23 Skipjack Tuna Fisheries

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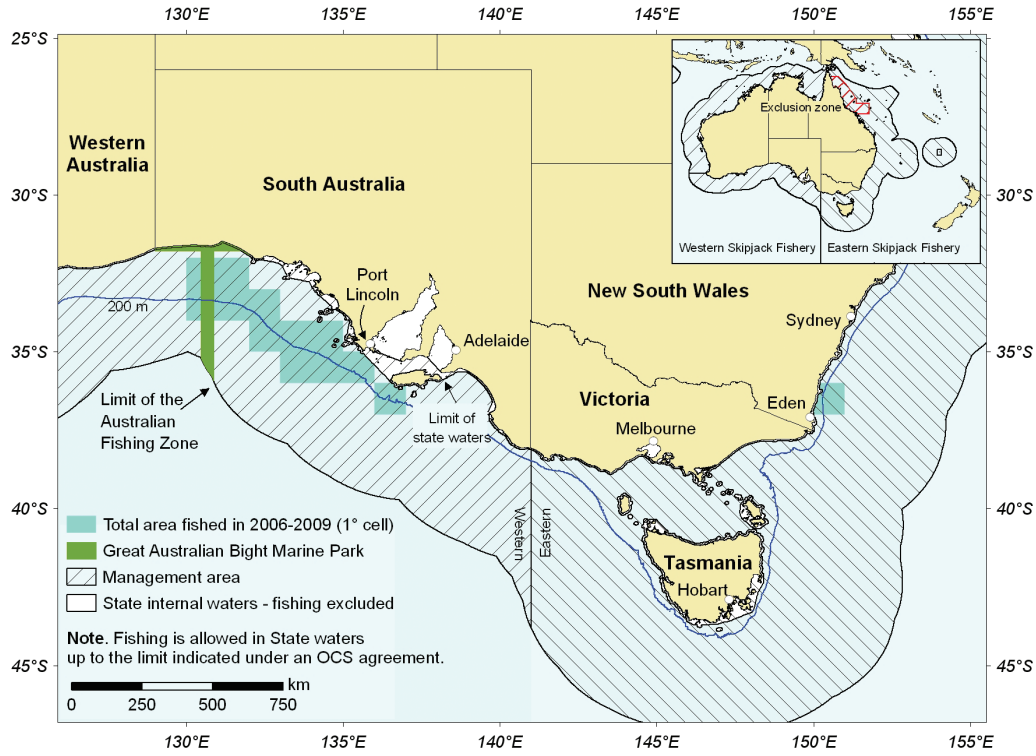


FIGURE 23.1 Area fished in the Skipjack Tuna Fisheries, 2006–2009

TABLE 23.1 Status of the Skipjack Tuna Fisheries

Fishery status	2008		2009		Comments
Biological status	Overfishing	Overfished	Overfishing	Overfished	
Indian Ocean skipjack tuna[a] (*Katsuwonus pelamis*)					Indicators do not give cause for concern, except for the exploitation rate by foreign fleets which increased substantially until 2006.
Western and central Pacific Ocean skipjack tuna[a] (*Katsuwonus pelamis*)					Stock assessment does not give cause for concern, except for the constantly increasing exploitation rate by foreign fleets.
Economic status Fishery level	Estimates of net economic returns not available				Economic status uncertain. Total net economic returns likely to be low with few domestic vessels fishing in either area in recent years.

NOT OVERFISHED / NOT SUBJECT TO OVERFISHING OVERFISHED / OVERFISHING UNCERTAIN NOT ASSESSED

a Domestic assessments are unreliable because interactions with broader regional stocks are uncertain. Ocean-wide assessments of species through the Western and Central Pacific Fisheries Commission and the Indian Ocean Tuna Commission were used as the basis for stock status determination.

