

SEYCHELLES FISHING AUTHORITY TECHNICAL REPORT

REPORT ON THE SPINY LOBSTER FISHERY

Summary of Fishing Activity for the 2013-2014 season



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SFA Fisheries Research Section

May 2014

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1. Introduction

The Seychelles artisanal spiny lobster fishery targets shallow water lobster stocks around the main granitic islands. The main species of lobsters caught are Homard Grosse Tete (*Panulirus penicillatus*), Homard Rouge (*P. longipes*), Homard Vert (*P. versicolor*) and Porcellene (*P. ornatus*). The preferred habitats for these species are fringing carbonate reefs and granite reefs which provide good shelter for the lobsters.

The fishery normally operates after dusk, between 6 and 9 pm and ends anytime during the night until dawn around 6 am. Fishing grounds are commonly accessed using small outboard vessels. An average fishing trip generally consists of two to three men fishing for approximately five hours. Several methods are used to catch lobsters. The most popular technique involves the use of snorkelling gear/skin diving whereby a fisher uses an underwater flashlight to extract lobsters from its shelter. To a lesser extent, SCUBA gear and bamboo traps are used but accounts for a small percentage of the catch.

The spiny lobster fishery in Seychelles is a licensed and seasonally-managed fishery with fishers applying for licences prior to the opening of the season, which typically last 3 months in duration. The current management regulations in place for the spiny lobster fishery are:

- i. Restrictions on the number of licenses
- ii. Seasonal restrictions (the fishery is typically opened for a 3 month period)
- iii. Minimum size (75 mm carapace length for all species)
- iv. Prohibition to retain berried females

In 1992, the Seychelles Fishing Authority (SFA) established a monitoring programme for this fishery (Mees, 1992). Since then, reports have been produced at the end of each season outlining several aspects of the fishery including research and management. After 3 or more consecutive open seasons, a more detailed analysis is carried out which focuses on assessing temporal and spatial trends in stock indicators such as catch rates and size distributions (see Robinson et al. 2009 & Govinden and Hollanda 2013). Such analyses are used to determine the status of the fishery and the lobster stocks. Following the opening of the fishery for 3 consecutive seasons, from 2010 to 2013, concerns were raised over the status of the lobster stock following declines in key stock indicators. A management decision was taken to open

the 2013/2014 fishing season for a period of only one month in order to reduce the fishing pressure on the lobster stock.

The fishery was opened from the 20th of December 2013 to the 20th of January 2014. A reduced refundable compliance bond of SCR1500 was maintained to ensure that licence holders submitted their logbooks and sales records at the end of the fishing season. A total of twenty fishing licences were offered to fishermen, with 12 for Mahe, 5 for Praslin and 3 for La Digue. However, only 8 fishermen applied and was subsequently issued a licence, of which 6 was from Mahe and 2 from Praslin. In comparison, for the 2012/2013 season, fifteen licences were issued to fishermen, of whom 11 were from Mahe and 4 was from Praslin.

This report presents analyses of fisheries-dependent data collected for the spiny lobster fishery during the 2013/2014 fishing season. It also compares the stock indicators, namely the size structure of lobsters and the harvest rate between the 2012/2013 and 2013/2014 fishing season.

2. Sampling methodology and analysis

During the 2013/2014 season data was collected from fishermen operating on Mahe and Praslin through three different sources:

- a) **Catch and Effort log:** Each licensed fishermen was given a logbook to record information on their fishing activities. Information collected included information on catch, effort and fishing location.
- b) **Sampled Catch and Effort log:** SFA technicians sampled the landed catch directly whenever possible. Information on the species caught, weight and length measures were collected. Interviews were also conducted to determine total effort and fishing location.
- c) **Receipt Book:** At the end of the fishing season, receipt books completed by licensed fishermen with sales of lobsters were collected to derive total sales. The fishermen recorded the number and weight of lobsters sold.

The total catch of lobsters caught for the season was derived from the sum of the weight of lobsters from the sampled catch and effort log and the raised calculated weight of lobsters from the catch and effort log for each species. The raised weight was calculated from the average estimated weight multiplied by the number of lobsters caught for each species. The average weight for each species was derived from the total number and weight of lobsters sampled from the sampled catch and effort log recorded by the technicians.

The total effort was based on the total number of fishing trips undertaken. The catch per unit effort (CPUE) was calculated from the total catch in kg and the total effort. The catch, effort and CPUE and species composition was estimated for the main fishing location groupings.

