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Background Paper: SFA 02

Results of the Catch Assessment Survey (CAS) 2011 and Research Activities for Artisanal Fisheries

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1. Artisanal fisheries statistics 2011

1.1 Catch and effort
1.1.1 Catches

Based upon output from the CAS, which has been implemented since 1985, this section of the report reviews the performance of the major artisanal fisheries for 2011 and summarizes major trends.

In 2011, catches generated by the artisanal fisheries showed an improvement over the previous year, with 2,870.1 MT landed. This represent an 11% increase over 2,595.4 MT landed in 2010.However, landings remained lower than the long term (26- years) average annual catch of 4,306 MT, (Figure 1). Compared to 2010, landings on Mahe increased by 266 MT (11%), whereas landings on Praslin increased by only 8 MT (3%).The decline in catch during the past three years was partly due to decline in fishing effort (Figure 3). From 2008 to 2011, in term of fishing effort, harpoon, handline and net fishery recorded a decrease of 71%, 40% and 6% respectively. Another factor contributing toward the decline in catch was the effect of the Somalian piracy operating inside of the Seychelles EEZ. As a result artisanal fishers are going out less often and on shorter trips because of fear of pirates attack.
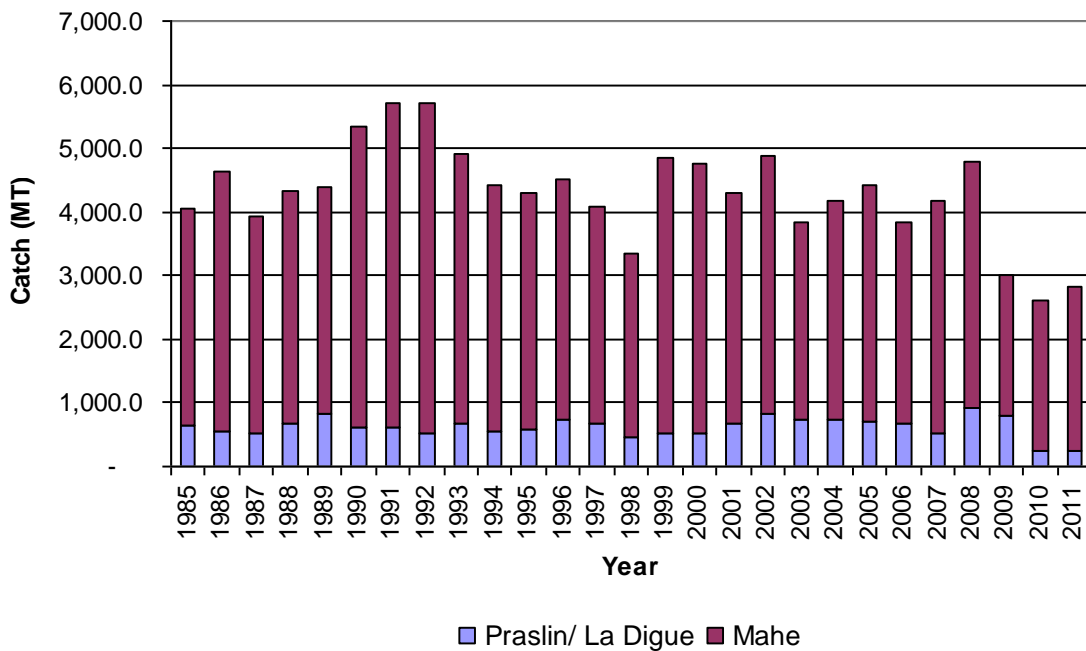

