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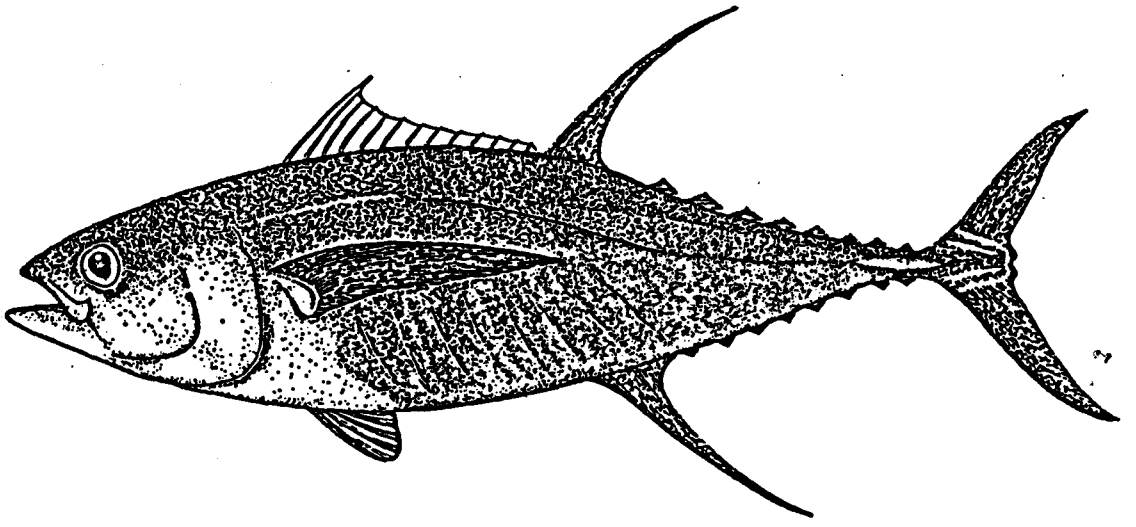
PRODUCT FLOWS OF TUNA IN THE WESTERN PACIFIC



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1. INTRODUCTION

A companion paper (WP.3) has provided historical estimates of annual production by fishery, species, vessel flag, and briefly considered geographical distribution of catch and effort in the western tropical Pacific (WTP) tuna fishery. Of further interest is the disposition of catch after capture. Whilst the economics of production, marketing, supply and demand are beyond the TBAP mandate, an understanding of post-harvest product flows can assist greatly in verification of declared catches particularly where data coverage of some fleets is incomplete. A knowledge of product flows is also a prerequisite for the design of efficient port sampling programmes. In the case of the RTTP, there is additionally the need to identify expected sources of tag returns. Particularly in large purse seine catches, tagged fish may not be detected onboard, but later recovered at transhipment points and in canneries. Awareness of the relative importance of these sources allows publicity and retrieval efforts to be appropriately targetted.

This brief analysis thus attempts to trace the complex post-harvest flow of tuna product captured within the western tropical Pacific (the SPC statistical area, plus eastern Indonesia and the Philippines - Figure 1). In some cases, product flow in adjacent areas of the western Pacific*, notably Japan, is considered. Catches of secondary market species of tunas and tuna-like species (*Auxis, Euthynnus, Thunnus tonggol* etc), billfish and by-catch species are not considered.

Information on product flow, for reasons of commercial confidence, is typically difficult to obtain. For this report, much has been obtained by word of mouth and only in relatively few cases, from published sources. In this initial document, sources are thus not generally identified. The summary presented should be regarded as an initial attempt to generate discussion, focusing initially on production for the year 1989 (for which information is more complete) then briefly considering 1990 production and likely future trends.

Product flow is considered by fishery (gear) type, vessel flag, and species, for the western tropical Pacific and where applicable, the western Pacific. It is instructive initially however to briefly consider utilization of the tuna harvest before examining product flow to these points.