TABLE 23.2 Main features and statistics of the Skipjack Tuna Fisheries

Feature	Description
Key target and byproduct species	Skipjack tuna (*Katsuwonus pelamis*)
Other byproduct species	Bigeye tuna (*Thunnus obesus*) Yellowfin tuna (*Thunnus albacares*) Mahi mahi (*Coryphaena hippurus*)
Fishing methods	Purse seine (approximately 98% of catch), pole-and-line methods (managed as a minor-line component of the ETBF—Chapter 22 and WTBF—Chapter 25 when poling is used on its own)
Primary landing ports	Port Lincoln
Management methods	Input controls: limited entry, gear (net size), area controls Output controls: bycatch limits
Management plan	Skipjack Tuna Fishery management arrangements 2009 (AFMA 2009)
Harvest strategy	*Skipjack Tuna Harvest Strategy* (AFMA 2008a)
Consultative forums	Tropical Tuna Management Advisory Committee (domestic) ESF: Western and Central Pacific Fisheries Commission (international) WSF: Indian Ocean Tuna Commission (international)
Main markets	Domestic: cannery product Foreign fleets: Thailand and American Samoa (canneries)
EPBC Act assessments: —listed species (Part 13) —international movement of wildlife specimens (Part 13A)	 Current accreditation dated 30 November 2005 Current accreditation (Wildlife Trade Operation) expires 30 November 2011

Table 23.3 continues over the page

TABLE 23.2 Main features and statistics of the Skipjack Tuna Fisheries CONTINUED

Feature	Description	
Ecological risk assessment	Level 1: Scale Intensity Consequence Analysis (SICA) completed on 328 species (Daley et al. 2007) Level 2: Productivity Susceptibility Analysis (PSA) completed on 320 species (Daley et al. 2007) Level 3: Sustainability Assessment for Fishing Effects (SAFE) completed on 144 species (Zhou et al. 2009)	
Bycatch workplans	*Australia's Tuna Purse Seine Fisheries Bycatch Action Plan* (AFMA 2005)	
Fishery statistics[a]	**2007–2008 fishing season**	**2008–2009 fishing season**
Fishing season	1 July 2007 – 30 June 2008	1 July 2008 – 30 June 2009
TAC or TAE	None	None
Catch	847 t	885 t
Effort	670 search hours	406 search hours
Fishing permits	ESF: 19 WSF: 13	ESF: 19 WSF: 13
Active vessels	ESF: 1 WSF: 2	ESF: 0 WSF: 2
Observer coverage	ESF purse seine: 100% WSF purse seine: zero	ESF purse seine: zero WSF purse seine: zero
Real gross value of production (2008–09 dollars)	Confidential (<5 vessels)	Confidential (<5 vessels)
Allocated management costs	$0.09 million	$0.1 million

EPBC Act = *Environment Protection and Biodiversity Conservation Act 1999*; ESF = Eastern Skipjack Fishery; ETBF = Eastern Tuna and Billfish Fishery; TAC = total allowable catch; TAE = total allowable effort; WSF = Western Skipjack Fishery; WTBF = Western Tuna and Billfish Fishery

a Fishery statistics provided by fishing season unless otherwise indicated.

23.1 BACKGROUND

The Eastern Skipjack Fishery (ESF) and Western Skipjack Fishery (WSF) extend throughout the same areas as the Western Tuna and Billfish Fishery (see Chapter 25) and the Eastern Tuna and Billfish Fishery (see Chapter 22) (Fig. 23.1), with the exception of an area off north Queensland (Coral Sea Zone, Cairns–Townsville Restricted Area). Together, the ESF and WSF comprise the Skipjack Tuna Fisheries (STF). Under Offshore Constitutional Settlement (OCS) arrangements, the Commonwealth manages skipjack tuna (as well as other tuna and tuna-like species) between the shoreline and three nautical miles (with the exception of New South Wales) (Table 23.3). Although skipjack tuna are widely distributed throughout the Australian Fishing Zone (AFZ), the main Australian fishing grounds have been historically located off south-eastern Australia and in the Great Australian Bight. In the ESF, skipjack are fished from southern New South Wales to north-eastern Tasmania. During the year, some of the southern bluefin tuna (*Thunnus maccoyii*) purse-seine fleet occasionally fishes for skipjack in the Great Australian Bight.

