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		2013 stock status determination
Indian Ocean	Catch[2] 2012: Average catch[2] 2008–2012:	152,391t 147,951t	
	MSY: F_{2012}/F_{MSY}: B_{2012}/B_{MSY}: SB_{2012}/SB_0:	126,000–132,000 t 0.9–1.06 1.09–1.17 unknown	

[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. There remains considerable uncertainty about stock structure and about the total catches. Preliminary analysis using a stock-reduction analysis (SRA) approach indicates that the stock in near optimal levels of F_{MSY}, or exceeding these targets, although stock biomass remains above the level that would produce MSY (B_{MSY}). Due to the quality of the data being used, the simplistic approach used here, and the rapid increase in kawakawa catch in recent years, some measures need to be taken to slow the increase in catches in the IO Region, despite the stock status remaining classified as **uncertain** (Table 1). A separate analysis done on a sub-population (north-west Indian Ocean region) 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. 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.

Outlook. 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, and the stock is likely to currently be fully exploited. Research emphasis on improving indicators and exploration of stock structure and stock assessment approaches for data poor fisheries are warranted. The following should be noted:

- the Maximum Sustainable Yield estimate for the whole Indian Ocean is estimated to be between 120,000 and 132,000 t.
- annual catches urgently need to be reviewed.
- 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 slow the increase in catches in the Indian Ocean.

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 13/07 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 2 outlines some key life history parameters relevant for management.

TABLE 2. 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, handlines and trolling (Table 3; 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] (Fig. 2).

[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 unreporting fisheries for which catches had to be estimated.

TABLE 3. Best scientific estimates of the catches of kawakawa by type of fishery for the period 1950–2012 (in metric tonnes) (Data as of October 2013).

Fishery	By decade (average)						By year (last ten years)									
	1950s	1960s	1970s	1980s	1990s	2000s	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Purse seine	100	385	2,446	11,679	23,749	34,647	30,038	32,429	33,154	38,970	39,424	41,854	44,419	42,599	42,229	40,882
Gillnet	2,179	4,098	9,205	16,695	29,793	50,312	44,060	45,762	46,000	52,600	55,404	66,121	63,539	57,997	69,471	75,007
Line	2,102	3,642	7,164	11,320	16,741	22,445	19,316	22,782	20,797	22,109	23,410	29,113	29,286	29,506	30,743	27,420
Other	295	719	1,357	2,690	5,132	7,853	6,594	7,555	7,618	7,954	9,639	9,830	10,266	10,484	9,908	9,082
Total	**4,676**	**8,844**	**20,172**	**42,383**	**75,415**	**115,257**	**100,008**	**108,529**	**107,569**	**121,634**	**127,877**	**146,918**	**147,510**	**140,585**	**152,351**	**152,391**

The catches provided in Table 3 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 40,000 t mark in the mid-1980's and 152,000 t in 2012, the highest catch ever recorded for this species in the Indian Ocean. In recent years the majority of the catches of kawakawa have been taken in the East Indian Ocean. In recent years (2010–12), the countries attributed with the highest catches are Indonesia (25%), India (21%), Iran (14%), Pakistan (9%) and Malaysia (7%) (Fig. 2).

