An observation on CPUE for U.S. and Japanese purse seiners fishing in the central-western Pacific

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INTRODUCTION

The U.S. tuna purse seine fleet has been fishing in the central-western Pacific since the mid 1970s. The fleet started operating under a South Pacific Regional Tuna Treaty in June 1988, and as a requirement of the Treaty, logbooks detailing daily fishing activity have been collected. Data from these logbooks have been used in various analyses to Astandardize@ yellowfin tuna catch-per-unit effort (CPUE) from the fishery (Kleiber 1993, Bartoo and Coan 1998). These analyses concluded that standardized CPUE exhibits no significant trend over time.

This study takes a more simplistic approach to show that there may be a trend in combined tropical tuna (yellowfin, skipjack and bigeye tunas) CPUE that is obscured by recent changes in operations of the U.S. fleet.

DATA AND METHODS

Days fished and catches are obtained from logbooks records. Total days fished is summarized as described in Bartoo and Coan (1998) (Table 1). Total catches of yellowfin, skipjack and bigeye tunas are summarized from cannery landings and adjusted for landings that overlap the beginning or end of the year, discards at sea and cannery rejects. Nominal annual CPUE is the total catch divided by the number of days fished. Nominal CPUE is adjusted by multiplying by the proportion of free-swimming schools sets in each year. This proportion is calculated from the number of free-swimming school and drifting object sets as recorded in vessel logbooks.

School size estimates are the total catch divided by the number of successful sets, or sets with 0.1 t or more of tuna catch.

Data for the Japanese purse seine fleet were from N. Miyabe and H. Okamoto (pers. comm.) and

H. Okamoto et al. 1998. They are used for comparison of nominal and adjusted CPUE.

RESULTS

The trend in school size for free-swimming and drifting object sets has been fairly flat until 1995 (Figure 1) and averaged 44 t for free-swimming school sets and 40 t for drifting object sets. In 1996, school size for both free-swimming and drifting object sets declined to 35 t. In 1997, school size for drifting object sets decreased even further to 32 t while free-swimming school sets increased to 51 t.

The trend in proportion of free-swimming school sets has been fairly flat at approximately 0.8 until 1995, since then it has decreased, reaching a low of 0.45 in 1997 (Figure 2). In comparison, the proportions for the Japanese fleet have remained fairly stable at approximately 0.45 during the entire period, 1989-1997 (Figure 2).

For the U.S. fleet, the nominal CPUE (t/day fished) showed a slight decreasing trend during the period 1992-1997, and fluctuates between 21 t per day fished and 30 t per day fished (Figure 3). Adjusting the nominal CPUE by the proportion of free-swimming schools in each year, preserves the trend until 1996 and 1997. In these years, the adjusted CPUE declines from 12 t per day fished to 10 t per day fished whereas the nominal CPUE increases, from 21 t per day fished to 24 t per day fished.

In comparison, the nominal CPUE for the Japanese fleets fluctuated between 19 t per day fished and 30 t per day fished during 1989-1997 (Figure 4). The overall trend, however, is fairly flat at approximately 25 t per day fished. Adjusting total CPUE for the proportion of free-swimming schools in each year, results in no change in the trend but reduces the level by about half, to an average of 12 t per day fished.

DISCUSSION AND CONCLUSIONS

There has been a marked change in the fishing operations, particularly the type of set, of the U.S. tuna purse seine fleet in the central-western Pacific since about 1995; however, this change is not evident in nominal CPUE. When nominal CPUE is adjusted for type of set, the CPUE shows a pronounced declining trend since 1994. In comparison, when Japanese purse seine fleet CPUE is adjusted, no difference is found in CPUE trends. This difference between fleets is due to the consistency in the fishing operations of the Japanese fleet for this period of comparison.

If the U.S. or the Japanese adjusted CPUE is indicative of the trend in stock abundance, then skipjack tuna is the stock most affected because it makes up more than 70% of the catch. Other factors in the data could affect the CPUE trends that have little to no relation to stock abundance. For example, ENSO events may be causing changes in fishing patterns. This topic will require further exploration.

ACKNOWLEDGMENT

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LITERATURE CITED

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Table 1. Total catches of yellowfin, skipjack and bigeye tunas and days fished for U.S. purse seiners fishing in the central-western Pacific.

YEAR	DAYS FISHED	YELLOWFIN	SKIPJACK	BIGEYE	TOTAL
1989	6,488	42,886	95,027	2,421	140,334
1990	6,511	52,089	110,044	1,762	163,895
1991	7,184	37,330	177,389	1,550	216,269
1992	7,473	43,693	155,898	3,480	203,071
1993	8,183	46,011	148,419	3,731	198,161
1994	8,139	56,426	151,486	1,711	209,623
1995	7,809	31,845	132,518	3,190	167,553
1996	7,038	18,632	120,146	10,645	149,423
1997	6,217	49,963	84,962	9,499	144,424