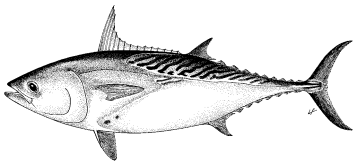
DRAFT: EXECUTIVE SUMMARY: KAWAKAWA

Indian Ocean Tuna Commission
Commission des Thons de l'Océan Indien
iotc ctoi



Status of the Indian Ocean kawakawa (KAW: *Euthynnus affinis*) resource

TABLE 1. Kawakawa: Status of kawakawa (*Euthynnus affinis*) in the Indian Ocean

Area[1]	Indicators		2014 stock status determination
Indian Ocean	Catch[2] 2013: Average catch[2] 2009–2013:	168,954 t 150,387 t	
	MSY: F_{MSY}: B_{MSY}: F_{2012}/F_{MSY}: B_{2012}/B_{MSY}: B_{2012}/B_0:	144 K t [113–167 Kt] 0.51 217 Kt (168–152 Kt) 0.97 (0.62–1.61) 1.13 (0.64–1.4) 0.57 (0.32–0.7)	

[1]Boundaries for the Indian Ocean stock assessment are defined as the IOTC area of competence.
[2]Nominal catches represent those estimated by the IOTC Secretariat. If these data are not reported by CPCs, the IOTC Secretariat estimates total catch from a range of sources including: partial catch and effort data; data in the FAO FishStat database; catches estimated by the IOTC from data collected through port sampling; data published through web pages or other means; data reported by other parties on the activity of vessels; and data collected through sampling at the landing place or at sea by scientific observers.

Colour key	Stock overfished($SB_{year}/SB_{MSY}< 1$)	Stock not overfished ($SB_{year}/SB_{MSY}\geq 1$)
Stock subject to overfishing($F_{year}/F_{MSY}> 1$)		
Stock not subject to overfishing ($F_{year}/F_{MSY}\leq 1$)		
Not assessed/Uncertain		

INDIAN OCEAN STOCK – MANAGEMENT ADVICE

Stock status. Analysis using a stock-reduction analysis (SRA) approach for a second year indicates that the stock is near optimal levels of F_{MSY}, and stock biomass is near the level that would produce MSY (B_{MSY}). Due to the quality of the data being used, the simplistic approach employed in 2014, combined with the rapid increase in kawakawa catch in recent years, measures need to be taken to slow the increase in catches in the IOTC area of competence. Based on the weight-of-evidence available to the WPNT, the kawakawa stock for the whole Indian Ocean is classified as **not overfished** and **not subject to overfishing** (Table 1, Fig. 1). A separate analysis done on a sub-population (north-west Indian Ocean region) in 2014 indicated that that stock may be experiencing overfishing, although spawning biomass is likely to be above the level to produce MSY. However, further analysis of the CPUE data should be undertaken in preparation for the next WPNT meeting so that more traditional approaches for assessing stock status are used.

Outlook. There remains considerable uncertainty about stock structure and about the total catches. Due to a lack of fishery data for several gears, only data poor assessment approaches can currently be used. Aspects of the fisheries for this species combined with the lack of data on which to base a more formal assessment are a cause for considerable concern. In the interim until more traditional approaches are developed the data-poor approaches will be used to assess stock status. The continued increase of annual catches for kawakawa is likely to have further increased the pressure on the Indian Ocean stock as a whole resource. Research emphasis on improving indicators and exploration of stock structure and stock assessment approaches for data poor fisheries should be undertaken. There is a high risk of exceeding MSY-based reference points by 2015 if catches are maintained at current (2012) levels (50% risk that $SB_{2015}<SB_{MSY}$, and 74% risk that $F_{2015}>F_{MSY}$) or a very high risk is catches are increase further (120% of 2012 levels) (98% risk that $SB_{2015}<SB_{MSY}$, and 100% risk that $F_{2015}>F_{MSY}$) (Table 2).

The following should be noted:

- The Maximum Sustainable Yield estimate for the whole Indian Ocean is estimated to be between 113,000 and 167,000 t.

- Reconstruction of the catch history needs to occur, as do annual catches submitted to the Secretariat.
- Improvement in data collection and reporting is required to assess the stock using more traditional stock assessment techniques.
- Given the rapid increase in kawakawa catch in recent years, some measures need to be taken to decrease the catches in the Indian Ocean (Table 2).
- Limit reference points: The Commission has not adopted limit reference points for any of the neritic tunas under its mandate.