Figure 1. *Artisanal catch (t) for Mahé and Praslin/La Digue: 1985 to 2011*

In terms of catch by gear categories, the trap fishery, handline & trap fishery, handline fishery and nets fishery all recorded increase of 18%, 10%, 9% and 2% respectively. Harpoon fishery recorded a decrease of 10% over the previous year (Figure 2).
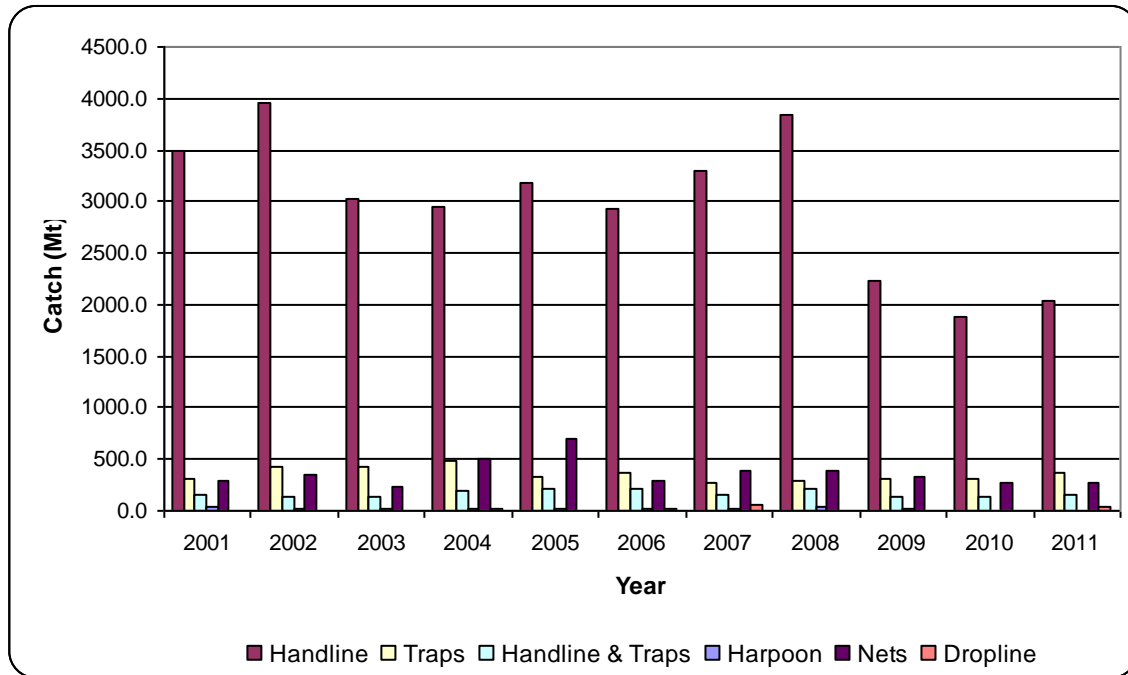

Figure 2. *Catch (MT) by gear category for 2001 to 2011*

The composition of the total artisanal catch by vessel category was dominated by whalers (51.8%), followed by outboard (33.1%) (Table 1).

Table 1. *Percentage (%) of annual catch landed by major vessel types, including foot fishermen: 2001 – 2011.*

Boat Type	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Pirogue	1.2	0.6	1.1	1.3	1.6	2.1	0.6	0.6	0.8	0.6	0.5
Outboard	25	25.4	27.4	34.3	36.2	28.3	25	25.4	37.6	33.9	33.1
Whalers	66.8	68.9	64.1	54.2	50.4	56.9	63.3	64.2	47.6	47.8	51.8
Schooners	6	4.5	6.8	9	11.1	11.5	9.3	8.9	13.3	17.1	12.9
Foot Fishers	1.1	0.6	0.6	0.9	0.7	0.6	0.4	0.8	0.5	0.6	0.4
Dropline vessels	0	0	0	0.3	0	0.6	1.4	0.1	0.2	0	1.3

1.1.2 Effort

As determined from monthly mean estimates of the number of vessels in operation, whereby the maximum value is used as an indicator of fleet activity for the year, the fishing activities of whaler, schooner and dropline vessels increased in 2011 compared to 2010, whilst those of pirogue and outboard vessel have decrease. The logbook returns from the sport fishery continued to be poor, precluding estimation of the number of vessels engaged in that fishery (Table 2).

