INTER-AMERICAN TROPICAL TUNA COMMISSION

SCIENTIFIC ADVISORY COMMITTEE

1ST MEETING

La Jolla, California (USA)
31 August -3 September 2010

DOCUMENT SAC-01-11

THE IATTC PROGRAM FOR IN-PORT SAMPLING OF TUNA CATCHES

1. Introduction ... 1
2. Details of the sampling program ... 1
3. Sampling statistics for 2009 ... 3
References ... 3

1. INTRODUCTION

This document provides a description of the Inter-American Tropical Tuna Commission's (IATTC) port-sampling procedures that have been in use since 2000 to sample the catches of surface fisheries operating in the eastern Pacific Ocean (EPO). Length-frequency and species composition samples obtained from this sampling program are used to estimate the size and species composition of the landings, which is one of the main inputs to stock assessment models. Material presented in this document has been summarized from several sources (Anonymous 2002; Tomlinson 2004, and references therein; Suter 2008, and references therein; Maunder *et al*. 2010). Descriptions of sampling protocols in use prior to 2000 can be found in Anonymous (2002), Tomlinson *et al*. (1992), Tomlinson (2004), and Suter (2008). Reviews of several aspects of the current and previous port-sampling programs also are available (*e.g*., Tomlinson *et al*., 1992, and references therein; Wild, 1994; Tomlinson, 2002; Suter, 2008; Lennert-Cody and Tomlinson, 2010).

2. DETAILS OF THE SAMPLING PROGRAM

2.1. Stratification of the surface fishery

The objective of the IATTC port-sampling program is to sample the catches of the surface fishery for tunas in the EPO, which includes purse-seine and pole-and-line vessels. Samples are collected during the unloading of vessels at ports in Ecuador (Manta and Las Playas), Mexico (Mazatlan and Manzanillo), Panama, and Venezuela (Cumana), where the IATTC has field offices. IATTC staff also sample the catches of recreational vessels in San Diego, USA, to obtain length-frequency data for bluefin tuna. The sampling protocol for recreational vessels is not described in this document.

To insure that samples collected in any given year are representative of the entire fishery, the fishery is divided into categories, or 'strata'. These strata have been defined so that the characteristics of the catches within each stratum will be relatively similar, as compared to characteristics of catches among strata. The strata are defined by area (13 areas, Figure 1), month, and mode of fishing (7 modes), for a total of 1,092 possible strata. Not all strata have fishing activity in any given year.

The fishing modes reflect the type of vessel and the type of set in which the fish were caught, and are defined as follows:

	Type of vessel	Type of set
1.	pole-and-line	n/a

2.	small[1] purse seiner	floating object
3.	"	unassociated
4.	"	dolphin
5.	large[2] purse seiner	floating object
6.	"	unassociated
7.	"	dolphin

The same protocol is used for collecting samples from each stratum. The sampling protocol uses a two-stage approach, where the wells of a vessel are the first stage, and the fish within a well are the second stage.

2.2. Sampling vessel wells

Each vessel has several compartments, called wells, in which the catch is stored while the vessel is at sea. A well is sampled only if all the catch it contains is from the same stratum (*i.e.*, from the same area, month and fishing mode). Because the number of wells in a stratum is not known in advance, and because vessels may unload in ports where logistics make sampling prohibitively difficult, the wells to be sampled are selected opportunistically as time and availability permit. Over the course of a year, unequal numbers of wells will be sampled per stratum. Although logistics dictate that wells be sampled opportunistically, for the purposes of analysis of the data, it is assumed that the sampled wells within each stratum are a random sample of all wells in the stratum. This assumption implies that wells filled with catches from a single stratum are considered representative of all catches within that stratum, regardless of where those catches were stored aboard the vessel.

2.3. Sampling fish within a well

Once a well of a vessel has been selected to be sampled, individual fish are sampled from that well as the catch is unloaded. A number of fish of each species (typically 50) are measured for length (from the tip of the snout to the fork of the tail) to the nearest millimeter. From the same well, and independently of the measured fish, several hundred fish are counted for species composition. The number of fish counted depends on the number of species believed to be in the well, which is determined in advance from observer data or the vessel's logbook. In addition to yellowfin, bigeye and skipjack tuna, field office staff also routinely sample other tuna species such as Pacific bluefin and black skipjack. Samplers are instructed not to measure or count fish from the top 10% or bottom 10% of the well. Ideally, the sampler would select fish at random from the remaining 80% of the well, beginning at a random point in the unloading. However, not only is the number of fish in the well not known, but obtaining a truly random sample of fish is not logistically feasible (the unloading process can be lengthy, and may begin at or extend into nighttime). Therefore, the fish sampled from the well are selected one at a time, from an opportunistically established starting point, as circumstances permit.

