Chapter 22
Eastern Tuna and Billfish Fishery

J Larcombe and A Bath

FIGURE 22.1 Relative fishing intensity in the Eastern Tuna and Billfish Fishery, 2014
## TABLE 22.1 Status of the Eastern Tuna and Billfish Fishery

<table>
<thead>
<tr>
<th>Status</th>
<th>2013</th>
<th>2014</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Biological status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Striped marlin</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Tetrapturus audax),</td>
<td></td>
<td></td>
<td>Most recent estimate of spawning biomass is above the default limit</td>
</tr>
<tr>
<td>south-west Pacific</td>
<td></td>
<td></td>
<td>reference point but below B_{MSY}. Current fishing mortality rate is</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>below that required to achieve MSY.</td>
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<tr>
<td>Swordfish</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Xiphias gladius),</td>
<td></td>
<td></td>
<td>Most recent estimates of biomass are above the default limit reference</td>
</tr>
<tr>
<td>south-west Pacific</td>
<td></td>
<td></td>
<td>point. Fishing mortality estimates vary depending on uncertain growth</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>schedule.</td>
</tr>
<tr>
<td>Albacore</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Thunnus alalunga),</td>
<td></td>
<td></td>
<td>Most recent estimate of spawning biomass is above the default limit</td>
</tr>
<tr>
<td>south Pacific</td>
<td></td>
<td></td>
<td>reference point. Recent ocean-wide catches and fishing mortality are</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>within MSY levels.</td>
</tr>
<tr>
<td>Bigeye tuna</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Thunnus obesus),</td>
<td></td>
<td></td>
<td>Most recent estimate of spawning biomass is below the limit reference</td>
</tr>
<tr>
<td>western and central Pacific</td>
<td></td>
<td></td>
<td>point. Ocean-wide catches exceed MSY, and current fishing mortality rate</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>exceeds that required to produce MSY.</td>
</tr>
<tr>
<td>Yellowfin tuna</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Thunnus albacares),</td>
<td></td>
<td></td>
<td>Most recent estimate of biomass is above the limit reference point.</td>
</tr>
<tr>
<td>western and central Pacific</td>
<td></td>
<td></td>
<td>Ocean-wide estimates of fishing mortality are below MSY levels.</td>
</tr>
<tr>
<td><strong>Economic status</strong></td>
<td>NER were $3.0 million in 2011–12 (preliminary estimates). NER estimates for 2012–13 and 2013–14 are not available. The move to individual transferable quotas and a new harvest strategy may support improvement; however, neither have been implemented long enough to determine whether there has been a positive effect.</td>
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<td></td>
</tr>
</tbody>
</table>

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**Notes:**
- B_{MSY} Biomass at maximum sustainable yield. MSY Maximum sustainable yield. NER Net economic returns.
- Fishing mortality:
  - Not subject to overfishing
  - Subject to overfishing
  - Uncertain
- Biomass:
  - Not overfished
  - Overfished
  - Uncertain

Regional assessments of species and the default limit reference points from the Commonwealth Fisheries Harvest Strategy Policy (DAFF 2007) are used as the basis for status determination.
22.1 Description of the fishery

Area fished

The Eastern Tuna and Billfish Fishery (ETBF) operates in the Exclusive Economic Zone, from Cape York to the Victoria – South Australia border, including waters around Tasmania and high seas of the Pacific Ocean (Figure 22.1). Domestic management arrangements for the ETBF are consistent with Australia's commitments to the Western and Central Pacific Fisheries Commission (WCPFC; see Chapter 21).

Fishing methods and key species

Key species in the ETBF are outlined in Table 22.1. Most of the catch in the fishery is taken with pelagic longlines, although a small quantity is taken using minor-line methods. Some ETBF longliners catch southern bluefin tuna (Thunnus maccocyii) off New South Wales during winter, after fishing for tropical tunas and billfish earlier in the year, while others take them incidentally when targeting other tunas. All southern bluefin tuna taken must be covered by quota and landed in accordance with the Southern Bluefin Tuna Fishery Management Plan 1995. Recreational anglers and game fishers also target tuna and marlin in the ETBF. Many game fishers tag and release their catch, especially marlins. The retention of blue marlin (Makaira nigricans) and black marlin (M. indica) has been banned in commercial fisheries since 1998, and catch limits have been introduced on longtail tuna (Thunnus tonggol), in recognition of the importance of these species to recreational anglers.