The length frequency distributions of males and females of the different species of lobsters sampled in 2013/2014 was compared with distributions of lobsters sampled in the previous season (2012/2013) using univariate analysis of variance (ANOVA). Assumptions of the ANOVA model were checked by examining the residual plots for normality of error terms and homogeneity of variances. In addition, homogeneity of variances was checked by running the Bartlett test and the Fligner-Killeen test. A significance level of $\alpha=0.05$ was used throughout the analysis.

3. Results

3.1 Catch, effort and catch per unit effort

Noting that the season was opened for only one month compared to three months for the previous seasons, the estimated total catch for the 2013/2014 fishing season was 608.52 kg. In contrast, for the 2012/2013 season the total catch was 2.11 T. (Figure 1). This represents a decline of 71% in the estimated total catch. The snorkelling technique was the only method used to catch lobsters during the 2013/2014 season.

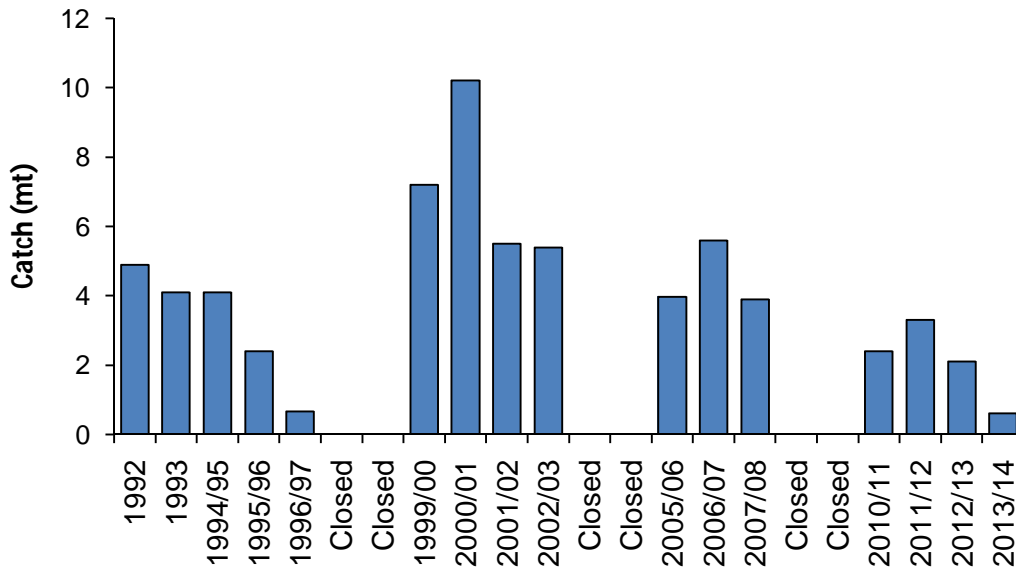


Figure 1: Historical seasonal catch (metric tonnes (MT)) of spiny lobsters from 1992 to 2014

Fishing was concentrated mainly around Mahé, with an estimated landed catch of 281.53 kg, accounting for 46% of the total catch. This was followed by Fregate/Récif with a total estimated catch of 96.98 kg and 71.60 kg from Praslin, accounting for 18% and 12% of the total catch respectively. Other minor fishing sites included the Praslin Ridge and North Island where a total of 39.33 kg and 7.70 kg of lobsters were caught respectively. A total of 111.37 kg of lobsters were caught at unspecified fishing locations, accounting for 18% of the total catch (Figure 2).