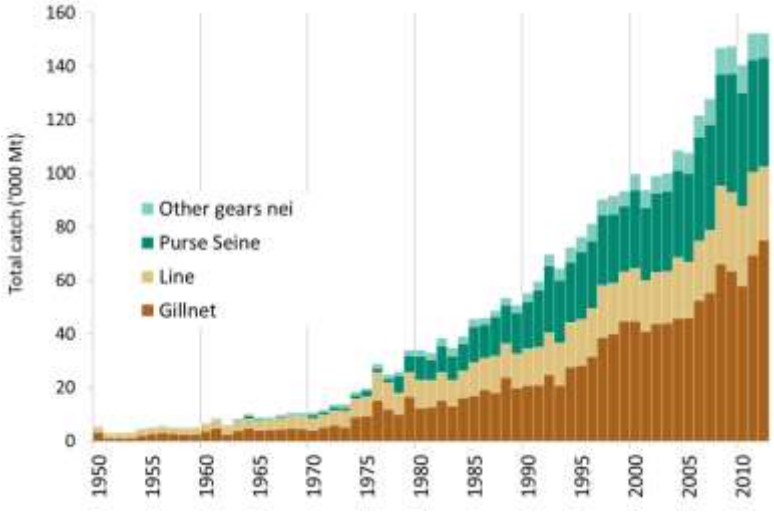


Fig. 1. Kawakawa: Annual catches by gear recorded in the IOTC database (1950–2012) (Data as of October 2013).

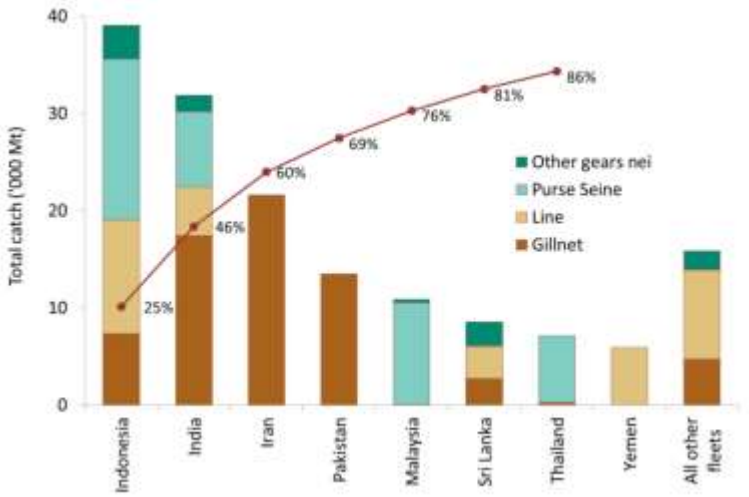


Fig. 2. Kawakawa: Average catches in the Indian Ocean over the period 2010–12, by country. Countries are ordered from left to right, according to the importance of catches of kawakawa reported. The red line indicates the (cumulative) proportion of catches of kawakawa for the countries concerned, over the total combined catches of this species reported from all countries and fisheries (Data as of October 2013).

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, in a recent review it was indicated that the catches of kawakawa had been overestimated by Indonesia. While the new catches estimated for the kawakawa in Indonesia remain uncertain, representing around 25% (38% in the past) of the total catches of this species in the Indian Ocean in recent years (2010–12), 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 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 21% (17% in the past) of the total catches of this species in the Indian Ocean in recent years.
- 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 Malaysia and Thailand).
- 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 European Union 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 European Union recently reported discard levels of kawakawa for its purse seine fleet, for 2003–07, estimated using observer data.
- Changes to the catch series: While the overall change to the total catch of kawakawa has not changed substantially for recent years since the WPNT meeting in 2012, there have been large revisions to the catch estimates for individual countries and breakdown by gear; specifically a decrease to catches estimated for Indonesia, and increases to the catch series for Sri Lanka, Pakistan, and India following reviews of the data by the IOTC Secretariat in 2012 and 2013.