Management methods

The primary ETBF tuna and billfish species are managed through total allowable catches allocated as individual transferable quotas (ITQs). The Commonwealth Fisheries Harvest Strategy Policy (HSP; DAFF 2007) is not prescribed for fisheries managed under international agreements. However, a harvest strategy framework has been developed for the ETBF (Campbell 2012a). The framework has been used to set the total allowable commercial catch (TACC) for swordfish (Xiphias gladius) and striped marlin (Tetrapturus audax) since 2011, but is not currently used for tuna species.

Australia's catch in the ETBF as a percentage of the total catch from all nations in the Coral and Tasman seas has been declining across the major target species. This is due primarily to a decline in ETBF catches and, for some species, an increase in the catch of other nations. The Tropical Tuna Resource Assessment Group (TTRAG) noted that the ETBF catch as a proportion of the total catch within the Coral and Tasman seas was relatively high for swordfish and striped marlin, and the ETBF harvest strategy would therefore be effective. In 2013, TTRAG made some adjustments to the target reference catch rates used in the ETBF harvest strategy for swordfish and striped marlin. These provide better alignment with the HSP default reference points of 48 per cent of unfished biomass ($B_{48}$) for the target and 20 per cent of unfished biomass ($B_{20}$) for the limit.

In 2013, TTRAG found that the ETBF harvest strategy was not likely to achieve its objectives according to the requirements of the HSP for bigeye tuna (Thunnus obesus), yellowfin tuna (T. albacares) and albacore (T. alalunga). Australia's catch of these species was low in proportion to total regional catch, and, under these circumstances, changes to Australia's catch could not be expected to result in a change in the stock status (because of a lack of feedback to the stock as a whole).
The Australian Fisheries Management Authority (AFMA) Commission subsequently directed TTRAG to cease using the harvest strategy to calculate recommended biological commercial catch levels for bigeye tuna, yellowfin tuna and albacore, and to prepare information on stock status of tunas. In the absence of an accepted harvest strategy, and as there has been no allocation of tuna catches by the WCPFC, AFMA has applied TACCs based on historical catch levels in the fishery and in accordance with any limits determined by the WCPFC.

The status of ETBF tuna and billfish is derived from the regional assessments undertaken for the WCPFC. Assessment results over the entire geographic area modelled are used to determine stock status, but supplementary management advice may also be derived from the region most relevant to Australia. The WCPFC has agreed limit reference points for some tuna stocks, but, in the absence of agreed limit reference points, status determination was informed by the proxies specified in the HSP.

**Fishing effort**

The number of active vessels in the fishery (Figure 22.2) has decreased substantially in the past decade (from around 150 in 2002 to 41 in 2014), probably as a result of a decline in economic conditions in the fishery and the removal of vessels through the Securing our Fishing Future structural adjustment package in 2006–07 (Vieira et al. 2010).

**FIGURE 22.2** Longline fishing effort, number of boat SFRs and active vessels in the ETBF, 1985 to 2014

![Graph showing fishing effort, number of boat SFRs, and active vessels from 1985 to 2014](image)

Note: SFR Statutory fishing right.
Source: AFMA

**Overall catch history**

Total catch in the ETBF has been declining over the past decade with decreasing effort, but has stabilised over the last several years at around 4000 t (Figure 22.3). Swordfish and yellowfin tuna continue to be the main target species.
Figure 22.3 Total catch (from logbook data) for all methods, by species, in the ETBF, 1987 to 2014