In term of fishing effort net and trap fishery recorded an increase of 31% and 13% respectively whilst harpoon and handline fishery recorded a decrease of 23% and 16% respectively (Figure 3).
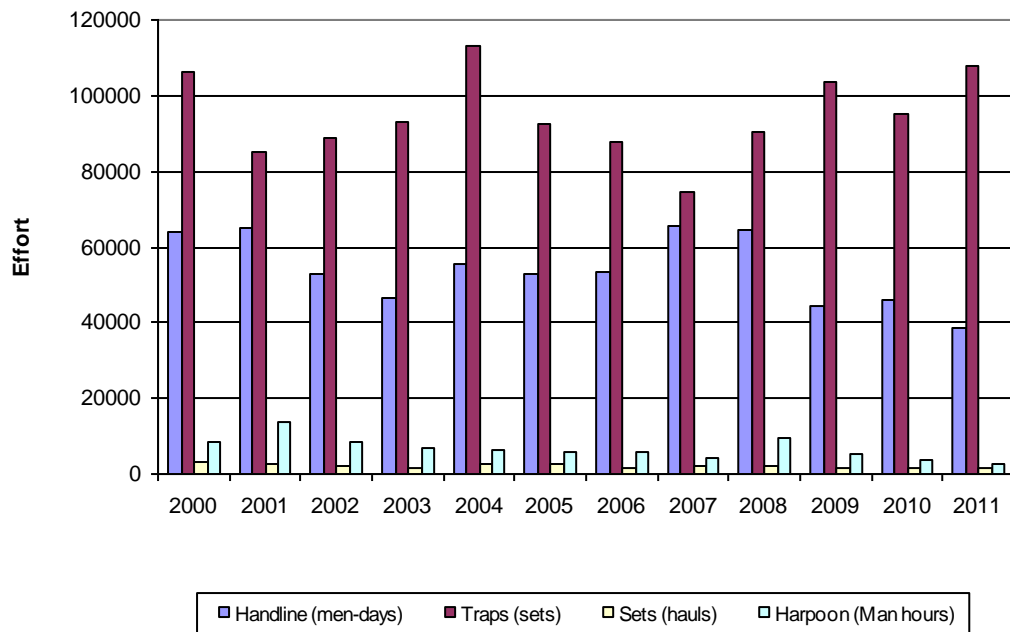

Figure 3. *Fishing effort for the major gear types for 2001-2011*

Table 2. *Maximum monthly fishing vessels in operation: 2006 to 2011.*

Vessel Type	2006	2007	2008	2009	2010	2011
Pirogue*	27	22	19	19	16	15
Outboard*	242	243	293	324	316	294
Whaler	94	105	107	113	105	106
Schooner	26	22	22	27	27	32
Sport	**	**	**	**	**	**
Dropline	4	5	3	2	1	5

*Includes part time fishing vessels. ** Data not available due to poor logbook returns