Although the fisheries extend into the high-seas areas of the Indian and Pacific Oceans, the Australian fisheries are considered to have little impact on Pacific and Indian Ocean stocks because they are located at the edge of the species' range. Catches in the south-eastern AFZ are highly variable and depend on recruitment from lower latitudes. Catches

in the south-western AFZ are opportunistic and highly variable, with several years of zero or near-zero catches over the past five years. Skipjack are not always present in the AFZ as they are believed to be heavily influenced by interannual variability in environmental conditions. The variability in the availability of skipjack in the AFZ, variable participation levels and low profit margins will influence the sustainable management of the resource. All operators are required to keep logbooks, and only authorised vessels are permitted to tranship at sea (Table 23.2).

Skipjack tuna PHOTO: KEVIN MCLOUGHLIN, ABARE–BRS

TABLE 23.3 History of the Skipjack Tuna Fisheries

Year	Description
1950s	Fishing began—offshoot from the Southern Bluefin Tuna Fishery off southern New South Wales.
1970s	Introduction of skipjack purse-seining in the ETBF.
1980s	Skipjack replaced southern bluefin tuna as main species for canning after collapse of Southern Bluefin Tuna Fishery and redirection of most South Australian southern bluefin tuna to the Japanese sashimi market. Skipjack catches in the western and central Pacific Ocean nearly doubled.
1988 to 1990	Australian catches increased from 61 t to 1617 t.
1990	AFMA introduced limited entry to the fishery, placed a moratorium on purse-seine net size and limited the take of yellowfin and bigeye tuna as byproduct to 50% per set and 2% of each vessel's total catch per season.
1991–92	Australian skipjack catches peaked at 7000 t.
1996	New logbook and transhipment forms introduced. The Agreement for the Establishment of the Indian Ocean Tuna Commission entered into force on 27 March 1996. Australia became a member of the Commission on 13 November 1996.
1997	Program to collect length-frequency data introduced.
1999	Heinz–Greenseas cannery at Eden closed.
2002	AFMA established the Skipjack Consultative Committee to advise the AFMA Board on skipjack tuna management.
2003	Purse-seine fishery entitlements for skipjack separated from the ETBF and WTBF, resulting in creation of the ESF and WSF.
2004	The Convention for the Western and Central Pacific Fisheries Commission entered into force on 19 June 2004. Australia became a member of the Commission in November 2004.
2006	Skipjack Consultative Committee disbanded. AFMA started dealing directly with permit holders.
2007	WCPFC recognised Australia's skipjack development plan.
2008	Skipjack harvest strategy adopted by AFMA; yet to be triggered due to low levels of fishing. WCPFC agreed to limits on purse-seine effort and to progress work on developing reference points.
2009	Formal management arrangements for the STF developed. The Tropical Tuna Management Advisory Committee (Tropical Tuna MAC) commenced in July and became the advisory body for the ETBF, WTBF and STF.

AFMA = Australian Fisheries Management Authority; ESF = Eastern Skipjack Fishery; ETBF = Eastern Tuna and Billfish Fishery; STF = Skipjack Tuna Fisheries; WCPFC = Western and Central Pacific Fisheries Commission; WSF = Western Skipjack Fishery; WTBF = Western Tuna and Billfish Fishery

23.2 HARVEST STRATEGY

The harvest strategy (HS) consists of a series of catch level triggers that invoke decision rules. The control rules initiate closer monitoring of the fisheries, semi-quantitative assessments and revision of trigger levels. Separate sets of triggers apply for the eastern and western fisheries, based on historical catch levels of skipjack in the domestic fisheries and regional assessments of stock status. Management action is initiated only when there is clear evidence of significant expansion in catches. The HS accommodates the developing nature of the fisheries, in which there is considerable variation in skipjack availability, uncertainty about future catch levels and no current concern regarding stock status. Target and limit reference points are not currently defined.

23.3 THE 2009 FISHERY (2008–09 FISHING SEASON)

Key target and byproduct species

In the 2008–09 fishing season, there were no active vessels in the ESF and two active vessels in the WSF. Value data for the STF have been confidential since 2005–06 due to the small number of active vessels in the fishery, and the real gross value of production has been highly variable in recent years because of fluctuating catch levels. Both of these factors are believed to be a result of high variability of skipjack tuna in the south-eastern AFZ (which is dependent on recruitment from lower latitudes), rather than declining stock levels.