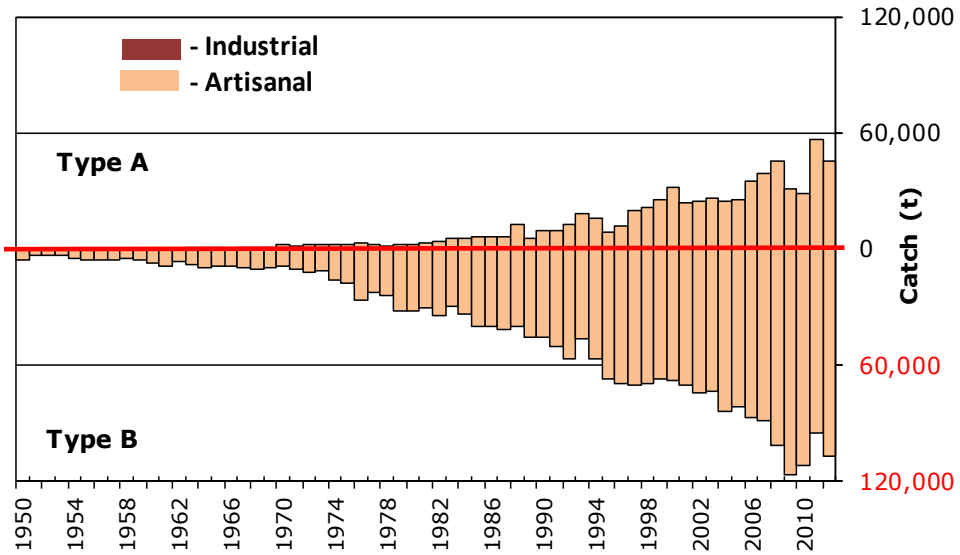


Fig. 3. Kawakawa: Uncertainty of annual catch estimates for kawakawa (1950–2012). Catches below the zero-line (Type B) refer to fleets that do not report catch data to the IOTC (estimated by the IOTC Secretariat), do not report catch data by gear and/or species (broken by gear and species by the IOTC Secretariat) or any of the other reasons provided in the document. Catches over the zero-line (Type A) refer to fleets for which no major inconsistencies have been found to exist. Light bars represent data for artisanal fleets and dark bars represent data for industrial fleets (Data as of October 2013).

Kawakawa – Effort trends

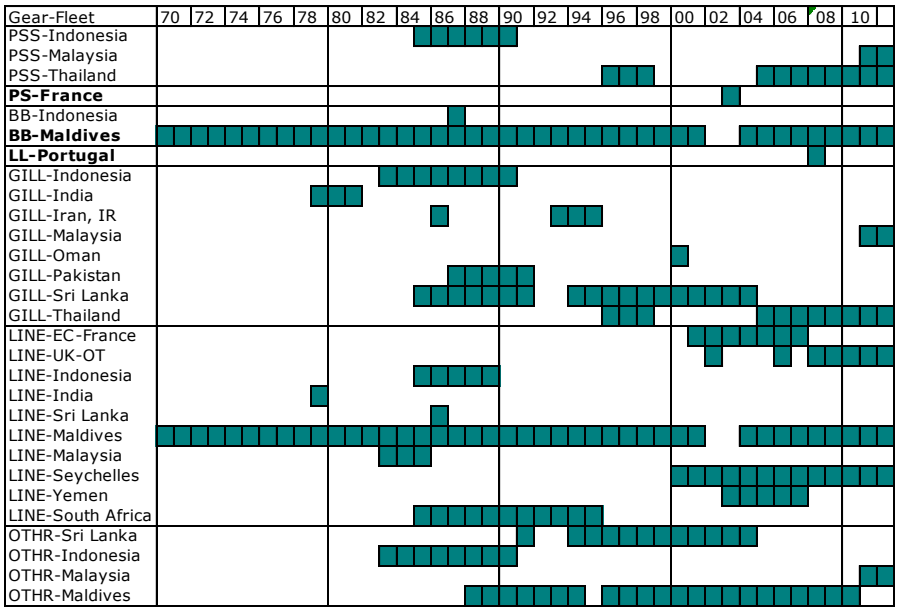
Effort trends are unknown for kawakawa in the Indian Ocean.

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

Standardised CPUE series were developed for some fisheries in 2013 (see IOTC–2013–WPNT03–R). Catch-and-effort series are available from some fisheries but they are considered highly incomplete. In most cases catch-and-effort data are only available for short periods (Table 4). 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.

Kawakawa catch in Oman is less than 2.5%/yr on average for the Indian Ocean which may not be representative of the entire Indian Ocean stock. CPCs are therefore encouraged to collect catch and effort data to compute CPUEs in their respective fisheries (Fig. 5).

