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Distribution of longline catches for southwest Pacific striped marlin

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Abstract

This purpose of this paper is to address the request from SC8 for an analysis of areas of concentration of catches of striped marlin in the southwest Pacific Ocean:

> *34. SC8 recognizes that striped marlin is often caught as a non-target species. SC8 therefore recommends data analysis be conducted to identify areas of high catch concentration that could be subject to targeted management.* [emphasis added]

This paper presents the distribution of longline effort and striped marlin catches from raised aggregate data and available operational catch and effort data. Note that the aggregate data represent the authoritative data set to address this question due to the gaps in the coverage of operational data.

Overall the waters of Australia and the adjacent high seas represent a consistent hotpot for catches across the data sets and time windows, with the waters of New Caledonia, Vanuatu, New Zealand, French Polynesia, and their adjacent high seas also important in some instances.

1. Introduction and data sources

SC8 requested an analysis of areas of concentration of catches of striped marlin in the southwest Pacific Ocean (paragraph 34 of the meeting report). This report only considers longline catches which were the dominant source of fishing mortality in the 2012 stock assessment. Non-commercial catches where included in the assessment, but are not available in a spatial form for inclusion here.

We consider two sources of longline data, raised aggregate data available at 5x5 degree spatial resolution and available operational catch and effort data aggregated to 1x1 degree resolution. The data sets span the periods 1952-2012 and 1960-2012 for the aggregate and operational data respectively. Data were extracted from the relevant databases on 28 May 2013.

The raised 5x5 degree aggregate data includes estimates of both retained and discarded striped marlin and provided the most complete and authoritative data set to address the identification of areas of high catch concentration. The operational data, while limited in many respects, does provide useful finer-scale information of potential hotspots but are not raised and not complete – especially with respect to fishing operations on the high seas.

2. Approach to identify areas of high catch concentration

For each data set maps were made covering the entire time period (1952-2012 and 1960-2012 for the aggregate and operational data respectively) and the most recent five years (2008-2012). The maps provide information on the spatial distribution of effort, catch, and indirectly catch per unit effort (CPUE), on a single panel. Effort is plotted a circle and catch is plotted as a +, the area of the circle is proportional to the effort and the circle that could be constructed around the + is proportional to the catch.

The relative size of the circles and the + provide a measure of the relative CPUE, for example when the + is well within the bounds of the circle then the CPUE is well below average while instances where the + extends outside the circle it is a hotspot for CPUE.

To further assist in the identification of catch hotspots, those spatial cells which are in the top 15% of all cells in terms of catch not only have a larger + (i.e. proportional to catch), but the + is also darker and thicker.

3. Results

Using the aggregate 5x5 degree data, the areas of highest concentration of catch differ somewhat between the longer term and more recent data (Figure 1). In both instances the Australian EEZ and adjacent high seas represent areas which have consistently produced high catches and furthermore the CPUE in this region is amongst the highest in the region (i.e., the + are often larger than the circles). In the long-term data set high catches were also found in New Caledonia (with reasonable catch rates), Vanuatu (with lower catch rates), the northern part of the New Zealand EEZ, the adjacent high seas and Norfolk zone, and the high seas to the northeast of French Polynesia. In the last five years, in addition to the Australian EEZ, catches have been high in Vanuatu and the south part of the Solomon Islands (primarily driven by the effort levels there than CPUE), around Papeete and the waters to the north. The high-seas to the northeast of French Polynesia have also remained important.

The patterns with operational data are broadly similar to those shown in the raised aggregate data, but help confirm that the area in the Coral Sea (both the Australian and New Caledonian sides) is a broad hotspot area in addition to the remainder of the Australian coast. Catches in the New Zealand EEZ are still high even though the retention of striped marlin in the commercial fishery is prohibited (all fish are released). The hotspot to the northeast of French Polynesia is not evident in the operational data suggesting that operational data are not available for the fleets fishing in that area.