Minor byproduct species

Southern bluefin tuna can only be retained by operators who hold quota for that species. Regulations limit the yellowfin and bigeye tuna take to less than 50% of the total catch in any trip and less than 2% of each vessel's annual catch. In addition, any blue or black marlin caught must be returned to the sea. Catches of other byproduct species, such as mahi mahi (*Coryphaena hippurus*) and frigate mackerel (*Auxis thazard*), are allowed under OCS agreements with Queensland, Western Australia and the Northern Territory.

There is a trip limit of 20 sharks, excluding school shark, gummy shark, saw shark and elephant fish of the families Callorhinchidae, Chimaeridae and Rhinochimaeridae (which must be retained with fins intact). Catches of byproduct species cannot be reported for confidentiality reasons.

Skipjack is also caught as byproduct in other tuna fisheries (see Chapter 22—Eastern Tuna and Billfish Fishery, and Chapter 25—Western Tuna and Billfish Fishery).

Indian Ocean

Skipjack has become the most important tuna species in the Indian Ocean, in terms of catch. The development of fishing methods using fish-aggregating devices (FADs) has increased skipjack catches by purse seiners in recent years—89% of current (2008) purse-seine skipjack catch is taken under natural FADs (log schools). The proportion of catch taken by industrial purse seiners (~34%) has decreased since 2006 (~42%), while the proportion of catch taken by gillnets in the artisanal fisheries has increased (~30% to ~34%).

Preliminary data for the Indian Ocean suggest that the 2008 catch of skipjack (405 198 t) may be the lowest reported since 1998 (Fig. 23.2). In contrast, the 2006 catch (605 980 t) was the highest on record. Catch rates in 2008 continued to decline from 2006 in both the industrial purse-seine fishery and the Maldives artisanal fishery. Vessels have been avoiding traditional skipjack fishing grounds known for high catch rates because of piracy off the coast of Somalia (IOTC 2010). The decline in catch rates in the Maldives fishery may be due to higher than average sea-surface temperatures and the marked increase in fuel prices (IOTC 2010).

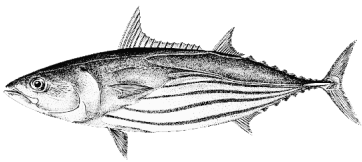
Western and central Pacific Ocean

Global catches of skipjack tuna have been increasing steadily since 1950 (Fig. 23.3). In the past decade, skipjack has been the most commonly caught species in the western and central Pacific Ocean (WCPO). Catches of skipjack in the WCPO were an estimated 1.63 million t in 2008 (the second highest on record and 67% of the total tuna catch) and 1.71 million t in 2007 (the highest on record). Purse seine is the most common fishing method used, but a substantial percentage of skipjack is also caught using pole-and-line and other methods.

23.4 BIOLOGICAL STATUS

SKIPJACK TUNA

(*Katsuwonus pelamis*)



LINE DRAWING: FAO

Skipjack tuna at Vietnamese food market
PHOTO: ANNETTE SANDS, ABARE–BRS

TABLE 23.4 Biology of skipjack tuna

Parameter	Description
General	Highly fecund. Pacific Ocean and Indian Ocean stocks of skipjack are assumed to be discrete.
Range	**Species:** Highly migratory. Found in nearly all tropical and subtropical waters except the eastern Mediterranean and the Black Sea; typically inhabits waters with temperatures of 15–30 °C. **Stock (WCPFC):** The boundaries for stock assessment purposes include the area of the western and central Pacific Ocean from 45°N to 20°S and from oceanic waters adjacent to the east Asian coast to 150°W. **Stock (IOTC):** The boundaries for the assessment are the IOTC Convention Area (see Chapter 21).
Depth	0–260 m
Longevity	<12 years
Maturity (50%)	**Age:** 1–2 years **Size:** 41–43 cm FL
Spawning season	Spawns opportunistically throughout the year when conditions are favourable
Size	**Maximum:** ~110 cm FL; 35 kg whole weight **Recruitment into the fishery:** 40–65 cm FL

IOTC = Indian Ocean Tuna Commission; WCPFC = Western And Central Pacific Fisheries Commission

SOURCES: Collette & Nauen (1983); Shomura et al. (1994); Langley et al. (2008); Pepperell (2009); IOTC (2010).