TABLE 4. Kawakawa: Availability of catches and effort series, by fishery and year (1970–2012)[2]. Note that no catch and effort data are available for the period 1950–69 in the IOTC Secretariat databases



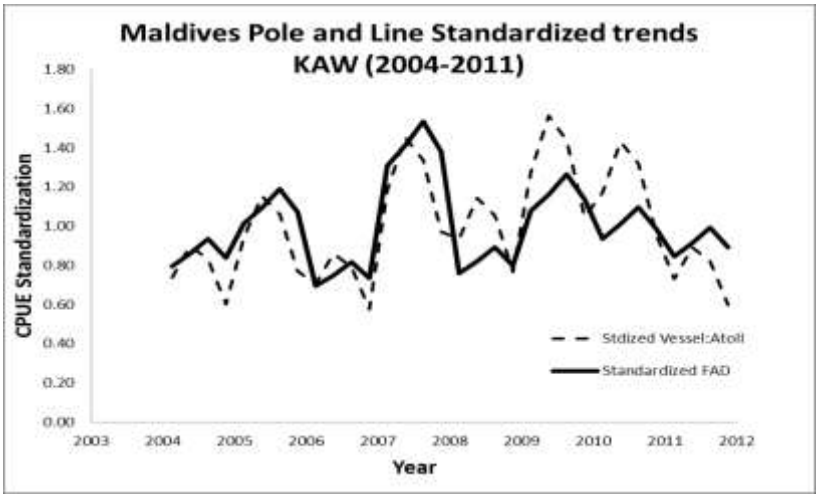


Fig. 4. Kawakawa: Maldives pole-and-line standardized index of abundance (CPUE) using two models (standardised by vessel and atoll; and standardised by FADs), from 2004–2011.

[2] Note that the above list is not exhaustive, showing only the fisheries for which catches and effort are available in the IOTC database. Furthermore, when available catches and effort may not be available throughout the year existing only for short periods

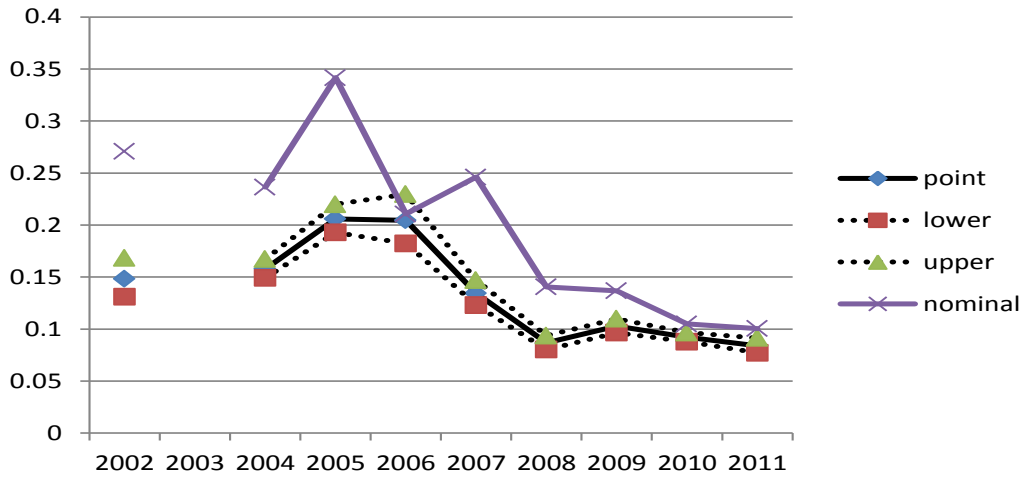
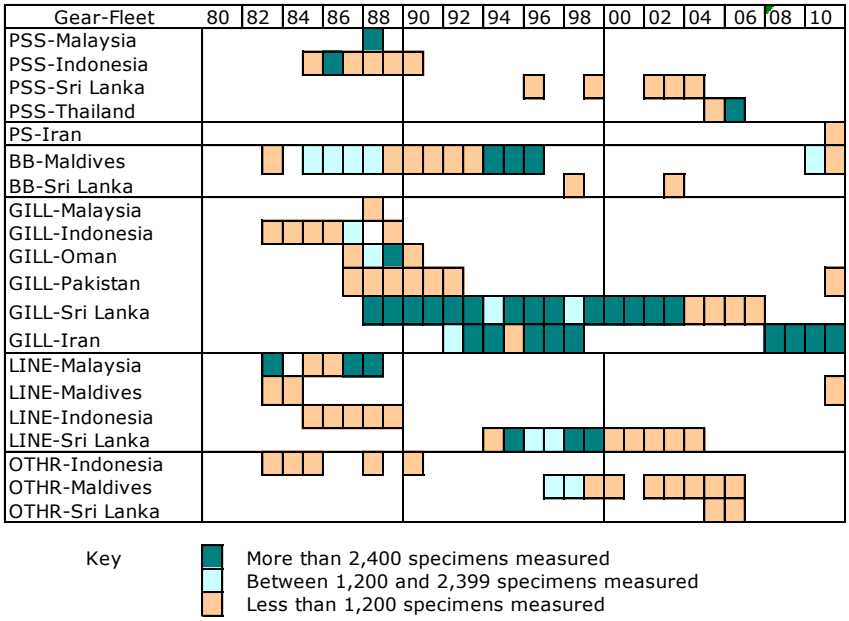