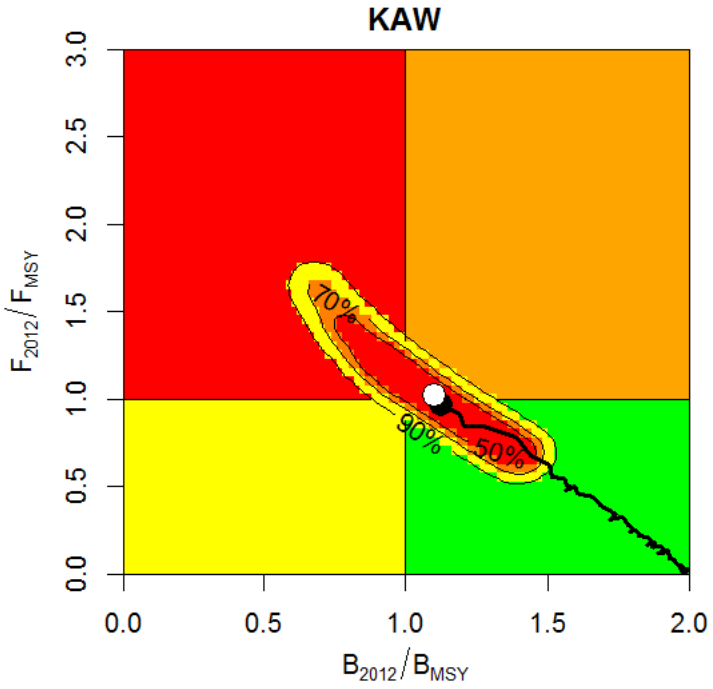


Fig. 1. Kawakawa: PFCRA Aggregated Indian Ocean assessment Kobe plot. The Kobe plot presents the trajectories for the range of plausible model options included in the formulation of the final management advice. The trajectory of the geometric mean of the plausible model options is also presented.

TABLE 2. Kawakawa: 2014 PFCRA Aggregated Indian Ocean assessment Kobe II Strategy Matrix. Probability (percentage) of plausible models violating the MSY-based reference points for five constant catch projections (2012 catch level, -10%, -20%, -30% and +20%) projected for 3 and 10 years. Note: from the 2014 stock assessment using catch estimates at that time.

Reference point and projection timeframe	**Alternative catch projections (relative to 2012) and weighted probability (%) scenarios that violate reference point**				
	70% (109,212 t)	80% (124,813 t)	**90%** (140,415 t)	**100%** (156,017 t)	**120%** (187,220 t)
$B_{2015} < B_{MSY}$	0%	4%	24%	50%	98%
$F_{2015} > F_{MSY}$	0%	0%	23%	74%	100%
$B_{2022} < B_{MSY}$	0%	12%	37%	77%	100%
$F_{2022} > F_{MSY}$	0%	6%	36%	80%	100%

Note: As detailed in Recommendation 14/07, the colour coding used above refers to 25% probability levels associated with the default target reference points of the Commission.

Appendix I
SUPPORTING INFORMATION
(Information collated from reports of the Working Party on Neritic Tunas and other sources as cited)

CONSERVATION AND MANAGEMENT MEASURES

Kawakawa (*Euthynnus affinis*) in the Indian Ocean is currently subject to a number of Conservation and Management Measures adopted by the Commission:

- Resolution 13/03 *on the recording of catch and effort by fishing vessels in the IOTC area of competence*
- Resolution 14/05 *concerning a record of licensed foreign vessels fishing for IOTC species in the IOTC area of competence and access agreement information*
- Resolution 12/11 *on the implementation of a limitation of fishing capacity of Contracting Parties and Cooperating Non-Contracting Parties*
- Resolution 10/02 *mandatory statistical requirements for IOTC Members and Cooperating non-Contracting Parties (CPC's)*
- Resolution 10/08 *concerning a record of active vessels fishing for tunas and swordfish in the IOTC area*

FISHERIES INDICATORS

Kawakawa: General

Kawakawa (*Euthynnus affinis*) lives in open waters close to the shoreline and prefers waters temperatures ranging from 18° to 29°C. Table 3 outlines some key life history parameters relevant for management.

TABLE 3. Kawakawa: Biology of Indian Ocean kawakawa (*Euthynnus affinis*)