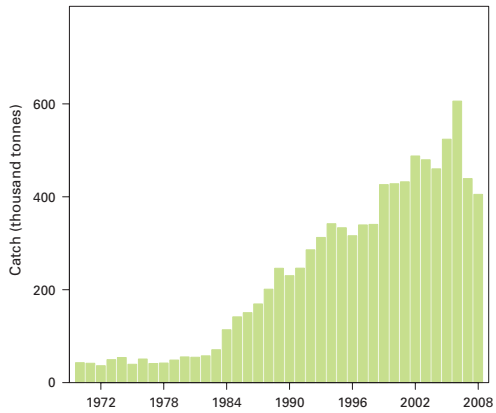


FIGURE 23.2 Skipjack tuna catch history in the IOTC Statistical Area, 1970 to 2008

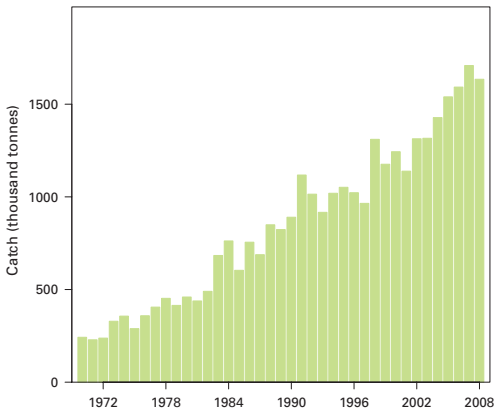


FIGURE 23.3 Skipjack tuna catch history in the WCPFC Statistical Area, 1970 to 2008

Indian Ocean skipjack tuna

Stock status determination

No quantitative stock assessment for skipjack tuna in the Indian Ocean is currently available, and the maximum sustainable yield (MSY) has not been estimated.

Fishery indicators (trends in catches and catch per unit effort—CPUE, average fish weights, spatial extension of the fishery) and exploitation rates from analyses of tagging data were updated and assessed in 2009. There was a large and continuous increase in skipjack catches from the mid-1980s until 2006 (Fig. 23.2), which has been credited to the expansion of the FAD-associated fishery in the western Indian Ocean (IOTC 2010). The standardised (by search time) CPUE series, although preliminary, fluctuated without trend (IOTC 2010). However, when the standardisation included fishing efficiency, an overall decline in CPUE from 1984 to 2008 was observed. The average weights of skipjack tuna taken by the various gears have remained relatively stable since 1991 (IOTC 2010). The estimated numbers of skipjack recruits in the western Indian Ocean are larger than the numbers for both bigeye and yellowfin tuna (IOTC 2010). This confirmed that substantially larger numbers of skipjack tuna are present in the Indian Ocean than either yellowfin or bigeye tuna. Exploitation rates of skipjack are estimated to be relatively low, not exceeding even 20% for the most selected age range of the stock (IOTC 2010).

In 2009 the Indian Ocean Tuna Commission (IOTC) Scientific Committee (SC) noted that the life-history characteristics and high productivity of skipjack tuna (Table 23.4) suggest that this stock is resilient and not prone to overfishing (IOTC 2010). Furthermore, the stock status indicators suggest that there is no immediate concern about the status of skipjack in the Indian Ocean. However, the SC also noted that catches cannot be increased at the current rate indefinitely and that the potential interaction between fisheries could be a source of concern. As a result, it recommended that the skipjack tuna catch needs to be monitored regularly. The IOTC has scheduled a quantitative stock assessment in 2010. The skipjack tuna stock in the Indian Ocean is assessed as **not overfished** and **not subject to overfishing** (Table 23.1).

Reliability of the assessment/s

Standardised CPUE analyses are still provisional and would be improved by including detailed information reflecting changes in the fishing power and efficiency of purse seiners over time.