Specific instructions for the order of sampling events (counting, measuring) depend on the stratum characteristics of the well and can be found in the Appendix of Suter (2008). Generally, the order of events can be summarized as follows. The sampler starts by measuring 25 fish. The sampler then counts and identifies to species anywhere from 50 to 200 fish, depending on the assumed species composition of the catch in the well and the fishing mode associated with the catch in the well. The sampler then continues to alternate between measuring groups of fish and counting fish until at least 50 fish have been measured of each species thought to be in the well and at least 100 fish have been counted and identified to species. This alternating process of measuring and counting extends the sampling of fish over more of the unloading, which has been shown to lead to a more representative sample (Wild 1994). If the species composition appears to change at the time the sample is being collected (*i.e.*, a species not known to be in the well appears in the sample), the sampling (measurements and counts) may be extended. If a species is

[1] <364 t fish-carrying capacity
[2] ≥ 364 t fish-carrying capacity

present in the well, but only in very low numbers, it may not be possible to obtained measurements for 50 fish of the species because the well sampling is not exhaustive. For the purpose of analysis of the data, since it is not possible to guarantee a random selection of fish, it is assumed that the unloading of fish from the well is at random.

Depending on the port of unloading, special circumstances may dictate a slightly different sampling protocol. In some ports, fish may be sorted by weight category and species as they are unloaded before they can be sampled. In this case, the catch in the well is sampled for length but not for species composition. The sampler is instructed to measure 25 fish of each species in every weight category. If the unloading is sorted only by species, the sampler is instructed to measure 50 fish of each species.

3. SAMPLING STATISTICS FOR 2009

The quarterly sampling statistics for 2009 are shown in Table 1. The total of 854 vessel wells sampled in 2009 is generally similar to the level of sampling in previous years; the annual average since 2000 is 893. Sampling statistics by quarter for previous years can be found in the Quarterly Reports of the IATTC (http://www.iattc.org/QuarterlyReportsENG.htm).

2009	Number of wells sampled	Number of fish measured		
		Yellowfin	Bigeye	Skipjack
Quarter 1	290	5,902	1,386	10,333
Quarter 2	243	6,999	3,307	6,537
Quarter 3	170	5,370	2,695	4,617
Quarter 4	151	5,348	2,294	5,322
TOTALS	**854**	**23,619**	**9,682**	**26,809**

TABLE 1. Sample size (number of wells sampled, number of fish measured by species) by quarter, 2009.

REFERENCES

Anonymous, 2002. Annual Report of the Inter-American Tropical Tuna Commission, 2000.

Lennert-Cody, C.E. and Tomlinson, P.K. 2010. Evaluation of aspects of the current IATTC port-sampling design and estimation procedures for catches of tunas by purse-seine and pole-and-line vessels. In: Inter-American Tropical Tuna Commission, Stock Assessment Report 10, pp. 279-299.

Maunder, M.N., Lennert-Cody, C.E., Aires-da-Silva, A., Bayliff, W.H., Tomlinson, P.K. and Schaefer, K.M. 2010. Summary of data available for bigeye tuna in the eastern Pacific Ocean and its use in stock assessment. Inter-American Tropical Tuna Commission, External Review of IATTC Bigeye Tuna Assessment, Document BET-01-07, 3-7 May, 2010, La Jolla, California, USA.

Suter, J.M. 2008. An evaluation of the area stratification used for sampling tunas in the eastern Pacific Ocean and implications for estimating total annual catches. Masters thesis, San Diego State University, San Diego, California, USA.

Tomlinson, P.K., Tsuji, S., and Calkins, T.P. 1992. Length-frequency estimation for yellowfin tuna (*Thunnus albacares*) caught by commercial fishing gear in the eastern Pacific Ocean. Inter-American Tropical Tuna Commission, Bulletin 20 (6): 357-398.

Tomlinson, P.K. 2004. Sampling the tuna catch of the eastern Pacific Ocean for species composition and length-frequency distributions. Inter-American Tropical Tuna Commission, Stock Assessment Report 4.