2. PRODUCT UTILIZATION

2.1 Canning

Production of tuna in the western tropical Pacific (WTP) is increasingly dominated by **purse seine** catches, which comprised over 50% of the estimated 1989 catch of one million tonnes in the western tropical Pacific plus the Philippines and eastern Indonesia (Tuna Programme, 1990). With the exception of a small amount of domestic consumption as fresh fish in the Philippines (and possibly Indonesia), virtually all of the purse seine catch (total 528,000 t.) is destined for canning in the western Pacific, and represents the major source of cannery raw material (approx. 80% skipjack, 10% yellowfin, by weight). The balance (10%) is made up of albacore and other tunas, notably longtail tuna, from various sources.

With the rapid growth of canning capacity first during the late 1970s in Philippines then during the 1980s in Thailand and American Samoa, western Pacific canneries are now believed to supply well over half the world's canned tuna production. Approximate total raw material inputs (tuna) for western Pacific canning locations and likely trends in production are shown below for each location (Table 1), with an estimate of the proportion sourced from the western Pacific, and likely production trends.

*Tuna catches in Vietnam, PRC, Malaysia, Australia and New Zealand are generally not included, although these countries, plus Thailand, ROC and ROK would be regarded as part of the broader western Pacific.

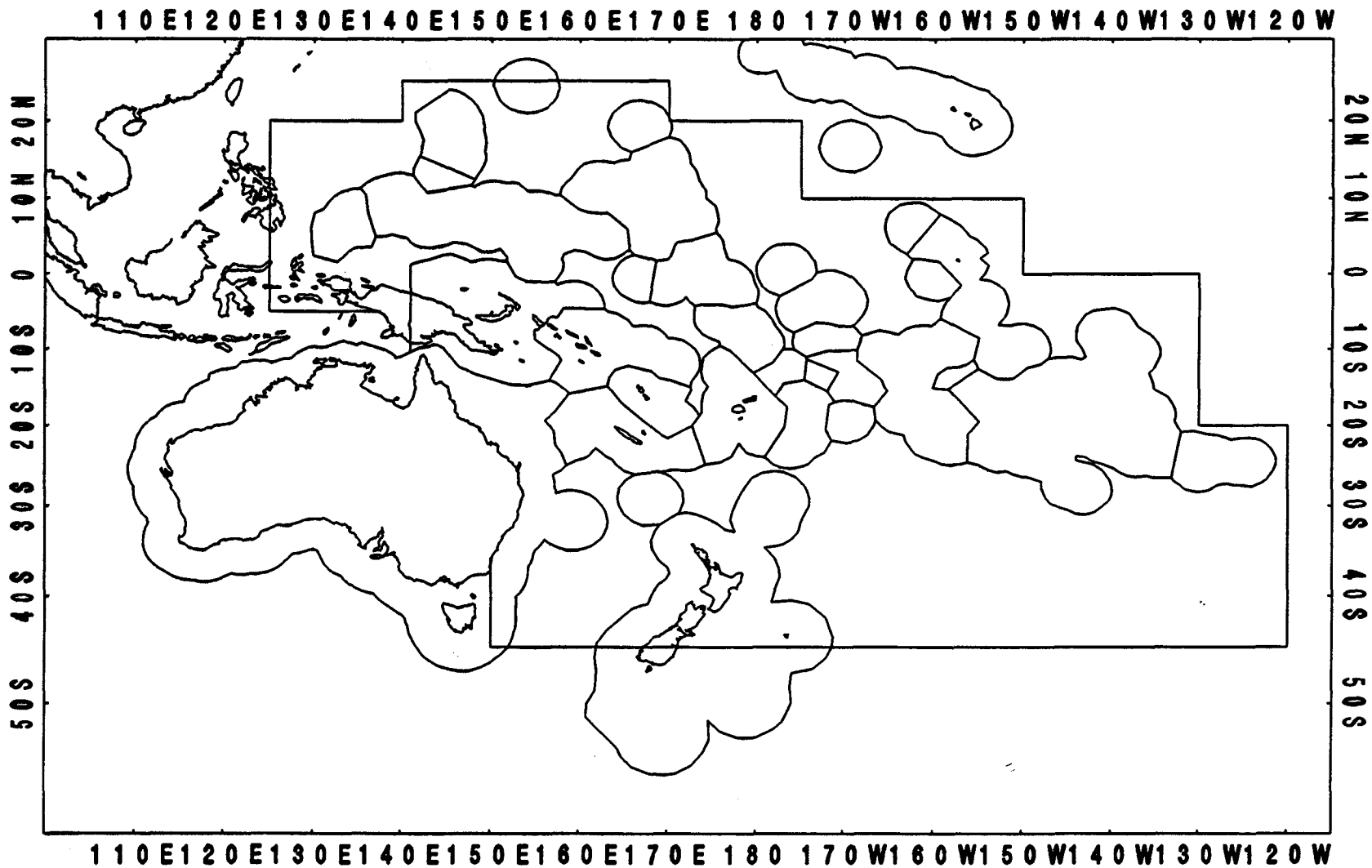

Figure 1. The SPC statistical area

Table 1. Estimated 1989 cannery throughput, western Pacific, and likely trends.

AREA	No. of major canneries/canning companies †	Est. 1989 throughput ('000 t)	Source of raw material (% W.P.)	Projected production trend
THAILAND	3 (22)	400-450	55-60* %	+
A. SAMOA	2 (2)	220	70	stable
INDONESIA	5	40 ?	75-80	+++
PHILIPPINES	8	110	100	+
JAPAN	2 (35)	100	100	-
FIJI	1 (1)	15	100	stable
SOLOMON IS.	1 (1)	4	100	+
REP. OF CHINA	?	20 ?	100 ?	?
REP. OF KOREA	12	75	100 ?	+
TOTAL	34 ? (79)	980-1030	65-70 %	+

* 65-70% of imports, which totalled 325,000 t in 1989; domestic catches contributed a further 90,000t, primarily *Thunnus tonggol.*

† total number of tuna canneries, including minor ones, given in brackets, where known.