Previous assessment/s

In 2007 the IOTC Working Party on Tropical Tunas (WPTT) analysed a range of stock status indicators, including trends in catches, nominal CPUE, average weight of the catch and number of one-degree squares visited or fished to gain a general understanding of the state of the stock. The results indicated that, although catches should not be increased at the current rate indefinitely, there is no need for immediate concern about the status of skipjack tuna in the Indian Ocean.

Future assessment needs

Catches of skipjack tuna have continued to increase as fishing effort has increased. However, catches declined in 2007 and 2008, and this trend has appeared to continue in 2009 (based on preliminary 2009 purse-seine data). The causes of this decline

need to be examined, given the decline in the CPUE trend standardised for fishing efficiency. The IOTC SC identified the stock assessment for skipjack as a priority for the 2010 WPTT meeting (IOTC 2010).

Western and central Pacific Ocean skipjack tuna

Stock status determination

The previous quantitative stock assessment for skipjack tuna was carried out in 2008 (Langley & Hampton 2008), using updated catch, size and tagging data. Results indicated that there had been little change in stock status since the previous assessment in 2005 (WCPFC 2010). The stock assessment model was conducted at two spatial scales: the entire WCPO stratified into six regions, and a model restricted to the two regions encompassing the equatorial region (the vast majority of catch from the WCPO skipjack fishery occurs in the equatorial region). As the equatorial model is a more robust assessment and not sensitive to the assumptions applied to the northern regions of the model, the key conclusions from the stock assessment are limited to the equatorial model. The model estimated the fishery's reference points as $B_{2008}/B_{MSY} = 2.99$ and $F_{2008}/F_{MSY} = 0.26$, indicating that skipjack tuna is neither overfished nor subject to overfishing.

Current high catches are believed to be sustainable, provided that recruitment does not continuously fall below the long-term average. No new information on the stock status of this species was presented to the Western and Central Pacific Fisheries Commission (WCPFC) in 2009, other than total catches (1.63 million t in 2008; Fig. 23.3), which have been well below the estimates of MSY (base case) (2 264 000 t) (Langley & Hampton 2008). The stock status assessment of **not overfished** and **not subject to overfishing** therefore remains valid (Table 23.1).

Reliability of the assessment/s

There are concerns about potential contractions in stock distribution and biomass, which may be first indicated by changes in the presence or abundance of fish at the edges of the distribution. These effects may not have been fully accounted for in the stock assessment for WCPO skipjack, which focused on the centre of the stock's distribution in tropical waters (WCPFC 2010). Specifically, the broader WCPO assessment model only applies to waters north of 20°S, as there are relatively minor catches (in terms of the whole fishery) south of this point. Care must be taken when interpreting the results for skipjack in Australian waters. Since Australian waters are at the edge of the skipjack distribution, there is the potential for localised depletion. However, this is not considered a matter of immediate concern. The distribution of recruitment among model regions is a critical assumption in the broader WCPO assessment. The data are insufficient to estimate this reliably within the broader assessment model, and many of the key model outputs are strongly influenced by the values assumed.

Previous assessment/s

There is no specific stock assessment for skipjack in the ESF. However, stock assessments of the WCPO skipjack tuna stock have been undertaken by the Secretariat of the Pacific Community using MULTIFAN-CL since 2000. Data used in the 2005 assessment included catch, effort and length-frequency data for the fisheries defined in the analysis, and tag–recapture data. Recruitment variability, influenced by environmental variability, was identified as the primary influence on stock size and fishery performance. The base-case model predicted that $B_{current}/B_{MSY} = 3.59$; as this value is above 1.0, it suggests that the current biomass is well above the size needed to achieve MSY. The model predicted a fishing mortality rate of $F_{current}/F_{MSY} = 0.12$, which is well below the level that produces MSY. Based on these results, the recommendation in 2005 was that skipjack tuna is exploited at a moderate level relative to its biological potential, and it was classified as not overfished and not subject to overfishing in the WCPO.

Future assessment needs

The current assessment results may not be sensitive to early events, which typically occur at the edges of stock distribution. Temperate waters such, as those off Japan and at the southern edge of the distribution in south Pacific waters, represent the edges of the WCPO skipjack tuna stock. Careful and continuous monitoring of these indicators, and comparisons with indicators for the central distribution of the stock in tropical waters will be important for future research. Continued monitoring and improvement in fisheries statistics, and incorporation of tag–release and recovery data into the stock assessment will also be important.