Source: AFMA

Table 22.2 Main features and statistics for the ETBF

<table>
<thead>
<tr>
<th>Fishery statistics a</th>
<th>2013 fishing season</th>
<th>2014 fishing season</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stock</td>
<td>TACC (t)</td>
<td>Real value (2012–13)</td>
</tr>
<tr>
<td>Striped marlin</td>
<td>370</td>
<td>$1 million</td>
</tr>
<tr>
<td>Swordfish</td>
<td>1 396</td>
<td>$4.6 million</td>
</tr>
<tr>
<td>Albacore</td>
<td>2 500</td>
<td>$1.8 million</td>
</tr>
<tr>
<td>Bigeye tuna</td>
<td>1 056</td>
<td>$5 million</td>
</tr>
<tr>
<td>Yellowfin tuna</td>
<td>2 200</td>
<td>$11.4 million</td>
</tr>
<tr>
<td>Total fishery</td>
<td>7 522</td>
<td>$24.8 million</td>
</tr>
</tbody>
</table>

Fishery-level statistics

- Effort
  - Longline: 6.78 million hooks
  - Minor-line: 95 lines
  - Longline: 6.93 million hooks
  - Minor-line: na

- Fishing permits
  - Longline boat SFRs: 100
  - Minor-line boat SFRs: 120
  - Longline boat SFRs: 92
  - Minor-line boat SFRs: 112

- Active vessels
  - Longline: 41
  - Minor-line: 7
  - Longline: 40
  - Minor-line: 4

- Observer coverage
  - Longline: 417 461 (6.2%)
  - Minor-line: zero
  - Longline: 195 032 (2.8%)
  - Minor-line: zero

- Fishing methods
  - Pelagic longline, minor-line (trolling, rod and reel, handline)

- Primary landing ports
  - Mooloolaba, Bermagui, Cairns, Coffs Harbour, Southport, Ulladulla

- Management methods
  - Output controls: TACC and ITQs
  - Input controls: limited entry, gear restrictions

- Primary markets
  - Domestic: fresh
  - International: Japan, United States—mainly fresh; Europe—frozen; American Samoa, Thailand, Indonesia—albacore mainly for canning

- Management plan
  - Eastern Tuna and Billfish Fishery Management Plan 2010

a Fishery statistics are provided by calendar year to align with international reporting requirements. Real-value statistics are by financial year and are expressed in 2013–14 dollars.

Notes: ITQ Individual transferable quota. na Not available. SFR Statutory fishing right. TACC Total allowable commercial catch.
22.2 Biological status

Striped marlin (*Tetrapturus audax*)

Genetic studies have identified multiple stocks of striped marlin in the Pacific Ocean (for example, McDowell & Graves 2008; Purcell & Edmands 2011). As a result, the north Pacific Ocean and south-west Pacific Ocean (SWPO) stocks are assessed separately (WCPFC 2013). Information for the SWPO stock is reported here.

**Catch history**

Catch for the ETBF increased slightly in 2014 to 273 t (Figure 22.4), while catches in the south Pacific decreased slightly from 2658 t in 2012 to 2323 t in 2013 (Figure 22.5). A recent increase in total catch in the south Pacific has been driven in part by increases in catch in the northern area that is not subject to the current conservation and management measure (CMM) for striped marlin, which only applies south of 15°S (WCPFC CMM 2006–04).

**FIGURE 22.4** Striped marlin catch and TACC in the ETBF, 1984 to 2014

![Graph showing catch and TACC for striped marlin in ETBF, 1984 to 2014](image)

Note: TACC Total allowable commercial catch.

Source: AFMA
FIGURE 22.5 Striped marlin catch in the south Pacific, 1970 to 2013

Source: WCPFC

**Stock assessment**

The stock assessment for striped marlin in the SWPO was updated in 2012 (Davies et al. 2012). Significant changes in the base case from the previous (2006) assessment included a 50 per cent reduction in Japanese longline catches over the entire model time period, faster growth rates, and steepness in the stock–recruitment relationship fixed at a higher level (0.8 rather than 0.55). A decreasing trend in recruitment through time was found, particularly from 1950 to 1970. There were conflicts among the standardised catch-per-unit-effort (CPUE) time series, and a series from the Japanese longline fishery was considered to be the most representative. Estimates of equilibrium maximum sustainable yield (MSY) and the associated reference points were highly sensitive to the assumed values of natural mortality and steepness in the stock–recruitment relationship. Estimates of stock status relative to MSY-based reference points, as used by the WCPFC, are therefore uncertain.