Parameter	Description
Range and stock structure	Lives in open waters close to the shoreline and prefers waters temperatures ranging from 18° to 29°C.Kawakawa form schools by size with other species sometimes containing over 5,000 individuals. Kawakawa are often found with yellowfin, skipjack and frigate tunas. Kawakawa are typically found in surface waters, however, they may range to depths of over 400 m (they have been reported under a fish-aggregating device employed in 400 m), possibly to feed.Kawakawa larvae are patchy but widely distributed and can generally be found close to land masses. Large changes in apparent abundance are linked to changes in ocean conditions. This species is a highly opportunistic predator feeding on small fishes, especially on clupeoids and atherinids; also squid, crustaceans and zooplankton. Fish form the dominant prey item (76.7%). *Sardinella longiceps*, *Encrasicholina devisi*, *Decapterus* spp. and *Nemipterus* spp. are the major food items. No information is available on stock structure of kawakawa in Indian Ocean.
Longevity	9 years
Maturity (50%)	**Age**: n.a; females n.a. males n.a. **Size:** females and males ~38–50 cm FL.
Spawning season	Spawning occurs mostly during summer. A 1.4 kg female (48 cm FL) may spawn approximately 0.21 million eggs per batch (corresponding to about 0.79 million eggs per season). Spawning is prolonged with peaks during June and October.
Size (length and weight)	Maximum: Females and males 100 cm FL; weight 14 kgs. Juveniles grow rapidly reaching lengths between 50–65 cm by 3 years of age.

n.a. = not available. Sources: Froese & Pauly 2009, Taghavi et al. 2010, Abdussamad et al. 2012, Kaymaram & Darvishi 2012

Kawakawa – Fisheries and catch trends

Kawakawa is caught mainly by coastal purse seines, gillnets and, handlines and trolling (Table 4 and Fig. 1); and may be also an important bycatch of the industrial purse seiners. The catch estimates for kawakawa were derived from very small amounts of information and are therefore highly uncertain[1].

[1] The uncertainty in the catch estimates has been assessed by the IOTC Secretariat and is based on the amount of processing required to account for the presence of conflicting catch reports, the level of aggregation of the catches by species and or gear, and the occurrence of non-reporting fisheries for which catches had to be estimated.

TABLE 4. Kawakawa: Best scientific estimates of the catches of kawakawa by type of fishery for the period 1950–2012 (in metric tonnes) (Data as of October 2014)

Fishery	By decade (average)						By year (last ten years)									
	1950s	1960s	1970s	1980s	1990s	2000s	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Purse seine	100	385	2,228	11,365	21,393	28,613	27,811	32,393	34,785	32,586	32,441	37,051	34,788	40,298	42,323	45,115
Gillnet	2,179	4,098	9,187	16,666	29,742	50,538	45,728	47,845	53,050	56,393	65,293	63,698	57,864	69,646	74,501	80,098
Line	2,102	3,642	7,146	11,216	16,739	22,946	22,780	23,816	22,847	25,017	28,127	29,931	29,795	30,970	32,160	33,828
Other	295	719	1,357	2,690	5,129	7,829	7,511	8,447	8,066	9,629	9,015	10,129	9,938	9,948	9,941	9,913
Total	**4,676**	**8,844**	**19,919**	**41,937**	**73,003**	**109,926**	**103,830**	**112,501**	**118,748**	**123,625**	**134,876**	**140,808**	**132,385**	**150,862**	**158,925**	**168,954**

The catches provided in Table 5 are based on the information available at the IOTC Secretariat and the following observations on the catches cannot currently be verified. Annual estimates of catches for the kawakawa increased markedly from around 20,000 t in the mid-1970's to reach the 45,000 t mark in the mid-1980's and 169,000 t in 2013, the highest catches ever recorded for this species. In recent years the catches of kawakawa have been recorded at similar levels in in the two Indian Ocean basins.

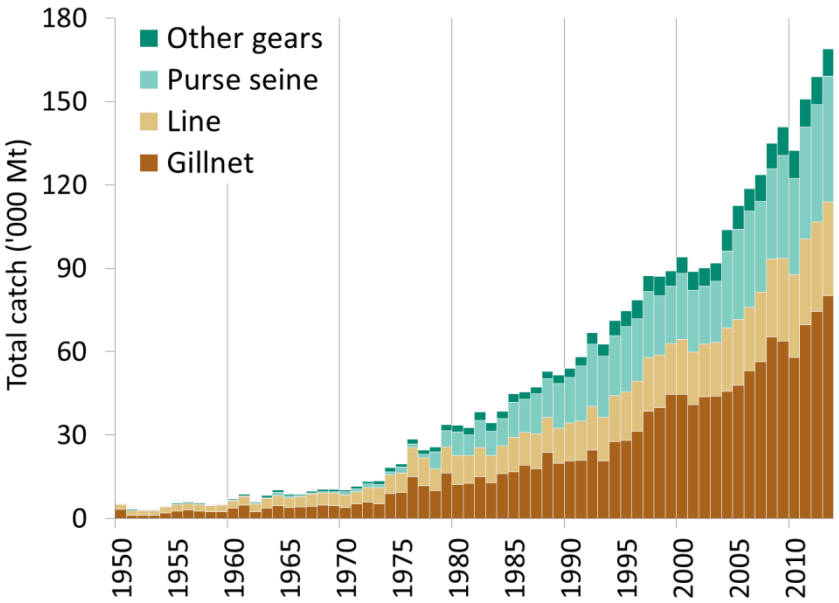


Fig. 1. Kawakawa: Annual catches of kawakawa by gear recorded in the IOTC database (1950–2013). (Data as of October 2014)