1.2 Catch Rates

Catch rates (CPUE) for the handline fisheries increased from 43.9 kg/man day in 2010 to 59 kg/man day in 2011 (Figure 4a). The whaler handline fishery recorded the highest CPUE compare to the other vessel types. An increase was observed in trap fishery from 3.8 kg/trap in 2010 to 4.0 kg/trap in 2011 (Figure 4b) whilst net and harpoon fishery recorded a decrease in the catch rate from 191.3 kg/set and 12.7 kg/man hour in 2010 to 148.6kg/set and 10.8 kg/man hour 2011(Figure 4c & 4d).
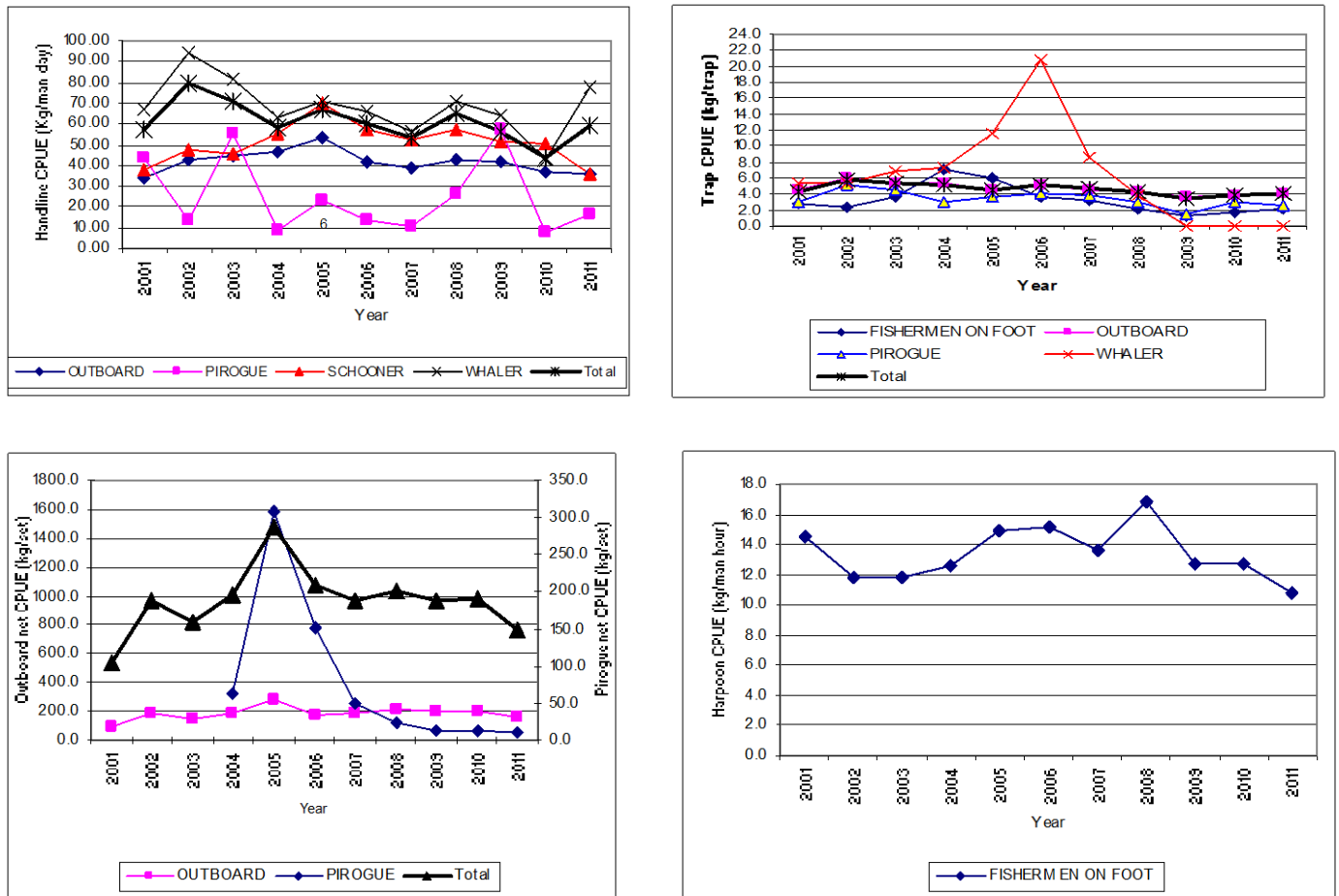

Figure 4. *Trends in catch rates (CPUE) for the major vessel and gear combinations in the (a) handline fisheries, (b) trap fisheries, (c) gill net fishery and (d) the harpoon (octopus) fishery for the period 2001-2011.*

1.3 Species composition

In term of species composition, trevally (*Carangoides* and *Caranx spp.*) and red snapper (*Lutjanidae*) were the two species dominating the catch for 2011. Catches of trevally increased from 675 MT in 2010 to 828 MT in 2011 whereas catches for red snapper

decreased from 561 MT to 504 MT .Catches of emperors, groupers, mackerel and jobfish all recorded an increase of 57%, 29%, 26% and 14% respectively compared to the previous year whilst the rabbitfish (Cordonier) catch decreased by 3% from 255 MT to 248 MT (Table 3).

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Table 3. Percentage (%) species/species-group composition of artisanal catch for the period 2006-2011