Wild, A. 1994. An evaluation of length-frequency sampling procedures and subsequent data analysis for purse-seine caught yellowfin tuna in the eastern Pacific Ocean. Inter-American Tropical Tuna Commission, Bulletin 21:1-70.

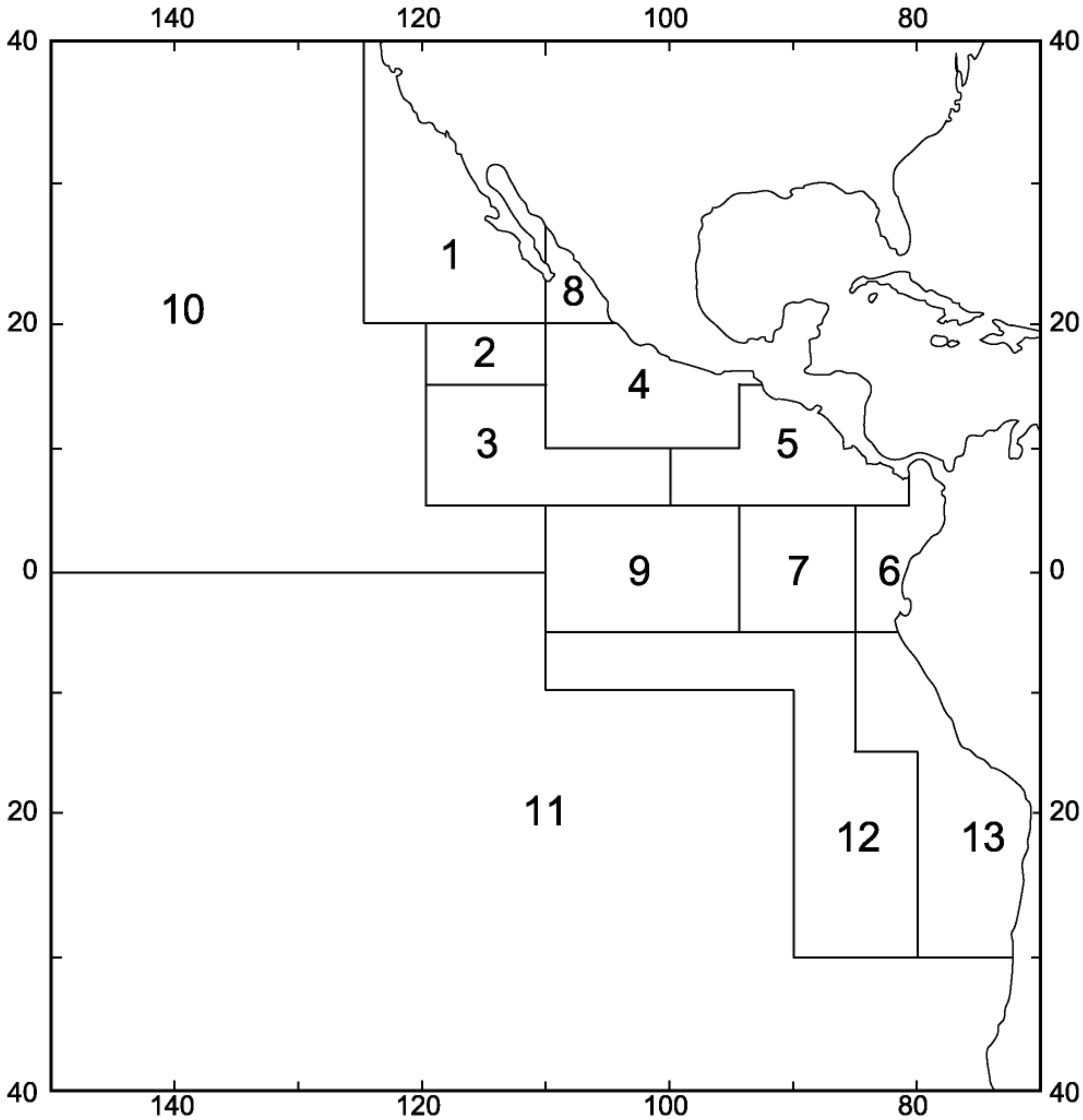

FIGURE 1. The 13 port-sampling areas defined for the EPO.