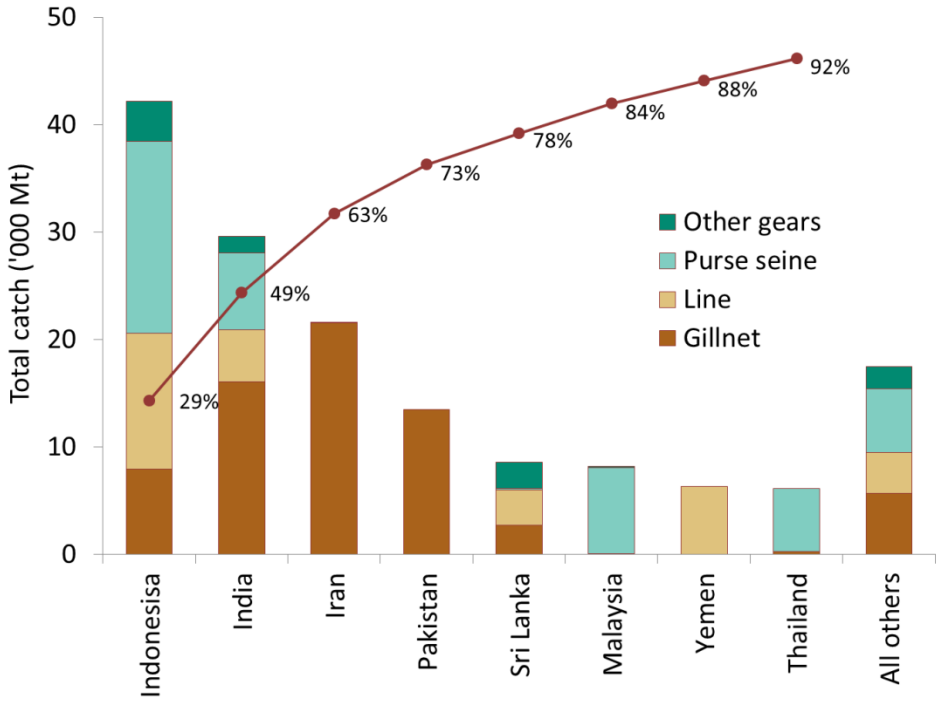


Fig. 2. Kawakawa: Average catches in the Indian Ocean over the period 2010–12, by country. Countries are ordered from left to right, according to the importance of catches of kawakawa reported. The red line indicates the (cumulative) proportion of catches of kawakawa for the countries concerned, over the total combined catches of this species reported from all countries and fisheries. (Data as of October 2014)

In recent years nearly three quarters of the total catches of kawakawa are attributed to four countries (Indonesia (29%), India (20%), Iran (15%), and Pakistan (9%) (Fig. 2).

Kawakawa – Uncertainty of catches

Retained catches are uncertain (Fig. 3), notably for the following fisheries:

- Artisanal fisheries of Indonesia: Indonesia did not report catches of kawakawa by species or by gear for 1950–2004; catches of kawakawa, longtail tuna and, to a lesser extent, other species were reported aggregated for this period. In the past, the IOTC Secretariat used the catches reported since 2005 to break the aggregates for 1950–2004, by gear and species. However, a review by the IOTC Secretariat conducted by an independent consultant in 2012 indicated that the catches of kawakawa had been overestimated by Indonesia. While the new catches estimated for kawakawa in Indonesia remain uncertain, representing around 29% of the total catches of this species in the Indian Ocean in 2010–12 (compared to around 38% in previous years, prior to the review of Indonesia's catch series), the new figures are considered more reliable than those previously recorded in the IOTC database.
- Artisanal fisheries of India: Although India reports catches of kawakawa they are not always reported by gear. The catches of kawakawa in India were also reviewed by the IOTC Secretariat in 2012 and assigned by gear on the basis of official reports and information from various other alternative sources. The catches of kawakawa in India have represented 20% of the total catches of this species in the Indian Ocean in 2010–12 (compared to around 17% in previous years, prior to the review of India's catch series).
- Artisanal fisheries of Myanmar and Somalia: None of these countries have ever reported catches to the IOTC Secretariat. Catch levels are unknown.
- Other artisanal fisheries: The catches of kawakawa are usually not reported by species, being combined with catches of other small tuna species like skipjack tuna and frigate tuna (e.g., coastal purse seiners of Thailand, and until recently Malaysia).
- Industrial fisheries: The catches of kawakawa recorded for industrial purse seiners are thought to be a fraction of those retained on board. Due to this species being a bycatch, its catches are seldom recorded in the logbooks, nor are they monitored in port. The EU recently reported catch levels of frigate tuna for its purse seine fleet, for 2003–07, estimated using observer data.
- Discard levels are moderate for industrial purse seine fisheries. The EU recently reported discard levels of kawakawa for its purse seine fleet, for 2003–07, estimated using observer data.