| Species Group		Percentage (%) of total annual catch					
English/Scientific	Kreol	2006	2007	2008	2009	2010	2011
Trevally (*Carangoides* spp.)	Karang	19.9	19	25.8	17.9	26.2	28.87
Red snapper (*Lutjanus* spp.)	Bourzwa, Bordomar	26.7	29.5	22	20.4	21.6	17.57
Jobfish (*Aprion virescens*)	Zob gri	15.5	15.8	15.8	16.9	13.6	14.03
Emperors (*Lethrinus* spp.)	Kaptenn	4.4	4.6	7.2	7.2	3.7	5.31
Bonito (*Euthynnus affinis*)	Bonit	1.9	1.9	3.1	5	1.8	2.97
Groupers (*Epinephelus* spp.)	Vyey	3.2	3.8	3.2	2.7	3	3.51
Rabbitfish (*Siganus* spp.)	Kordonnyen	7.2	5.1	4	7.3	9.8	8.62
Mackerel (*Rastrelliger* sp.)	Makro dou	4.8	7.5	6.1	2.9	6.7	7.63
Others		16.4	12.8	12.8	19.7	13.6	11.49
Total annual catch (MT)		**3845**	**4181.4**	**4777.1**	**3019.1**	**2595.4**	**2870.1**
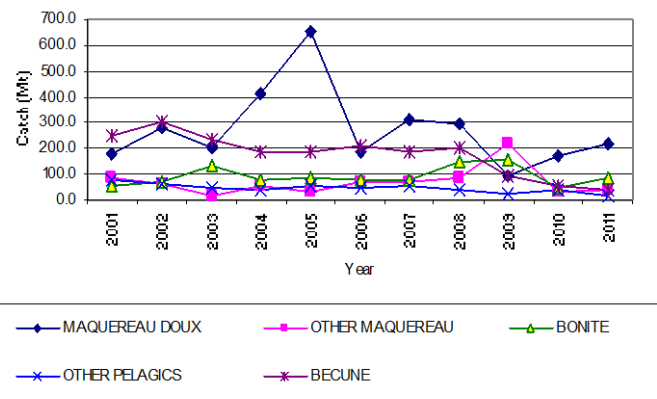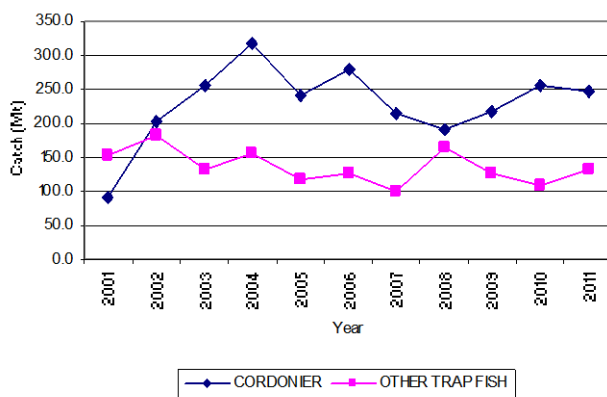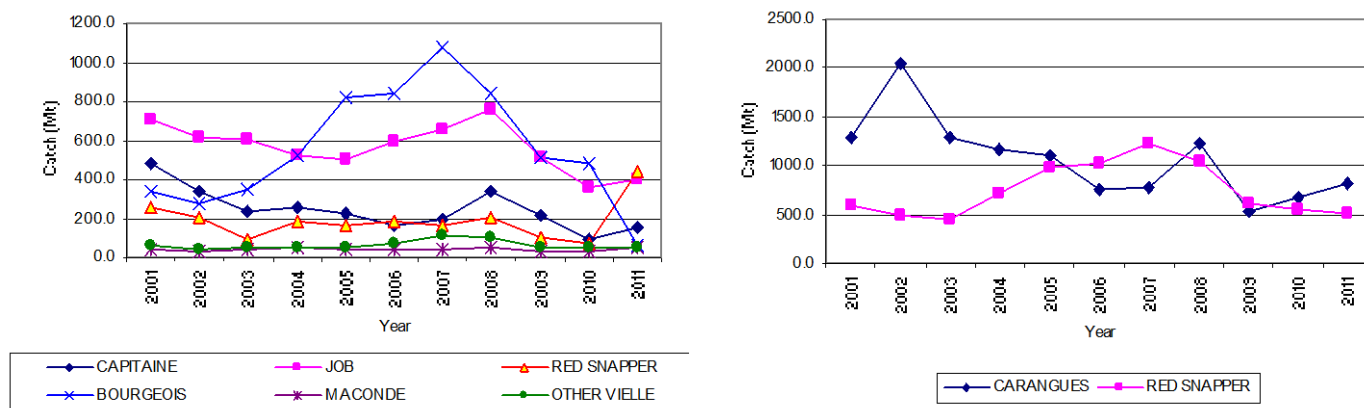
Figure 5*. Trends in catches (Mt) for the major species and species groups for the periods 2001-2011, in terms of (a) comparison of the dominant species/groups in the artisanal catch, (b) semi-pelagic fisheries, (c) demersal, and (d) trap fisheries.*

