such large-scale programs are infrequent: The IOTC had a major program that culminated recently and is now resulting in data that will feed into the assessments. The WCPFC is now researching the feasibility of having an ongoing tagging program to feed into future assessments.

Are the assessments adequate?

As mentioned above, collaborative management and collaboration in setting up an adequate information base go hand-in-hand. The "best practice" in providing management advice for highly migratory tuna stocks has to be via collaboration within the relevant RFMO. For this reason, the shortcomings in the T-RFMO information base for fishery management advice have to be identified, and addressed. It is not good enough to say that the information base is inadequate and throw ones' hands up.

On the other hand, the level of detail in a management regime can be served best by an equal level of detail in the information base. For example, spatially structured management measures cannot be designed appropriately with simple production models that only track overall biomass at the stock-wide level. If T-RFMO members want to make decisions that require a rich information base, it is they who need to ensure that sufficient resources are made available in order to ensure that richness. It cannot be the other way around.

How much do we know about the tuna stocks, their ecosystem and fisheries?

Ask scientists involved in the stock assessment process and they will invariably want to know more. Understanding the broader effects of removing vast quantities of an array of tuna species on their ecosystem is particularly intriguing. But that does not mean that we don't know enough in order to manage them. Tuna fishery stock assessments are based on incomplete data and direct and indirect observations of a complex process.

The broader effects relate to (1) the direct effects on the tuna populations themselves, (2) the collateral effects of removing species other than tunas, (3) the collateral environmental effects of man's tuna fishing machines and related activities and, perhaps most interestingly, (4) the effects of reducing the tunas' own effects on their ecosystem. We actually have data on all four classes of effects. Most scientific attention has been focused historically on the first two classes of effects and more recently on the third but the fourth has been largely forgotten except indirectly in the simple feedback mechanisms of our most simple of assessment models.

There is always room for improvement: More research funds, more detailed fishery statistics, more staff, etc. But, the "best practice" for management starts with making use of what is known now, and taking appropriate action as necessary. Delaying action because the T-RFMO information base is short of being perfect is a very bad practice that, unfortunately, sometimes occurs.

Again, the shortcomings in the information base need to be identified and addressed. But in the meantime, management must use the current information base of the T-RFMOs.

Can the Precautionary Approach help?

The Precautionary Approach is partly about this concept of not delaying action until a problem and its perfect solution is proven beyond any doubt. But the Precautionary Approach can also help in establishing a direct link between uncertainty and management in such a way that the benefits of improving the information base can be incentivized and ultimately realized. Consider the case of a simple "control rule[2]" for fishery management in which the management "limits" are set at a distance from management "targets" by an amount that is directly proportional to uncertainty in the stock assessment: More uncertainty = more conservative catches. For example, if the number of fish in the tuna populations were known exactly, and the amount and characteristics of fish caught by the fleets fishing for a given number of days were also known exactly, and the biological characteristics of the population were also known exactly, fishery management decisions could be very safely made by setting the allowable catch to that resulting from fishing at the MSY level (Fmsy). But now, consider that nothing is known exactly, and that scientists can actually measure that lack of precision. Then, to be safe (or cautious or precautionary), the catch should be set at a lower level, or F<Fmsy in proportion to the amount of uncertainty.

In the above example, when the precautionary approach is being used, it follows that any improvements in the information base that reduce uncertainty will allow for higher catches (F can be set closer and closer to Fmsy) without increasing the risk of overfishing. More uncertainty = foregone catches and everybody is unhappy; less uncertainty = higher catches, happy managers, consumers, NGOs, fishers; everybody wins.

The example given is admittedly simplistic. Quantifying uncertainty in itself is a difficult task and scientists in all fields that require modeling are continuously

[2] A Control Rule is a formula for making management decisions based on stock status. For example, set the catch to a given level if the stock size is greater than X, or to a lower level otherwise.

making improvements to the techniques used. But the example serves to make the point that if fishery managers use the information base in a consistent way to make decisions, then they will realize benefits for the fisheries by investing in improving the information base. The Precautionary Approach is not a magic tool. But its elements provide a way of thinking that should help fishery managers avoid unnecessary risks and also understand that there are tangible returns from improved knowledge.

How can we make things better?

The elements necessary to effectively utilize the existing science information are available through each T-RFMO and its members. While the current system does not need to be replaced, it does require improvements in order to function as intended. This growth must be fostered inside the T-RFMO structure but it is also possible for outside groups to take on a supporting role.

The International Seafood Sustainability Foundation (ISSF) – a global partnership among leading marine scientists, tuna processors and WWF – was founded with the mission to support this system of international governance through RFMOs.

Again, the science used to develop conservation and management measures is currently the best available and should be fully utilized. Still, all science can benefit from more robust data sets and continuous efforts should be made to increase access to comprehensive data. As an example of efforts that can be made by groups that fall outside the structure of an RFMO, ISSF participating companies provide detailed data that is in their control directly to RFMO scientific bodies. This information from unloadings and landings at the trip level can be used as a complement to official fishery statistics, which then supports stock assessments.

There is also a need for scientific support to identify best practices and develop new technologies and techniques to mitigate the impact of fishing for tuna on the ecosystem. As a non-governmental organization, ISSF's partnership is in the unique position to coordinate a global research effort and raise the funds necessary to complete such a project. The outcomes of a series of at-sea studies will help RFMOs adopt universal best practices and better understand the impact of bycatch in tuna fisheries.

Assessments made by the scientific body of an RFMO must be supported by the RFMO members. Even the best science will have limited impact if nations lack the political will necessary to follow the scientific directive. Therefore advocacy in support of science-based conservation and management is needed to ensure that one nation's short-term interests do not trump sound, scientific reasoning.

These examples of direct action, applied science and advocacy are being applied by ISSF to additional strategic areas of focus - managing fishing capacity, eradicating illegal, unreported and unregulated (IUU) fishing, advancing industry performance through monitoring, control and surveillance (MCS) and improving overall tuna stock health – with the intention of improving the ability of RFMOs to manage and conserve tuna fisheries through more responsible, sustainable, science-based best practices.