- Changes to the catch series: The overall catch series of kawakawa has not changed substantially since the WPNT meeting in 2012. The IOTC Secretariat is currently undertaking reviews of the catch series for Indonesia, Malaysia and Thailand which are likely revise the catch estimates for the next WPNT in 2015; however at present the total catches of kawakawa remain at similar levels when compared to previous estimates.

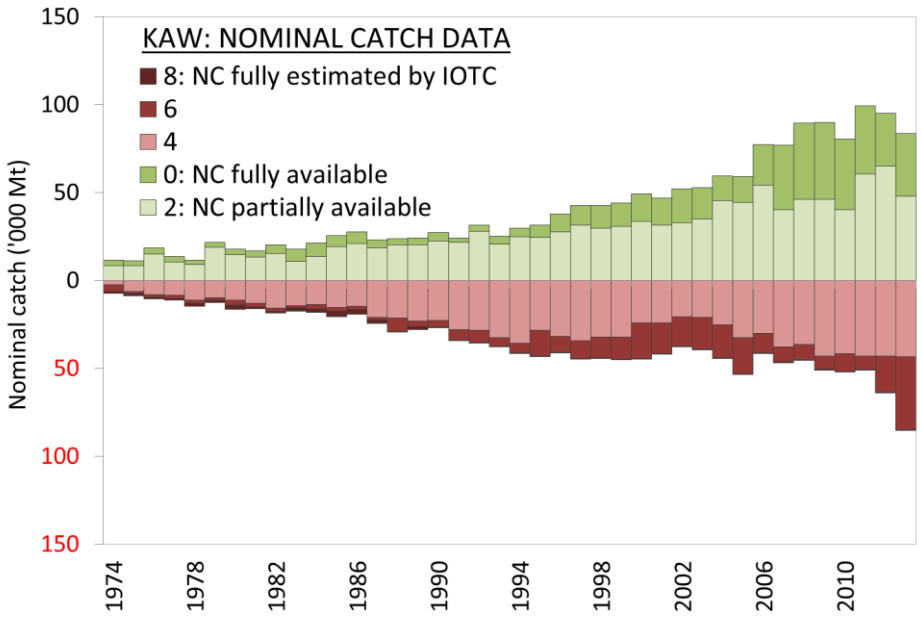


Fig. 3. Kawakawa: nominal catch; uncertainty of annual catch estimates (1950–2013). Catches are assessed against IOTC reporting standards, where a score of 0 indicates catches that are fully reported according to IOTC standards; catches assigned a score of between 2 – 6 do not report catch data fully by gear and/or species (i.e., partially adjusted by gear and species by the IOTC Secretariat) or any of the other reasons provided in the document; catches with a score of 8 refer to fleets that do not report catch data to the IOTC (estimated by the IOTC Secretariat). (Data as of October 2014)