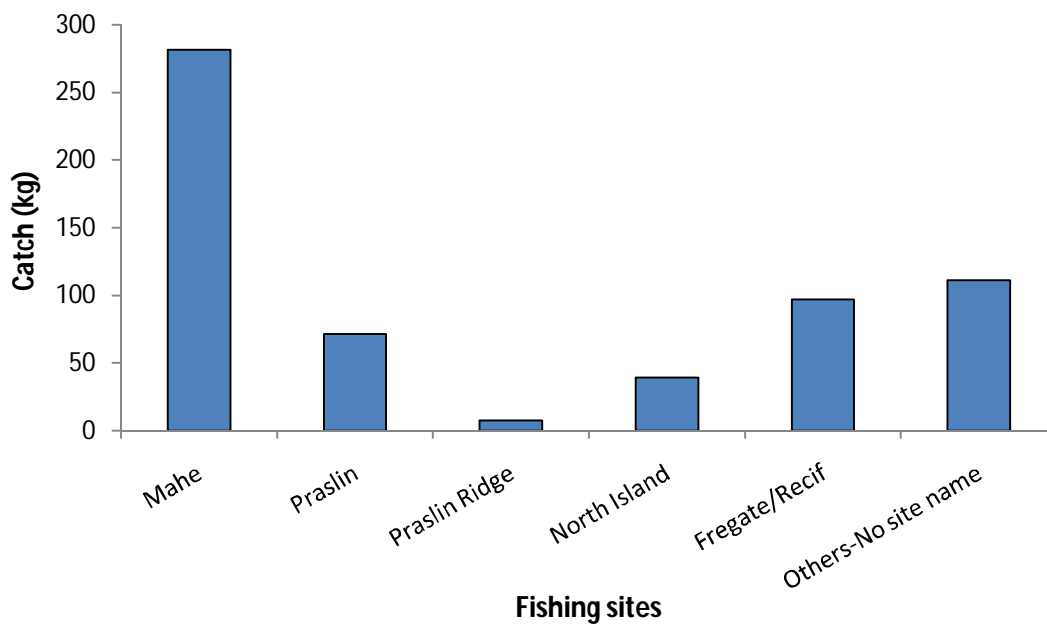


Figure 2: Catches (kg) by major fishing location for the 2013/2014 fishing season

A total of 33 fishing trips were recorded compared to 208 trips in the 2012/2013 season, this represents a decrease of 84% in the total effort. In terms of location, fishing effort were concentrated around Mahé, with a total of 19 trips, followed by Praslin with 4 trips, Fregate /Récif with 2 trips and the Praslin Ridge and North Island with 1 trip each (Figure 3).

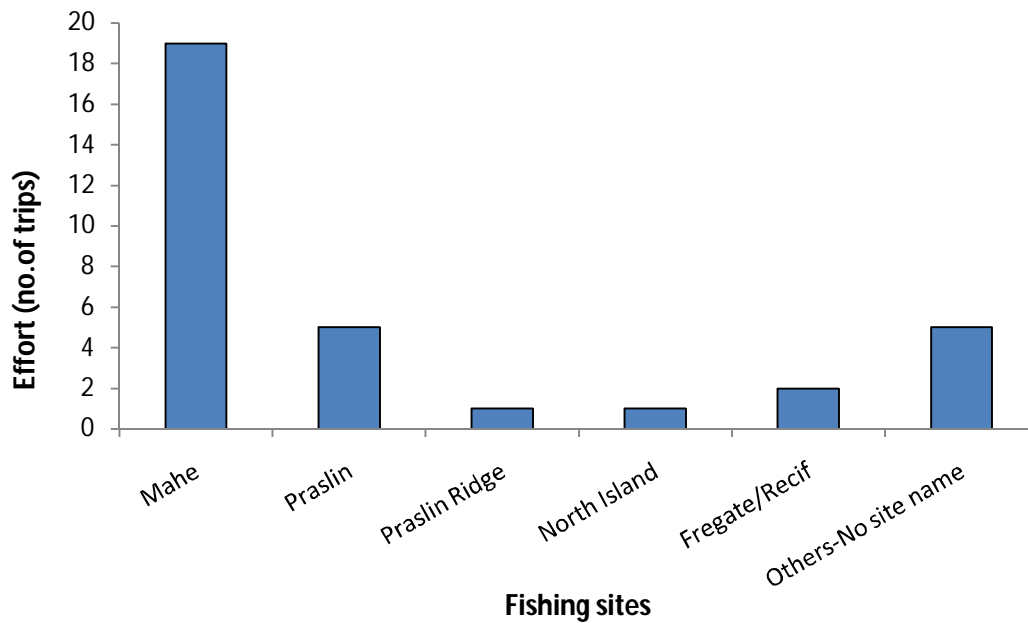


Figure 3: Fishing effort (no. of trips) by major fishing location for the 2013/2014 fishing season.

The estimated CPUE for the 2013/2014 season was 18.44 kg/trip. This represents an increase of 82 % in the CPUE compared to the last season whereby the CPUE was 10.14 kg/trip (Figure 4).