Fig. 5. Kawakawa: Sultanate of Oman gillnet standardized index of abundance (CPUE), its 95% confidence intervals and nominal CPUE, from 2002–11.

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 (Fig. 5). 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 only be assessed for Sri Lankan gillnets but the amount of specimens measured has been very low in recent years (Table 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, data collection did not continue after the end of the IPTP activities.
- Catch-at-Size(age) data are not available for the kawakawa due to the paucity of size data available from most fleets (Table 5) and the uncertain status of the catches for this species. Length distributions derived from the data available for some selected fisheries are shown in Fig. 5.
- Sex ratio data have not been provided to the IOTC Secretariat by CPCs.

TABLE 5. Kawakawa: Availability of length frequency data, by fishery and year (1980–2012)[3]. Note that no length frequency data are available for the period 1950–82



[3] Note that the above list is not exhaustive, showing only the fisheries for which size data are available in the IOTC database. Furthermore, when available size data may not be available throughout the year existing only for short periods

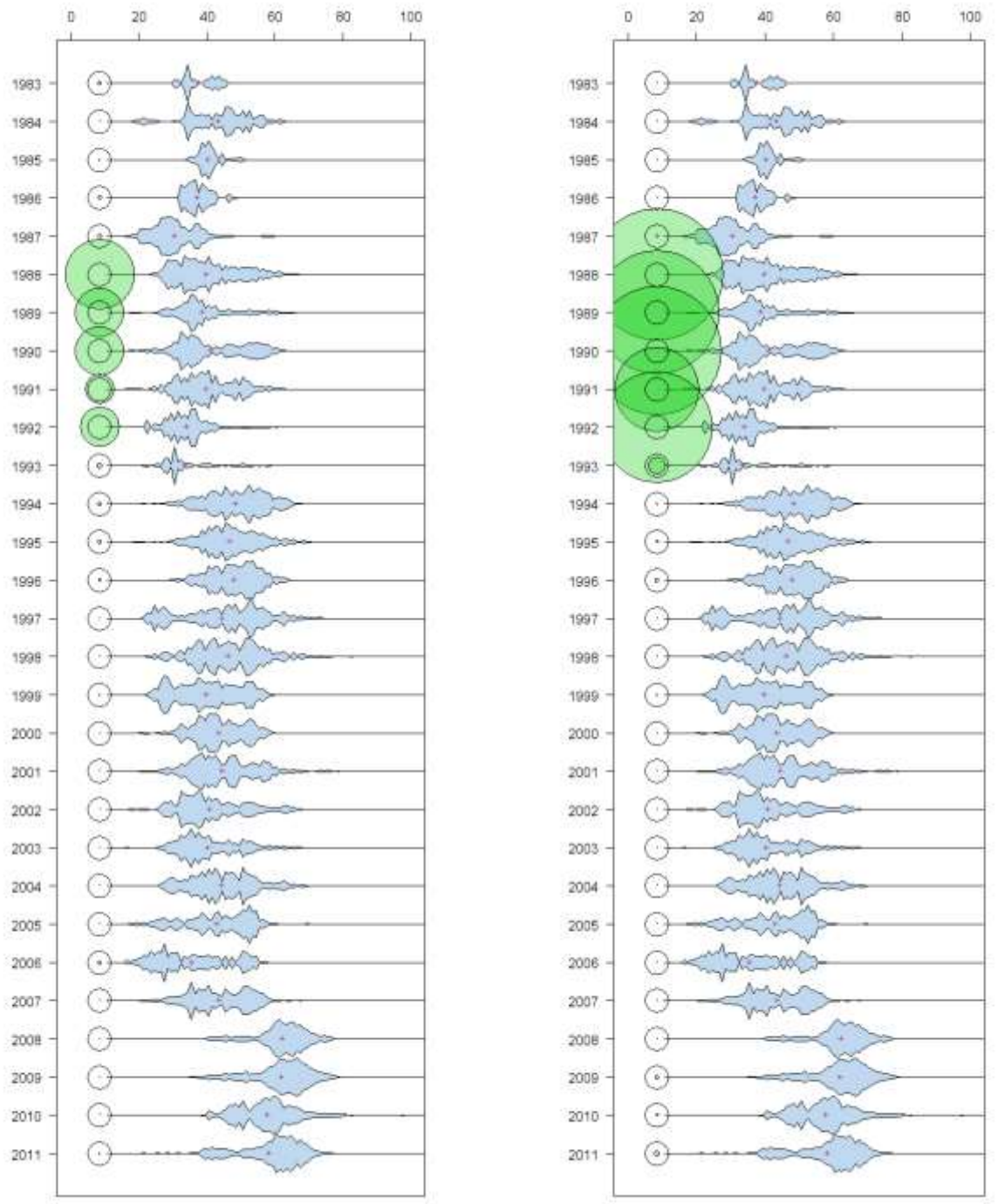


Fig. 5. Kawakawa: Length frequency distributions (total amount of fish measured by 1cm length class) derived from the data available at the IOTC Secretariat for selected fisheries and periods, by gear and year. The black outline circles (to the left of each chart) indicate the minimum sampling standard set by IOTC of one fish per metric tonne; the green proportional circles indicate the relative sampling coverage in each year (i.e., circles with areas greater than the minimum sampling standard indicate relatively high sampling coverage in a given year).