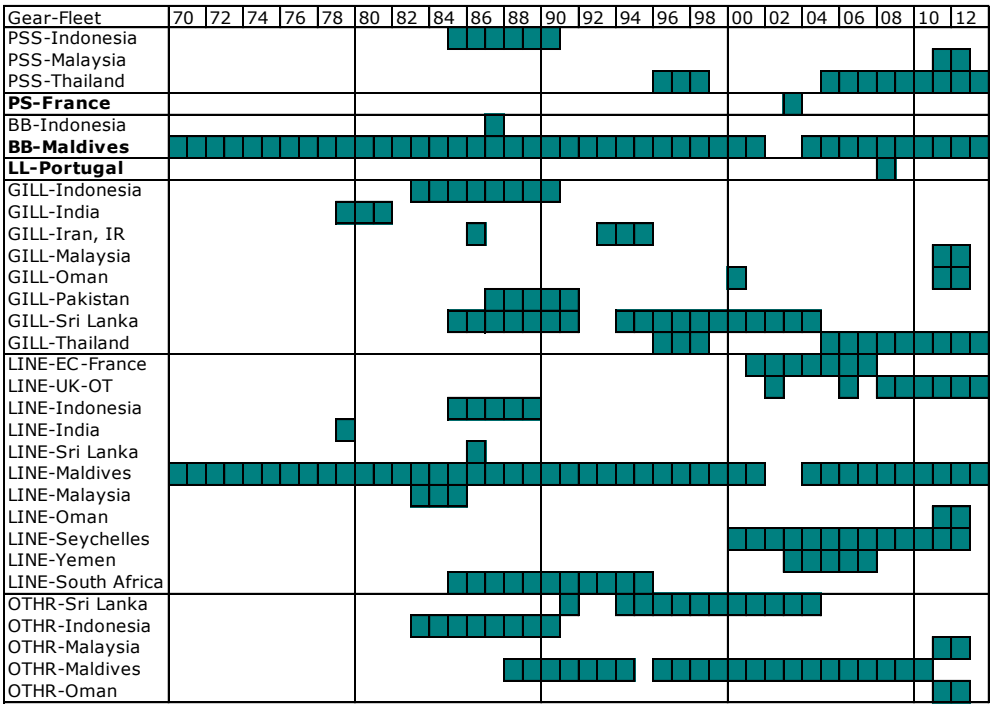
Kawakawa – Effort trends

Effort trends are unknown for kawakawa in the Indian Ocean.

Kawakawa – Catch–per–unit–effort (CPUE) trends

Catch-and-effort series are available from some fisheries but they are considered highly incomplete (Table 5). In most cases catch-and-effort data are only available for short periods. Reasonably long catch-and-effort data series (extending for more than 10 years) are only available for Maldives baitboats and troll lines and Sri Lanka gillnets (Fig. 4). The catch-and-effort data recorded for Sri Lankan gillnets are, however, thought to be inaccurate due to the dramatic changes in CPUE recorded between consecutive years.

TABLE 5. Kawakawa: Availability of catches and effort series, by fishery and year (1970–2013). Note that no catches and effort are available at all for 1950–69.



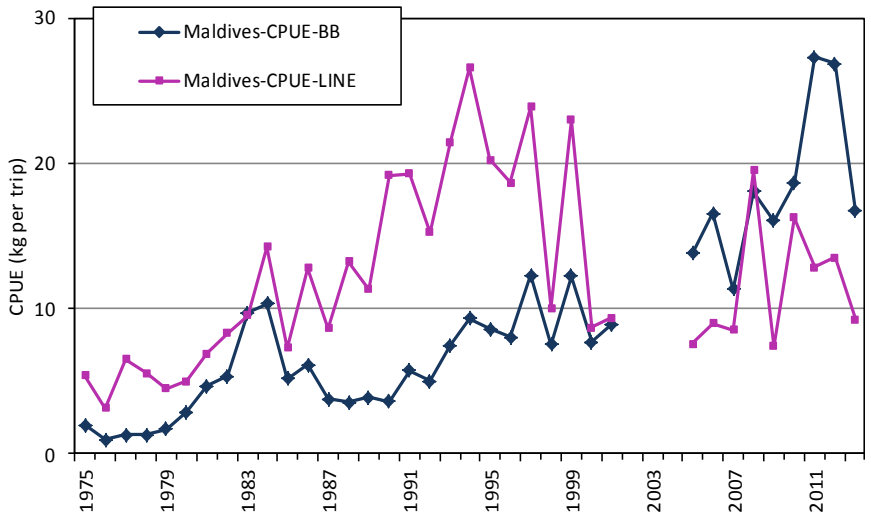


Fig. 4. Kawakawa: Nominal CPUE series for the baitboat (BB) and troll line (TROL) fisheries of Maldives (1975–2013) derived from the available catches and effort data.

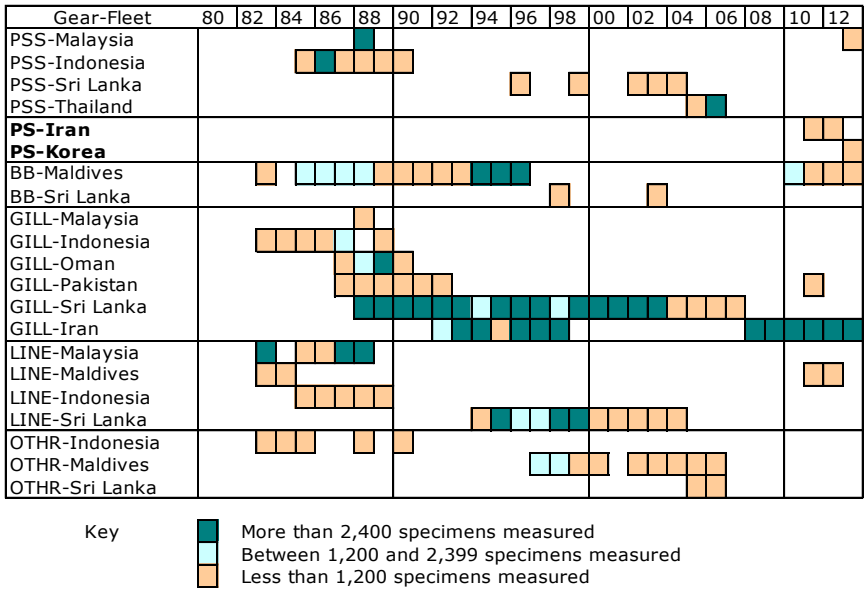
Kawakawa – Fish size or age trends (e.g. by length, weight, sex and/or maturity)