The base case in the assessment estimated that the latest (2010) spawning biomass had been reduced to 37 per cent of the levels predicted to occur in the absence of fishing ($\frac{SB_{LATEST}}{SB_{F=0}} = 0.37$ for the base case; range 0.14–0.67 across the base case and sensitivities). It was estimated that the spawning biomass was below the level associated with MSY ($\frac{SB_{LATEST}}{SB_{MSY}} = 0.90$; range 0.38–2.19). Current fishing mortality (2007 to 2010) is below $F_{MSY}$ ($\frac{F_{CURRENT}}{F_{MSY}} = 0.81$; range 0.51–1.21), and recent catches are close to MSY.

**Stock status determination**

The most recent estimate of the SWPO spawning biomass of striped marlin is above the WCPFC limit reference point of 20 per cent of the levels predicted to occur in the absence of fishing. The most recent base-case estimates of fishing mortality and most sensitivity analyses are below the level associated with MSY, and recent catches are close to MSY. As a result, SWPO striped marlin is classified as not subject to overfishing and not overfished. Although not yet adopted by the commission, the Scientific Committee of the WCPFC recommended measures to control overall catch, through the expansion of the geographical scope of CMM 2006–04, to cover the distribution range of the stock.
Swordfish (*Xiphias gladius*)

**Stock structure**

Although studies of swordfish have generally indicated a low level of genetic variation in the Pacific Ocean (Kasapidis et al. 2008), the WCPFC assesses two stocks separately: a north Pacific stock and an SWPO stock. The information reported here is for the SWPO stock.

**Catch history**

Swordfish catch in the ETBF increased slightly in 2014 (Figure 22.6). Catch in the SWPO increased to a peak of more than 26 000 t in 2007 before declining to around 18 000 t in 2010. Catch has since increased slightly to just over 20 000 t in 2013 (Figure 22.7).

**FIGURE 22.6 Swordfish catch and TACC in the ETBF, 1984 to 2014**

Note: TACC Total allowable commercial catch.
Source: AFMA
FIGURE 22.7 Swordfish catch in the south Pacific, 1970 to 2013

Source: WCPFC

Stock assessment

The SWPO stock of swordfish was most recently assessed in 2013 (Davies et al. 2013) using the assessment model MULTIFAN-CL. The new assessment builds on the 2008 assessment and is underpinned by several other analyses examining standardised CPUE series (for example, Campbell 2012b; Hoyle et al. 2013). The main uncertainty in the assessment pertains to swordfish growth, maturity and mortality-at-age schedules, with two schedules used in the assessment: one derived from Hawaiian estimates and the other from Australian estimates. Although these two schedules affected the stock status of swordfish, the WCPFC Scientific Committee was unable to decide which schedule was more reliable (WCPFC 2013).

Model runs for both growth schedules indicated that the current (2007 to 2010) level of spawning biomass was above the level that would result in MSY (Australian estimate: $SB_{\text{CURRENT}}/SB_{\text{MSY}} = 1.15–1.80$; Hawaiian estimate: $SB_{\text{CURRENT}}/SB_{\text{MSY}} = 1.86–2.54$). The range of key model runs also indicated that current spawning biomass was above 20 per cent of initial spawning biomass ($SB_{\text{CURRENT}}/SB_0 = 0.27–0.55$). However, estimates of fishing mortality relative to $F_{\text{MSY}}$ varied under the growth schedules, with the Hawaiian schedule indicating that overfishing was not occurring ($F_{\text{CURRENT}}/F_{\text{MSY}} = 0.40–0.70$), and the Australian schedule indicating that overfishing was occurring ($F_{\text{CURRENT}}/F_{\text{MSY}} = 1.06–1.77$).