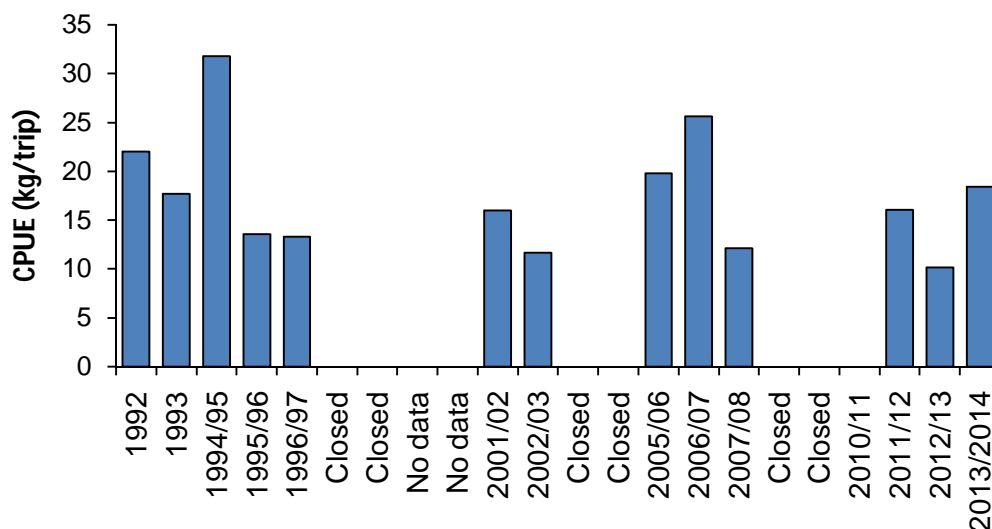


Figure 4: Seasonal CPUE (kg/trip) for open seasons of the lobster fishery between 1992 and 2014. Due to unavailable data for 3 open seasons and underreporting for 2010/2011 season, the CPUE was not calculated

In terms of fishing locations, the highest CPUE was recorded at Fregate/Récif followed by North Island with catch rates of 48.49 kg/trip and 39.33 kg/trip respectively. Mahé and Praslin recorded similar catch rates of 14.82 kg/trip and 14.32 kg/trip respectively, whilst the catch rate at the Praslin Ridge was 7.70 kg/trip (Figure 5).

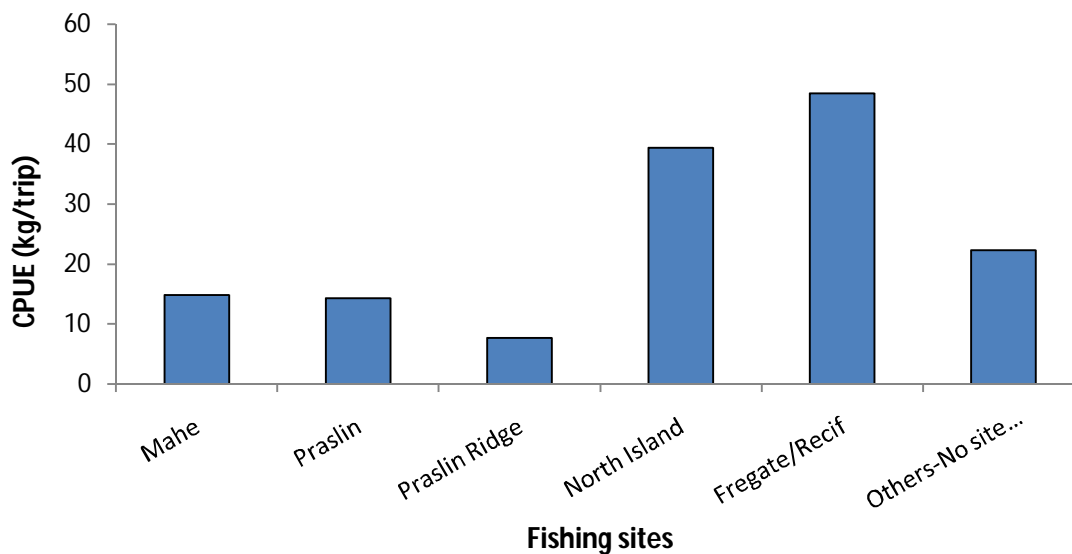


Figure 5: Catch per unit effort (CPUE) (kg/trip) for the 2013/2014 season at the major fishing locations.

3.2 Species composition by location

Catches of the main targeted species during this season was dominated by *P. penicillatus*. A total of 421.53 kg of *P. penicillatus* was caught compared to 1.37 t caught in 2012/2013. The second most dominant species in the catch was *P. longipes*. A total of 184.68 kg of this species was caught in 2013/2014 compared to 0.71 t in 2012/2013. *P. versicolor* was the rarest species caught comprising of only 2.31 kg of the total catch.

By fishing location, *P. penicillatus* was the main species caught around Mahé and North Island, comprising of 84% and 78% of the total catch respectively at those locations. In contrast, *P. longipes* was the most dominant species caught on Praslin and the Praslin Ridge accounting for 60% and 66% of the total catch. Similarly, catches at Fregate/Récif was slightly dominated by *P. longipes* (Figure 6).