Pole and line caught fish (90% skipjack) are also canned, and because of quality considerations, attract premium prices. Production from this source, with the exception of eastern Indonesia, has nevertheless been declining, due to economic factors.

Lesser quantities of albacore tuna (approx. 50,000 t. from the western Pacific, including tropical and sub-tropical areas, plus Indian Ocean sources) are canned as higher priced white meat tuna. The primary source of albacore is longline caught adult fish, with lesser quantities of troll caught or driftnet caught sub-adults. In 1989 however, longline and troll/driftnet production were approximately equal.

A small quantity of tuna caught by purse seiners in the region is canned beyond the region eg. Puerto Rico (whole fish, decreasing), USA west coast (loins, increasing). The export of loins from developing countries with lower labour costs to consuming countries for final packing is increasing rapidly. Indian Ocean product, purse seine (Seychelles) and pole and line caught (Maldives), is also imported for canning in western Pacific locations (Thailand, Indonesia). There is also domestic canning of juvenile tuna (<1 kg - skipjack, yellowfin, *Auxis*) in some countries, notably in the Philippines, as "mackerel". Such production (est. 50,000 t.) is considered only briefly here.

Cannery production, dominated by light meat product (skipjack, yellowfin) and supplying markets in Europe and USA continues to increase steadily, with significant further production increases expected in Indonesia (1991 raw material inputs may approach 140,000 t.) and possibly Korea (for an increasing domestic market), with steady increases in Thailand and Philippines. This is despite temporary setbacks during 1990 in some countries (eg. Thailand) due to dolphin-associated problems.

Inputs of western Pacific caught tuna to western Pacific canneries in 1989 probably exceeded 700,000 t. In other words, 65-70 percent of the total western tropical Pacific harvest of primary market species was utilised for canning purposes.

2.2 Non-cannery tuna consumption

Western Pacific tuna is also consumed as fresh or frozen unprocessed product, either as high quality high value sashimi (sliced raw fish) or for a variety of domestic preparations.