Stock status determination

The most recent estimates of spawning biomass, from all models and sensitivities, are above the HSP default limit reference point of 20 per cent of initial unfished levels. As a result, the swordfish stock in the SWPO is classified as not overfished. However, the most recent estimates of fishing mortality relative to the $F_{\text{MSY}}$ reference point vary greatly, depending on the growth schedule assumed in the model. The WCPFC Scientific Committee was unable to decide which growth schedule was more reliable, and further research on growth schedules is underway to resolve this issue. The stock is classified as uncertain with regard to the level of fishing mortality.
Albacore (*Thunnus alalunga*)

**Stock structure**

Two distinct stocks of albacore (north Pacific and south Pacific) are found in the Pacific Ocean, generally associated with the two oceanic gyres. These two stocks are assessed separately (WCPFC 2013). Information for the south Pacific albacore stock is reported here.

**Catch history**

Catches in the ETBF in 2014 decreased slightly (Figure 22.8). Catches in the south Pacific have increased in recent years, but decreased slightly in 2013 to 84 835 t (Figure 22.9). The WCPFC Scientific Committee recommended that longline fishing mortality be reduced if the WCPFC’s goal is to maintain economically viable catch rates.

**FIGURE 22.8 Albacore catch and TACC in the ETBF, 1984 to 2014**

Note: TACC Total allowable commercial catch.

Source: AFMA
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FIGURE 22.9 Albacore catch in the south Pacific, 1970 to 2013

Source: WCPFC

Stock assessment

The assessment for albacore in the south Pacific Ocean was updated in 2012 using MULTIFAN-CL. Updates included revised longline CPUE indices, revised catch and size data, and substantial changes to some of the biological parameters (Hoyle et al. 2012). Cumulatively, these revisions resulted in a more optimistic assessment of status.

The base case in the assessment estimated that the current (2007 to 2010) spawning biomass has been reduced to 59 per cent of initial levels (SB\textsubscript{CURRENT}/SB\textsubscript{0} = 0.59; range 0.41–0.76). It was estimated that the spawning biomass was well above the level associated with MSY (SB\textsubscript{CURRENT}/SB\textsubscript{MSY} = 2.56; range 1.46–5.20). Current fishing mortality is well below F\textsubscript{MSY} (F\textsubscript{CURRENT}/F\textsubscript{MSY} = 0.21; range 0.04–1.08), and recent catches are comparable with the estimates of MSY. Reference points based on MSY are quite uncertain for this assessment.

Stock status determination

The most recent estimate of spawning biomass is above the HSP default limit reference point of 20 per cent of initial unfished levels. The most recent estimates of fishing mortality are below the levels associated with MSY, and recent catches are around MSY. As a result, albacore in the south Pacific Ocean is classified as not subject to overfishing and not overfished.
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Bigeye tuna (*Thunnus obesus*)

Genetic data have indicated that bigeye tuna in the Pacific Ocean is a single biological stock (Grewe & Hampton 1998).

**Catch history**

Catches of bigeye tuna remained stable in the ETBF in 2014 (Figure 22.10) and in the WCPFC area in 2013 (Figure 22.11). Recent bigeye tuna catch in the WCPFC area (150 281 t in 2013) is well above the estimated MSY (108 520 t). Catch has been above this level since around 1987–88 (Figure 22.11).

**FIGURE 22.10 Bigeye tuna catch and TACC in the ETBF, 1984 to 2014**

<table>
<thead>
<tr>
<th>Year</th>
<th>Australia (domestic and charter)</th>
<th>Japan (bilateral and joint venture)</th>
<th>TACC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1986</td>
<td>400 t</td>
<td>800 t</td>
<td>1200 t</td>
</tr>
<tr>
<td>1990</td>
<td>800 t</td>
<td>400 t</td>
<td>1600 t</td>
</tr>
<tr>
<td>1994</td>
<td>1200 t</td>
<td>800 t</td>
<td>2000 t</td>
</tr>
<tr>
<td>1998</td>
<td>1600 t</td>
<td>1200 t</td>
<td>2400 t</td>
</tr>
<tr>
<td>2002</td>
<td>2000 t</td>
<td>1600 t</td>
<td>3000 t</td>
</tr>
<tr>
<td>2006</td>
<td>2400 t</td>
<td>2000 t</td>
<td>3600 t</td>
</tr>
<tr>
<td>2010</td>
<td>3000 t</td>
<td>2400 t</td>
<td>4200 t</td>
</tr>
<tr>
<td>2014</td>
<td>3600 t</td>
<td>3000 t</td>
<td>4800 t</td>
</tr>
</tbody>
</table>