1.4 Update on the lobster fishery

The 2011/2012 fishing season was opened from December to March inclusive. The total catch for the season was estimated at 3.3 MT compared to 2.4 MT for the 2010/2011 fishing season. Similarly to previous seasons, the majority of lobsters were caught using the snorkelling fishing technique. Based on logbook submissions, a total of 206 trips were undertaken during the season. The estimated CPUE was 16.0 kg/trip. Similarly to previous seasons the catch composition of lobsters was dominated by pronghorn spiny lobster (*Panulirus penicillatus*), which accounted for 71% of the catch, followed by the long legged spiny lobster (*Panulirus longipes*) with 23%.

2. Research Activities

2.1. Stock assessments

In 2011, the number of size samples collected was insufficient to conduct stock assessment for the three key indicator species. However, we carried out stock assessments for the Trap fishery, Siganids, Grouper fishery and *Epinephelus chlorostigma* using catch and effort time series data (1991-2011). The assessments were carried out using the Fisheries Management Science Programme (FMSP) tool, CEDA.

The catch and effort data was fitted to the Schaefer and Fox production models using a range of initial proportion estimates and error models. The appropriate models were chosen by examining the residual plots of the models to examine the fit and eliminating

models that produced unrealistic estimates on maximum sustainable yield (MSY) or final biomass.

2.1.1. Trap fishery

The catch and effort data for the trap fishery was analysed in CEDA. The most appropriate models were the Schaefer production model using the log transform error model with initial proportions of 0.3, 0.4 and 0.5.

The average estimated MSY was 422 Mt. The current catch in 2011 (380 Mt) is below the estimate of MSY. However, the current catch is slightly above the lower estimate of MSY (Table 4).

Table 4. Summary results of the production models. Estimates of MSY, final biomass, current catch and level of certainty.

Year	MSY (95% CI) (Mt)	Final Biomass (Mt)	Current catch (Mt)	Level of certainty
2011	422 (353-529)	6678	380	Medium

2.1.2. Siganids

The catch data of siganids and effort data for the trap fishery was analysed in CEDA. The most appropriate models were the Schaefer production model using the gamma error model with initial proportions of 0.3 and 0.5.

The average estimated MSY was 299 Mt. The current catch in 2011 (247 Mt) is below the estimate of MSY. However, the current catch is slightly above the lower estimate of MSY (Table 5). Given the fact that there is a possibility that the effort might be overestimated, caution should be taken in interpreting the estimates of MSY.

Table 5. Summary results of the production models. Estimates of MSY, final biomass, current catch and level of certainty.

Year	MSY (95% CI) (Mt)	Final Biomass (Mt)	Current catch (Mt)	Level of certainty
2011	299 (242-418)	991	247	Medium

2.1.3. Grouper fishery

The catch and effort data of groupers for the schooner and whaler fleets was analysed in CEDA. The most appropriate models were the Fox production model using the least squares and log transform error model with an initial proportion of 0.5.

The average estimated MSY was 101 Mt. The current catch in 2011 (77 Mt) is below the lower estimate of MSY (Table 6). Given the fact that there is a possibility that the effort might be overestimated, caution should be taken in interpreting the estimates of MSY.

Table 6. Summary results of the production models. Estimates of MSY, final biomass, current catch and level of certainty.

Year	MSY (95% CI) (Mt)	Final Biomass (Mt)	Current catch (Mt)	Level of certainty
2011	101 (96-107)	299	77	Medium

2.1.4. *Epinephelus chlorostigma*

The catch and effort data of *Epiniphelus chlorostigma* for the schooner and whaler fleets was analysed in CEDA. The most appropriate models were the Fox production model using the least squares, log transform and gamma error model with an initial proportion of 0.5.

The average estimated MSY was 39 Mt. The current catch in 2011 (40 Mt) is slightly above estimate of MSY (Table 7). However, the current catch is below the upper estimate of MSY. Given the fact that there is a possibility that the effort might be overestimated, caution should be taken in interpreting the estimates of MSY.

Table 7. Summary results of the production models. Estimates of MSY, final biomass, current catch and level of certainty.

Year	MSY (95% CI) (Mt)	Final Biomass (Mt)	Current catch (Mt)	Level of certainty
2011	39 (33-43)	121	40	Medium