- The size of kawakawa taken by the Indian Ocean fisheries typically ranges between 20 and 60 cm depending on the type of gear used, season and location. The coastal purse seine fisheries operating in the Andaman Sea tend to catch kawakawa of small size (15–30 cm) while the gillnet, baitboat and other fisheries operating in the Indian Ocean catch usually larger specimens (25–55 cm).
- Trends in average weight can be assessed for Sri Lankan gillnets but the amount of specimens measured has been very low since the mid-1990s (Table 6 & Fig. 5). The length frequency data available from the mid-eighties to the early nineties was obtained with the support of the IPTP (Indo-Pacific Tuna Programme); unfortunately, the data collection did not continue after the end of the IPTP activities. Since 1998 there has been some sampling of lengths from Iranian gillnets (collected from vessels operating in the Arabian Sea),

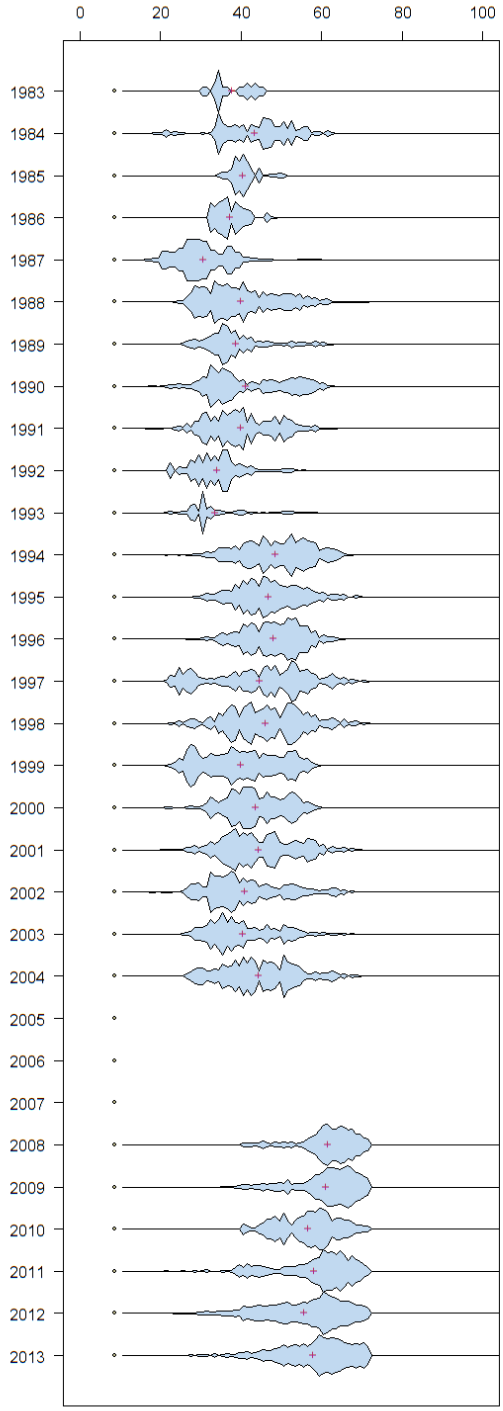
although average lengths and distribution of lengths of samples are significantly larger than specimens reported by other fleets.

- Catch-at-Size(Age) data are not available for the kawakawa due to the paucity of size data available from most fleets (Table 3) and the uncertain status of the catches for this species (Fig. 33). Length distributions derived from the data available for gillnet fisheries are shown in Fig. 38. No data available for all other fisheries.
- Sex ratio data have not been provided to the IOTC Secretariat by CPCs.

TABLE 6. Kawakawa: Availability of length frequency data, by fishery and year (1980–2013). Note that no length frequency data are available at all for 1950–82.