Note: TACC Total allowable commercial catch.  
Source: AFMA
FIGURE 22.11 Bigeye tuna catch in the western and central Pacific, 1970 to 2013

Source: WCPFC

Stock assessment

The bigeye tuna stock in the western and central Pacific Ocean (WCPO) was most recently assessed in 2014 (Harley et al. 2014) using MULTIFAN-CL, and the assessment was subject to significant changes and improvements following a review in 2012. The assessment indicated that spawning biomass had declined to approximately half of initial levels by the mid-1970s and continued to decline after that. The base case in the assessment estimated that the 2012 spawning biomass had been reduced to 16 per cent of the levels predicted to occur in the absence of fishing ($SB_{LATEST}/SB_{F=0} = 0.16$ for the base case; range 0.14–0.18 across the base case and three sensitivities). The 2012 spawning biomass was also below the level that will support MSY ($SB_{LATEST}/SB_{MSY} = 0.77$ for the base case; range 0.62–0.96).

The assessment indicated that current (2008 to 2011 average) fishing mortality is 1.57 times the fishing mortality that will support MSY ($F_{CURRENT}/F_{MSY} = 1.57$ for the base case; range 1.27–1.95).

A whole-of-Pacific assessment of bigeye tuna (including the east Pacific) is scheduled for 2015.

Stock status determination

The base case (and all sensitivities) in the latest assessment (Harley et al. 2014) indicates that bigeye tuna spawning biomass is below the 20 per cent depletion reference point adopted by the WCPFC ($0.2SB_{F=0}$). This reference point corresponds with the limit reference point in the HSP. As a result, the stock is classified as overfished. The current fishing mortality across the WCPO is well in excess of levels needed to maintain MSY and has driven the stock to below the limit reference point ($B_{20}$); consequently, the stock is classified as subject to overfishing. The WCPFC Scientific Committee has recommended a reduction of at least 36 per cent in fishing mortality from the average levels for 2008 to 2011, to reduce the fishing mortality rate to $F_{MSY}$. 
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**Yellowfin tuna** (*Thunnus albacares*)

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**Stock structure**

Yellowfin tuna in the WCPO is considered to be a single biological stock (Langley et al. 2012).

**Catch history**

Catch increased in the ETBF in 2014 (Figure 22.12) but decreased substantially in the wider WCPFC area in 2013 (Figure 22.13). The WCPFC 2013 catch (524,022 t) is below the estimated MSY (586,400 t).

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**FIGURE 22.12 Yellowfin tuna catch and TACC in the ETBF, 1984 to 2014**

Note: TACC Total allowable commercial catch.
Source: AFMA
Stock assessment

The yellowfin tuna stock in the WCPO was most recently assessed in 2014 (Davies et al. 2014) using MULTIFAN-CL, with data up to and including 2012. The base case in the assessment estimated that the 2012 spawning biomass had been reduced to 38 per cent of the levels predicted to occur in the absence of fishing ($SB_{\text{LATEST}}/SB_{F=0} = 0.38$ for the base case; range 0.35–0.40 across the base case and three sensitivities). The 2012 spawning biomass was above the level that will support MSY ($SB_{\text{LATEST}}/SB_{\text{MSY}} = 1.24$ for the base case; range 1.05–1.51).

The assessment indicated that current (2008 to 2011 average) fishing mortality is 0.72 times the fishing mortality that will support MSY ($F_{\text{CURRENT}}/F_{\text{MSY}} = 0.72$ for the base case; range 0.58–0.90).