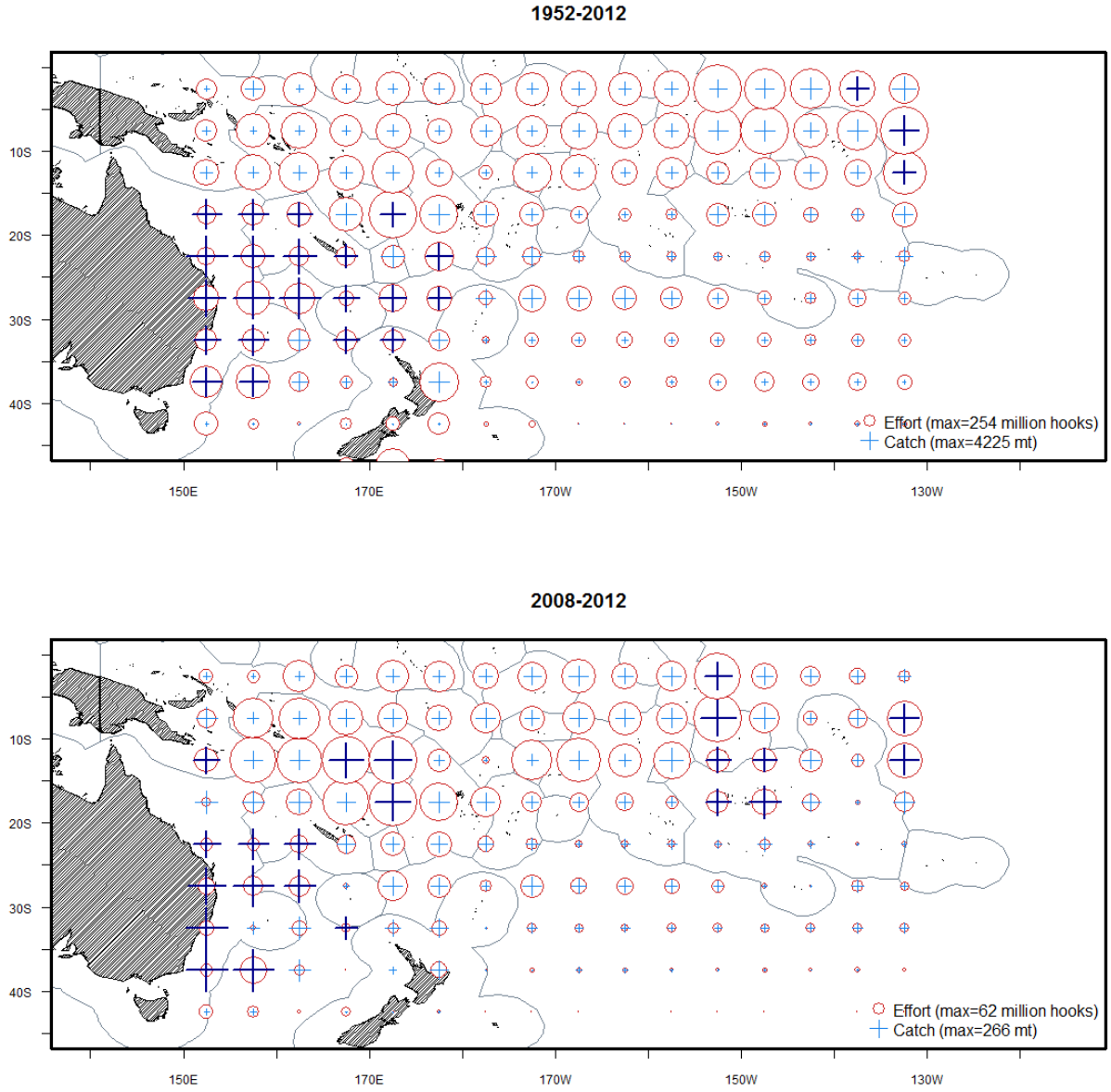

Figure 1 Spatial distribution of raised aggregate 5x5 degree longline effort (red circles) and striped marlin catch (blue +) for all years (top panel) and the last five years (bottom panel). The 5x5 degree squares which are in the top 15% in terms of catch are highlighted with the darker and heavier +. Note that the catch estimates include discards where these are reported.