Sashimi

Japan remains the major world market for the high quality fresh or blast frozen tuna (typically adult fish caught by longliners) utilized as sashimi. Landings in Japanese ports in 1989 of fresh and frozen bigeye, yellowfin and bluefin totalled 82,000 t., 40,000 t., and 13,500 t. respectively (Globefish 90).

In addition, approximately 120,000 t. of fresh and frozen tunas and billfish (90% tunas) were imported during 1989, mainly from Korea, Taiwan, Philippines and Indonesia. Of this amount, approximately 30,000 t. was fresh tuna (chilled and airfreighted) with Taiwan (15,600 t.), Indonesia (8,500 t.) and Philippines (3,600 t.?) the main suppliers. Transhipment through Guam and Palau emerged as increasingly important avenues of supply during 1990.

Over 250,000 t. of large tunas (bigeye, yellowfin), mostly from the total western Pacific, is therefore probably utilized in Japan as sashimi or related high quality fresh product. An equal or greater quantity of skipjack, from pole-and-line vessels operating in home and offshore waters (cf. distant waters) is probably also consumed, and appears to be increasing in popularity.

Other fresh/frozen consumption

A significant proportion of the tuna catch (excluding *Auxis, Euthynnus*) in Philippines and Indonesia, particularly that made by artisanal and municipal vessels, is marketed through a variety of outlets for domestic consumption (est. 40,000 t. and 70,000 t. respectively). Product may be sold in fresh form then dried, salted, boiled etc. High domestic consumption is also true of most artisanal catch in Pacific Island countries, as well as significant proportions of the Japan, Korea and Taiwan landings.

Other processed tuna

Tuna is consumed in a variety of other ways following commercial post-harvest processing, particularly in Southeast Asia. This may include pickling, processing into fish paste, and smoke drying (katsuobushi, arabushi). The latter product, supplying specialist Japanese markets, is primarily processed in Japan, but there is limited production elsewhere (eg. Solomon Islands 2,000 t. p.a., Philippines) for export to Japan.

3.1 PRODUCT MOVEMENT

3.1 Purse seine catches

Disposal of purse seine catches, intended primarily for western Pacific canneries as noted, occurs typically by transfer on the high seas to reefer vessels, but also by direct unloading from vessels to canneries (Pago Pago, Solomon Islands), or in transhipment ports (Tinian). Table 2 below summarizes probable volumes of movement of purse seine-caught fish to various western Pacific cannery locations, for the various fleets, and Figure 2 presents this in graphical form. Figure 3, conversely, summarizes product supply, by vessel flag to the main western Pacific canning countries. As noted, 65-70 percent of this fish is of western Pacific origin, and 90 percent overall is purse seine caught.

Table 2. Movements of western Pacific purse-seine caught tuna

FLAG	1989 catch (est. '000 mt)	Destination by volume (est.)		Route	1990 catch (prelim. est.)
U.S.A.	140	Pago Pago	110	Direct, reefer, Tinian	160
		Thailand	15‡	Reefer, Tinian	
		Puerto Rico	15	Reefer	
		Indonesia	?		
JAPAN	150	Japan	90	Reefer	190
		Thailand	60	Reefer	
ROK	120	Thailand	50	Reefer	(150)
		Pago Pago	10	"	
		Puerto Rico	20	"	
		Korea	35	" , direct	
ROC	100	Thailand	70	Reefer, Tinian	(120)
		Pago Pago	5	Reefer	
		Puerto Rico	10	"	
		R O C	(10)	Reefer, direct?	
		Philippines	?	"	
PHILIPPINES	100*	Philippines	100	Reefer	(100)
INDONESIA	12†	Indonesia	12	Direct	(15)
SOLOMON IS.	11	Australia	1	Reefer	(9)
		Pago Pago	4	"	
		Thailand	6		
		Fiji	(1)		
NEW ZEALAND	7	New Zealand	?		?
		Thailand	?		
TOTAL	~650		635-650		~750

‡ possible underestimate for 1989.
* includes catches in Indonesia and Papua New Guinea, and some ringnet catches of small tuna.
† excludes catches by foreign flag vessels.