Stock status determination

The results of the 2014 assessment indicate that the spawning biomass of yellowfin tuna is above the 20 per cent depletion reference point adopted by the WCPFC ($0.2SB_{F=0}$). This reference point corresponds with the limit reference point in the HSP. As a result, the stock is classified as not overfished. The 2012 catch is slightly above the base-case MSY; however, the current fishing mortality for the base-case assessment is below that required to achieve MSY. As a result, the stock is classified as not subject to overfishing.
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22.3 Economic status

Key economic trends

ABARES has conducted economic surveys of the ETBF since the early 1990s. The survey data are used to estimate the level of net economic returns (NER) earned in the fishery. The ETBF was most recently surveyed in 2012. Survey-based estimates were provided for the 2009–10 and 2010–11 financial years, and non-survey based estimates for economic performance were provided for 2011–12. Survey results showed that in 2010–11 NER were positive for the first year since 2000–01 (George & New 2013). This improvement was attributed to the reduced number of active vessels and lower associated costs. These changes followed the exit of vessels from the fishery in response to market forces and the Securing our Fishing Future structural adjustment package (Vieira et al. 2010), which removed 99 longline permits and 112 minor-line permits. A change in the production mix (that is, species caught) towards more highly valued tuna species since 2006–07 probably contributed to the revenue increases and positive NER.

Between 2009–10 and 2010–11, improved economic performance in the fishery was driven primarily by a reduction in operating costs. In 2011–12, NER were estimated to have increased to $3.0 million (preliminary estimate). Revenue and operating costs were both estimated to have declined, with the fall in operating costs proportionately larger than the fall in revenue. The main driver for the reduction in operating costs was a fall in boat numbers, total effort, catch (which affects some key variable costs) and the estimated distance travelled by the ETBF fleet.

Previous improvements in the economic performance of the fishery are consistent with generally increasing productivity since the early 2000s (Stephan & Vieira 2013). Total factor productivity followed a generally increasing trend since 1999–2000, although the rate of growth increased after 2001–02. The increased rate of growth occurred at the same time as the reduction in fleet size, driven primarily by market forces in the early 2000s and, later in that decade, by the Securing our Fishing Future structural adjustment package. This is likely to have left the more efficient vessels continuing to operate in the fishery, which may be the principal driver for the increasing productivity trend during the latter part of the decade.

Cost and NER estimates are not yet available for 2013–14. Between 2012–13 and 2013–14, effort fell slightly (from 6.78 million hooks to 6.71 million hooks) and the number of active vessels in the fishery remained the same. Despite little change in effort, the catch in the fishery increased from 3916 t to 4365 t in 2013–14, indicating potential improvements in productivity. The gross value of production increased in 2013–14 by 22 per cent (Figure 22.14). NER in 2013–14 still remain uncertain; however, economic information available indicate positive signs for NER in the fishery.
FIGURE 22.14 Real GVP for the ETBF, 2002–03 to 2013–14

Note: GVP Gross value of production.

Management arrangements

Despite being a managed fishery, the ETBF has previously exhibited some of the economic characteristics of an unmanaged, open-access fishery (Kompas et al. 2009). Estimates suggest that the fishery earned negative NER between 2001–02 and 2009–10. Low NER are likely to have been a major reason for a large proportion of the fishery’s permits being inactive. This is a sign that the fishery was overcapitalised. The structural adjustment under the Securing our Fishing Future package addressed these issues to a degree—it left fewer vessels sharing a similar amount of catch and revenue.

In March 2011, output controls were introduced for five key target species in the form of TACCs, allocated as ITQs. The removal of some input controls under ITQs can provide fishers with more flexibility to fish with a more efficient combination of inputs (Elliston & Cao 2004). The transferability of statutory fishing rights among fishers also allows for more efficient allocation of these rights. This is likely to result in the catch being taken by the most efficient operators in the fishery.