STOCK ASSESSMENT

A preliminary surplus production assessment indicates that the Indian Ocean stock may be fully exploited/over exploited and the current spawning stock size levels may be at optimal spawning stock size (0.99). Further exploratory analysis of

the data available should be undertaken in preparation for the next WPNT meeting. The preliminary estimation of stock indicators was attempted on the catch and effort datasets from the Indian and Thailand fisheries, and the Maldives baitboat and troll line fisheries (described above). However, there is considerable uncertainty about the degree to which this and other indicators represent abundance as factors such as changes in targeting practices, discarding practices, fishing grounds and management practices are likely to interact in the depicted trends. Further work must be undertaken to derive additional stock indicators for this species, because in the absence of a quantitative stock assessment, such indicators represent the only means to monitor the status of the stock and assess the impacts of fishing (Table 6).

TABLE 6. Kawakawa (*Euthynnus affinis*) stock status summary

Management Quantity	Aggregate Indian Ocean
2012 catch estimate	152,391 t
Mean catch from 2008–2012	147,951 t
MSY (80% CI)	126,000–132,000 t
Data period used in assessment	1950–2011
F_{2011}/F_{MSY} (80% CI)	0.9–1.06
B_{2011}/B_{MSY} (80% CI)	1.09–1.17
SB_{2011}/SB_{MSY}	–
B_{2011}/B_0 (80% CI)	–
SB_{2011}/SB_0	–
$B_{2011}/B_{0,\ F=0}$	–
$SB_{2011}/SB_{0,\ F=0}$	–

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