3.2 Pole and line catches

Pole and line catches are made by small to medium size vessels, which irrespective of their operational range, make regular port calls for bait replenishment and supplies. Trip lengths vary from several days (domestic ice boats) to 30 days or more (long range pole-and-line vessels based in Japanese ports). Catches are therefore unloaded directly to canneries or to transhipment points.

Table 3 below summarizes the presumed flow of western Pacific pole-and-line catches.

Figure 2. **Destination of western Pacific purse seine catch by the various fleets in 1989 (Catches are estimates in '000 mt).**

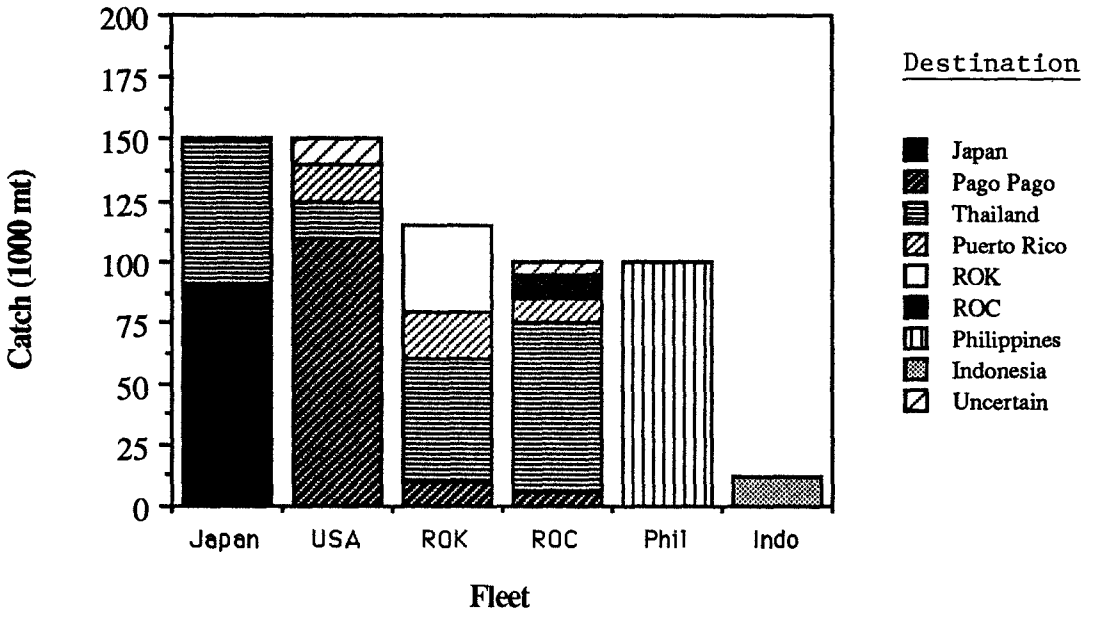

Figure 3. **Origin of tuna raw product utilized by western Pacific canneries in 1989 by vessel flag (Catches are estimates in '000 mt).**