The move to ITQs may have benefits for some species, but, since they were only introduced in 2011, it is too early to assess their impact on NER. The setting of TACCs in the ETBF is complicated by uncertainty around what level of TACC is consistent with maximising NER from an internationally shared stock (see ‘Performance against economic objective’). If TACCs are set too high so that they do not constrain a species’ catch, the incentive for quota trade and the associated positive impacts for fishery-level efficiency are reduced (Elliston et al. 2004). If TACCs are set too low (based on a stock’s biological and economic status), some level of NER will be foregone.
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Performance against economic objective

The harvest of stocks that are internationally shared complicates both the selection of economic-based targets and the assessment of economic status against the objective of maximum economic yield (MEY), intended to maximise NER to the Australian community. Stock assessment is particularly complicated for the ETBF because the catch taken may be a relatively small proportion of the total WCPFC catch, and the degree of connectivity between the Australian population and that in the wider region remains uncertain for some species. For these species, a reduction in the Australian catch may not necessarily lead to an increase in stock and, therefore, profitability in the long term. The potential lack of association between domestic management actions and changes in stock biomass means that stock-wide $B_{\text{MEY}}$ may not be relevant.

The species-specific biomass targets in this fishery are based on the expected catch rates and the size proportion that is expected to occur when the level of mean spawners per recruit is at 48 per cent of initial unfished levels. This is assumed to be consistent with the MEY target recommended by the HSP. It is unclear how accurately the target reflects MEY. Since the harvest strategy for the fishery was implemented in 2010, NER have turned positive. However, it is unclear to what extent the targets are responsible for this. NER were improving in the fishery before the harvest strategy was implemented, and many factors other than the harvest strategy may have influenced the fishery’s economic performance.
22.4 Environmental status

Product from the ETBF currently has export approval under inclusion on the List of Exempt Native Specimens until 2019. Several conditions were imposed as part of the previous approval (which expired on 28 August 2014), including AFMA ensuring that the catch of bigeye tuna is sustainable and implementing measures to ensure that the take of sharks in the fishery is sustainable. To meet these conditions, AFMA, through TTRAG, undertook research into the consequences of different bigeye stock structures for the harvest strategy. For sharks, operators must not take more sharks than the number of fish of the quota species retained, up to a maximum of 20 sharks per trip. This excludes species that are subject to other catch limits (for example, white shark *[Carcharodon carcharias]* and other shark species that are no-take in the ETBF). AFMA has implemented a ban on retaining oceanic whitetip sharks (*Carcharhinus longimanus*) that was agreed by the WCPFC in early 2012. The use of wire trace leaders is prohibited in the ETBF.

Under the level 3 Sustainability Assessment for Fishing Effects (for fish only), two species of sunfish and three species of shark were identified as being at high risk from the effects of fishing in the ETBF (Zhou et al. 2007). A 2012 review of the ecological risk assessment, using new information on sunfish, has reclassified both species of sunfish as medium risk. The priorities of the ecological risk management response are to reduce interactions with marine turtles, seabirds and whales because of their protected status (AFMA 2012), and to reduce the capture and mortality of sharks by implementing the 20-shark trip limit. The ecological risk management report also lists specific actions for the priority groups—for example, all vessels in the ETBF are required to carry line cutters and de-hookers so that sharks, turtles and other protected species can be easily removed from fishing gear, should they become hooked or entangled.

In 2014, logbooks indicated that 1543 shortfin mako sharks (*Isurus oxyrinchus*) were hooked in the ETBF. Of these, 3 were alive, 1235 were dead and 305 were released in unknown condition. Ten longfin mako sharks (*I. paucus*) were also hooked; three were dead and seven were in unknown condition. Two porbeagle sharks (*Lamna nasus*) were hooked and released in unknown condition. Six green turtles (*Chelonia mydas*) were hooked; five were released alive, and the condition of the other was unknown. Four leatherback turtles (*Dermochelys coriacea*) and one unidentified turtle were also hooked and released alive. Finally, one black-browed albatross (*Thalassarche melanophris*) and one shy albatross (*T. cauta*) were dead after being hooked.

22.5 References


Purcell, CM & Edmands, S 2011, 'Resolving the genetic structure of striped marlin, Kajikia audax, in the Pacific Ocean through spatial and temporal sampling of adult and immature fish', Canadian Journal of Fisheries and Aquatic Sciences, vol. 68, pp. 1861–75.


Getting ready to set
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