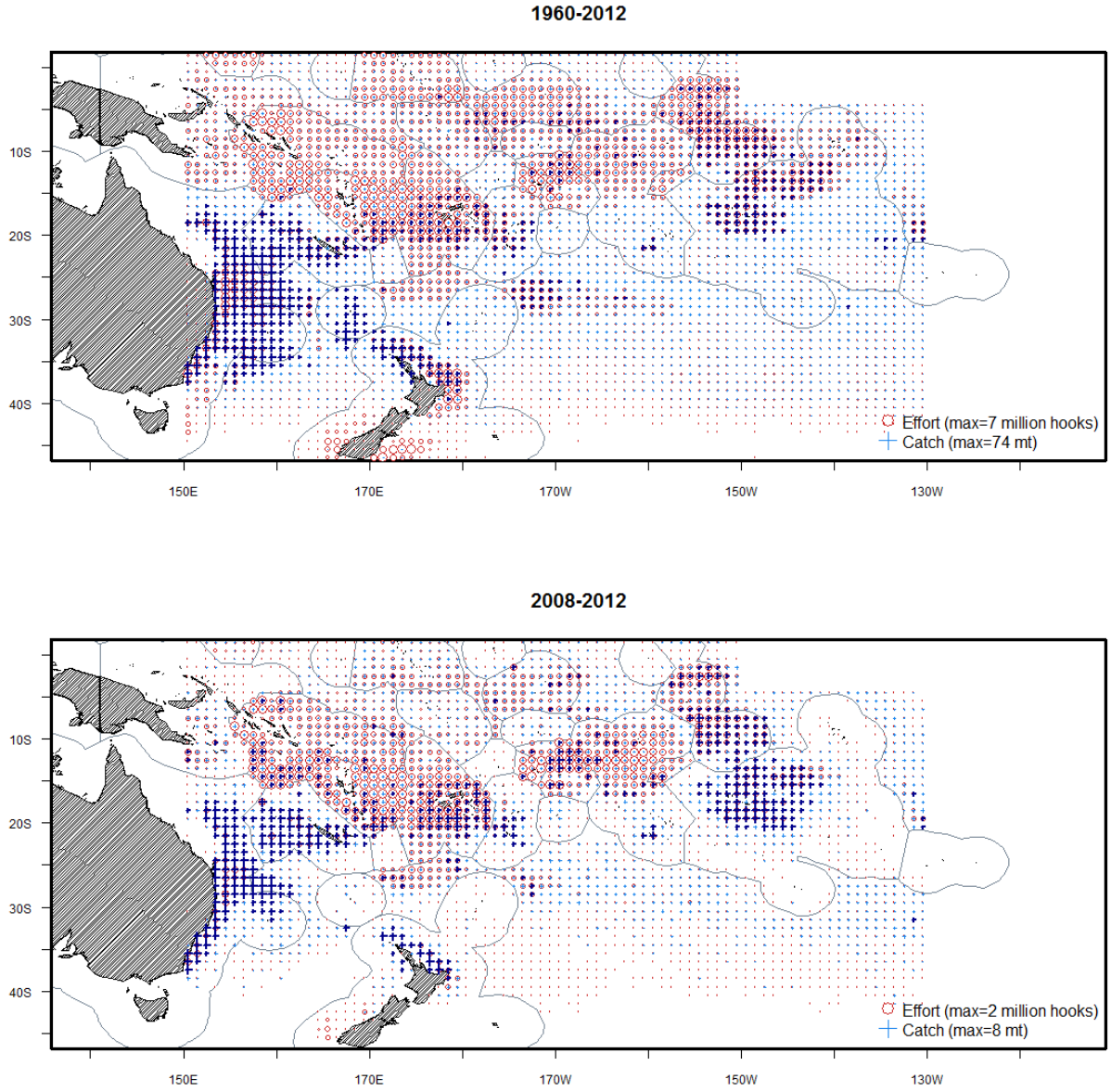

Figure 2 Spatial distribution of unraised operational (aggregated to 1x1 degree) longline effort (red circles) and striped marlin catch (blue +) for all years (top panel) and the last five years (bottom panel). The 1x1 degree squares which are in the top 15% in terms of catch are highlighted with the darker and heavier +. Note that the catch estimates include discards where these are reported and that logsheet coverage is biased towards fishing within EEZs.