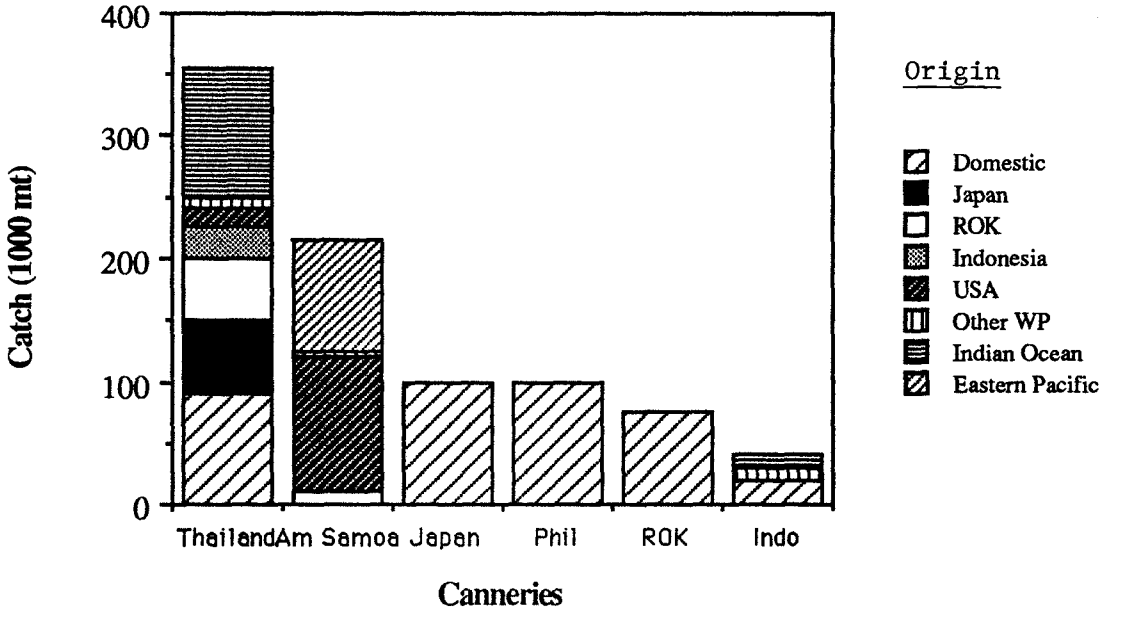

Table 3. Movements of western Pacific pole-and-line caught tuna. (More than 95% skipjack.)

FLAG	1989 catch (est. '000 mt)		Destination by volume (est.'000 mt)		1990 catch (prelim. est.)
JAPAN	Long range	140*	Japan	140	100
	Coastal offshore }	115	Japan	115	NA
SOLOMON ISLANDS		26	Solomon Is.	6	22
			Fiji	3	
			Thailand	7	
			Pago Pago	2	
			Japan	7	
			Indonesia	1	
FIJI		6	Fiji	6	4
KIRIBATI		1.2	Fiji	1.2	0.5
INDONESIA		69	Thailand	25	
			Indonesia	44	
TOTAL		357		357	126.5

* includes some catch (20,000 t.?) outside the SPC area. NA - not yet available.

3.3 Longline catches

Longline catches of two types are distinguished

(i) frozen tuna unloaded from conventional blast-freezer equipped longliners of large size (typically 200 GRT plus), which undertake trips of long duration (2-3 months). They operate out of offshore bases, some of which are in the region, (eg. Pago Pago, Levuka) or from domestic ports (eg. Yaizu, Kaohsiung, Pusan); both cannery and sashimi (often second grade) material are produced;

(ii) fresh tuna unloaded from small coastal longliners (less than 100 GRT, and typically less than 20 GRT) which make short trips (< 10 days) and unload at transhipment points; both sashimi and material for lower grade fresh consumption are produced, the former typically being airfreighted to the primary market, Japan.

Statistics are difficult to obtain, particularly for the latter type of operation, but Table 4 below lists production volumes and destinations.

Table 4. **Movements of western Pacific longline-caught tuna, according to vessel type, or capture zone.** (Conventional and sashimi vessels are distinguished, and in the case of Japan, catches in two zones recognized.)

FLAG	1989 Catch (est. '000 mt)		Destination by volume (est. '000 mt)		Use
JAPAN	Coastal and offshore zones	65	Japan	65	Sashimi
	Distant-water zones (WP)	40	Japan	40	Sashimi, canning*
R O K	Conventional	31.5	A. Samoa	8	Canning (albacore)
			Japan	23.5	Sashimi
ROC	Conventional	20-30	A. Samoa	12	Canning (albacore)
			Fiji	2.8	Canning (albacore)
			Thailand	(5?)	Canning
			Japan	5-10	Sashimi, canning
	Sashimi†	15-20	Japan	15	Sashimi
INDONESIA, PHILIPPINES	Sashimi‡	10-15	Japan	10	Sashimi
FIJI	Sashimi	0.5	Japan, USA	0.5	Sashimi
		180-190		180-190	

* includes 7,000 t albacore, and increasing amounts of yellowfin, for canning.
† catches landed in Palau, FSM, Guam and Taiwan for transhipment.
‡ includes a large proportion of handline caught tuna, excludes Indian Ocean catches by joint venture vessels in Jakarta, Denpasar.