KAW (Gillnet samples): size (in cm)



KAW (Gillnet): no. of samples ('000)

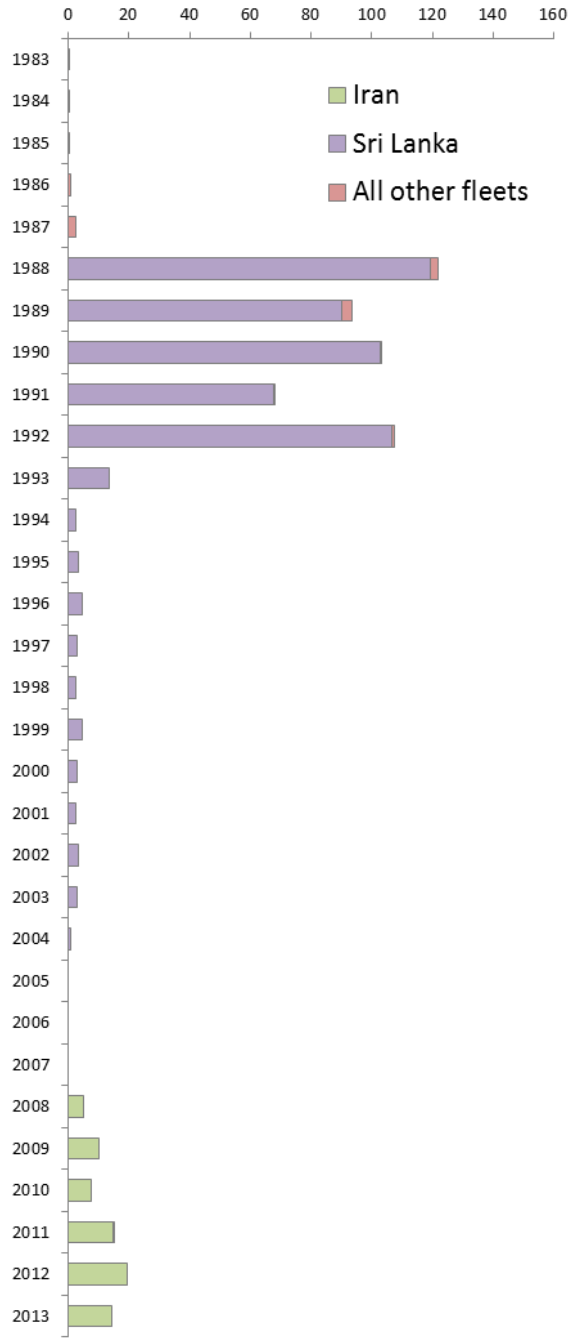


Fig. 5. Kawakawa: Left - Length frequency distributions for gillnet fisheries (total amount of fish measured by 1cm length class) derived from data available at the IOTC Secretariat. Right - number of kawakawa specimens sampled for lengths, by fleet (gillnet only).

STOCK ASSESSMENT

Two modelling methods, posterior-focused catch-based assessment method and catch-based stock reduction analysis (SRA) were applied to kawakawa in 2014. Surplus Production Model (SPM) was also applied to kawakawa CPUE data. However, this classical method had problems in convergence due to non-informative CPUE data so the results from the SPM Model were not included in the final report as it performed poorly and yielded unrealistic results.

The trajectories for both approaches were very similar and gave similar outcomes, and for reporting and stock status advice would use the PFCRA approach as it was statistically robust. Noting that the Commission adopted Resolution 12/01 *On the implementation of the precautionary approach*, which effectively means that in a situation of increased uncertainty (e.g. data poor situations), a more precautionary approach should be undertaken when developing advice and possible management actions, this approach, combined with the weight-of-evidence available (stock status indicators from data poor assessment approaches, species biology, fishery indicators), should be used to determine stock status for kawakawa (Table 7).

The stock status management advice for kawakawa should be based on the catch-based stock reduction method, combined with the known species and fishery attributes for status interpretation purposes (PFCRA). The approach presented is useful to assess stock status in the near term, while more traditional stock assessment approaches in the region are deferred until more data are collected and submitted in accordance with the IOTC data recording and reporting requirements for neritic tunas.

TABLE 7. Kawakawa (*Euthynnus affinis*) stock status summary

Management Quantity	Aggregate Indian Ocean
2013 catch estimate	168,954 t
Mean catch from 2009–2013	150,387 t
MSY (80% CI)	144 K t [113–167 Kt]
Data period used in assessment	1950–2012
F_{MSY}	0.51 (n.a.)
B_{MSY}	217 Kt (168–152 Kt)
F_{2012}/F_{MSY} (80% CI)	0.97 (0.62–1.61)
B_{2012}/B_{MSY} (80% CI)	1.13 (0.64–1.4)
SB_{2012}/SB_{MSY}	–
B_{2012}/B_0 (80% CI)	0.57 (0.32–0.7)
SB_{2012}/SB_0	–
$B_{2012}/B_{0, F=0}$	–
$SB_{2012}/SB_{0, F=0}$	–

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