23.5 ECONOMIC STATUS

Economic performance

Given the low level of activity in the domestic fishery, no economic surveys have been conducted in the STF. Latent effort provides an indication of economic performance. Currently, 19 permits are issued in the ESF and 13 in the WSF. These are held by 18 operators, seven of whom hold permits for both fisheries. Only two vessels were active in the fishery in the 2008–09 fishing season (Table 23.5).

TABLE 23.5 Number of active purse-seine vessels in the STF

	Eastern Skipjack Fishery	Western Skipjack Fishery
Number of permits 2008–09	19	13
Year	**Active vessels**	
2003–04	3	1
2004–05	0	0
2005–06	2	3
2006–07	0	0
2007–08	1	2
2008–09	0	2

Overall economic status

Few vessels have fished in either fishery in recent years, indicating the low profitability of the fishery in Australian waters. Neither the Indian Ocean nor the WCPO skipjack tuna stocks are considered overfished; however, stock availability varies from year to year. Operators capitalise on this, fishing opportunistically in years of relatively abundant stocks and not using their permits in years of relatively scarce stocks. As a result, effort in the fishery is more dependent on availability than on prices, although lower prices in recent years have also contributed to lower effort levels.

Future consideration

The low value of production in this fishery does not justify additional economic surveys. Given current information and the size and value of the fishery, there is no pressing need for additional economic information.

23.6 ENVIRONMENTAL STATUS

In 2005 the Australian Fisheries Management Authority released the first bycatch action plan for tuna purse-seine fisheries, covering both the skipjack and southern bluefin tuna fisheries (AFMA 2005). The aim of the plan is to gain an understanding of the range of significant bycatch issues and, if required, develop and implement mitigation measures. Independent data collection by observers will assist in achieving the aims of the plan. There has been very little observer coverage aboard domestic vessels targeting skipjack because of the low level of effort in recent years.

Ecological risk assessment

AFMA, in conjunction with the Commonwealth Scientific and Industrial Research Organisation (CSIRO), have undertaken three levels of ecological risk assessment (ERA) for the STF (Table 23.2). A

total of 328 species were initially assessed in the ERA process (Daley et al. 2007). Of these, 124 species were considered to be at high risk to the effects of fishing in the STF, including: 5 chondrichthyans, 9 reptiles, 85 seabirds and 25 marine mammals. A total of 25 species, mostly threatened, endangered and protected species, remained high risk after applying the residual risk guidelines (AFMA 2010).

Threatened, endangered and protected species

Sharks, marine turtles and seabirds

Fishers report few interactions with non-target species, such as sharks, marine mammals, turtles and seabirds, but there is an absence of verified data on bycatch in Australia's skipjack fisheries. To date, no interactions of skipjack purse-seine nets with marine mammals, turtles or sharks have been recorded. Although seabirds are commonly present during tuna purse-seine operations, there have been few recorded interactions (AFMA 2008b).

Pelagic habitats

During purse-seining, no contact is made between the net and the substrate; therefore, minimal habitat impacts occur. Habitats were eliminated at the end of the Level 1 ecological risk assessment for this reason (Daley et al. 2007).

23.7 HARVEST STRATEGY PERFORMANCE

The decision rules have yet to be implemented in either skipjack tuna fishery, as catches have not exceeded trigger levels. There is no direct obligation to develop a HS for the STF under the *Commonwealth Fisheries Harvest Strategy Policy* (HSP), as skipjack tuna is managed under the WCPFC and IOTC. The decision rules for the domestic fisheries were developed taking into account the highly variable and international nature of the fisheries, their low value, the current

Unloading skipjack tuna PHOTO: KEVIN MCLOUGHLIN, ABARE–BRS

low levels of catch in the AFZ and the potential for development of the fisheries.

In keeping with the intent of the HSP, the decision rules are sufficient to detect expansion in the fisheries. However, they are not adequate to restrict effort because the decision rules simply call for monitoring and revision of trigger levels. The suggested analyses, especially in the international context, would add a substantial time lag to the process.

23.8 LITERATURE CITED

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