4. 1990 PRODUCTION AND FUTURE TRENDS

4.1 Fishery production

Although final estimates are not yet available, tuna fishery production in the western tropical Pacific continued to increase in 1990, particularly in the purse seine fishery. U.S. vessels increased in number to nearly 50, with catches increasing to an estimated 160,000 t. Fleet increases were also recorded for ROK (28 to 32 plus), ROC (23 to over 30) and Philippines. Total purse seine landings probably exceeded 700,000 t. in the western tropical Pacific during 1990 and potentially could increase further, with continuing additions to existing DWFN fleets and possible new arrivals from other areas (ETP, Indian Ocean). The only current restriction on further expansion is recent effort limitation imposed by FFA member states, and the associated difficulties experienced by DWFNs (excluding the USA) in accepting a new series of Minimum Terms and Conditions pertaining to access agreements. To date, this has been unsuccesful in restricting fleet size.

Conventional longline landings and distant-water pole-and-line catches continued their downward trend, whereas fresh-chilled sashimi longline landings and some domestic pole-and-line catches (E. Indonesia) continue to increase.

4.2 Cannery production

Major increases in capacity and throughput were achieved in Indonesia during 1990 (40,000 t. est. 1989 to over 100,000 t.), with continuing increases likely in both the number of canneries and capacity of existing plants. Current total capacity in 1991 may be approximately 150,000 t. p.a. Both domestic sources, and, increasingly, western Pacific purse seine fish (ROC, ROK, USA), are fuelling this expansion.

Thailand domestic cannery production may have actually decreased during 1990, due to a combination of the dolphin-safe issue and increased export of loins for final packing in the U.S. Several major Thai canners have embarked on expansion plans, and given adequate fish supply, production seems likely to increase at a steady rather than rapid rate, in combination with increased involvement in other areas (Europe, Africa). Movement of production capability to southern Thailand, closer to product source and aided by Government investment incentives, is occurring. Increasing competition from Indonesia is likely to be experienced; in response to this, plans for joint-venture involvement in Indonesian-based processing operations have also been announced.

Philippines cannery production increases are also projected, subject to adequate product supply. This is likely to be associated with further fishery expansion of distant-water purse seine fishing in the western tropical Pacific.

Production in American Samoa and Japan seems unlikely to increase markedly. A long term downward trend will probably continue in the latter case with exports now virtually non-existent, but domestic consumption remains buoyant. Some increase in production may occur in the smaller Pacific Island canneries in Fiji and Solomon Islands.

Considerable continuing cannery expansion is expected in Korea, to meet increasing domestic demand. Current consumption is believed to be over 60,000 mt. and increasing. The Taiwan tuna canning sector remains a largely unknown quantity, but exports are generally believed to show a downward trend.

4.3 Loin production

The recent increase in loin production in the western Pacific and export for final canning elsewhere has been noted earlier.

4.4 Fresh tuna consumption

Further increases in sashimi consumption in Japan are presumably tied to some extent to the health of the Japanese economy, but perhaps increasingly to trilateral supply agreements amongst Japan, ROC and ROK. Low to medium grade sashimi is in oversupply, with large inventories. Continuing increases in consumption at 1980's rates appear unlikely.

CONCLUSION

Both fishery and cannery production of tuna from the western tropical Pacific continued to increase during 1989/90, with product flows becoming increasingly complex. There would clearly be considerable value in improving the monitoring of this situation, in terms of verifying total catch estimates and understanding the dynamics of the fishery, which is now the largest tuna fishery in the world.