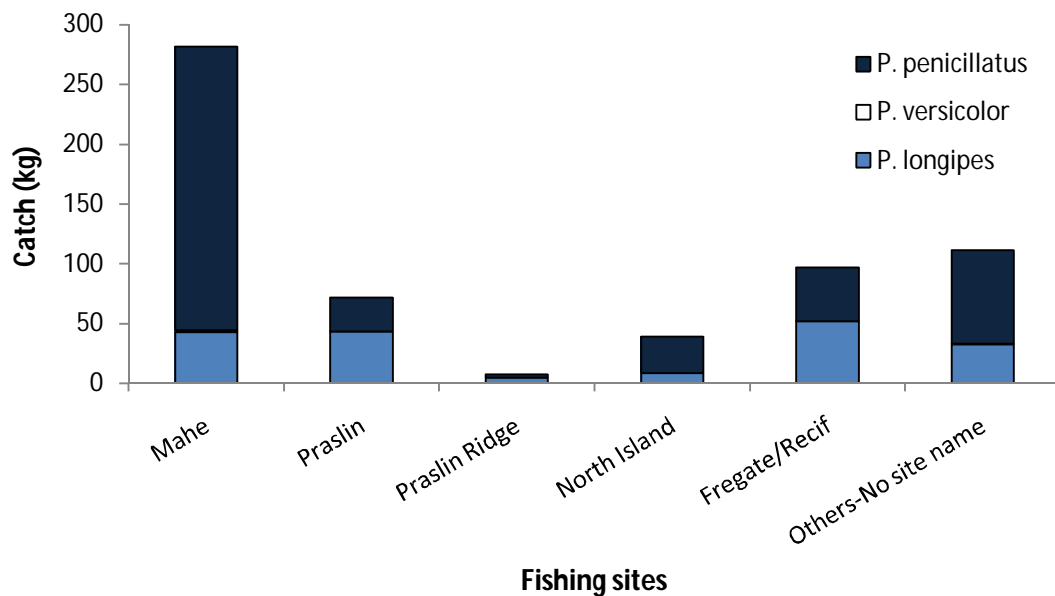


Figure 6: Species compositions of spiny lobster catch from the main fishing locations during the 2013/2014 fishing season

3.3 Size frequency distributions

A total of 249 spiny lobsters were sampled for length and sex during the 2013/2014 season compared to 1490 sampled in 2012/2013 (Table 1). This represents a sampling coverage of about 40% of fishing activities for the 2013/2014 season. Similarly to previous seasons, males dominated females in the samples with a ratio of 1.22.

Table 1: Size frequency sample sizes by species for the last 2 open season

Season	Species	F	M	Total
2012/2013	<i>P. penicillatus</i>	335	488	823
	<i>P. longipeds</i>	284	365	649
	<i>P. versicolor</i>	8	10	18
2013/2014	<i>P. penicillatus</i>	77	109	186
	<i>P. longipeds</i>	34	27	61
	<i>P. versicolor</i>	1	1	2

Note: M=males, F=females

The relative size frequency distributions of male and female *P. penicillatus* sampled over the last 2 fishing season are shown in Figure 7. Female *P. penicillatus* sampled during the 2013/2014 season ranged in size from 6.7 to 12.1 cm. The average size was 9.2 cm with a mode at 8.7 cm and a median of 8.9 cm. In contrast, in 2012/2013, females sampled ranged in size from 6.3 to 19.6 cm. The average size was 9.5 cm and with a mode at 10.1 cm and a

median of 9.3 cm. There was no significant difference in the size distribution between the two seasons¹. The size frequency distribution of females shows a similar pattern between the two seasons, however the mode and median has shifted to smaller sizes during the 2013/2014 season.

Males *P. penicillatus* sampled in 2013/2014 ranged in size from 7.4 to 16.1 cm. The average size was 11.0 cm with a mode at 11.5 cm and a median of 11.2 cm. In contrast, males sampled in 2012/2013 ranged in size from 6.99 to 17.4 cm. The average size was 11.8 cm with a mode at 10.0 cm and a median of 11.6 cm. From the histograms it can be observed that the relative strength of the smaller size classes (8.0-9.5 cm) increased in 2013/2014 compared to 2012/2013 (Figure 7). The average size of male lobsters sampled in 2013/2014 was significantly smaller than males sampled in 2012/2013².

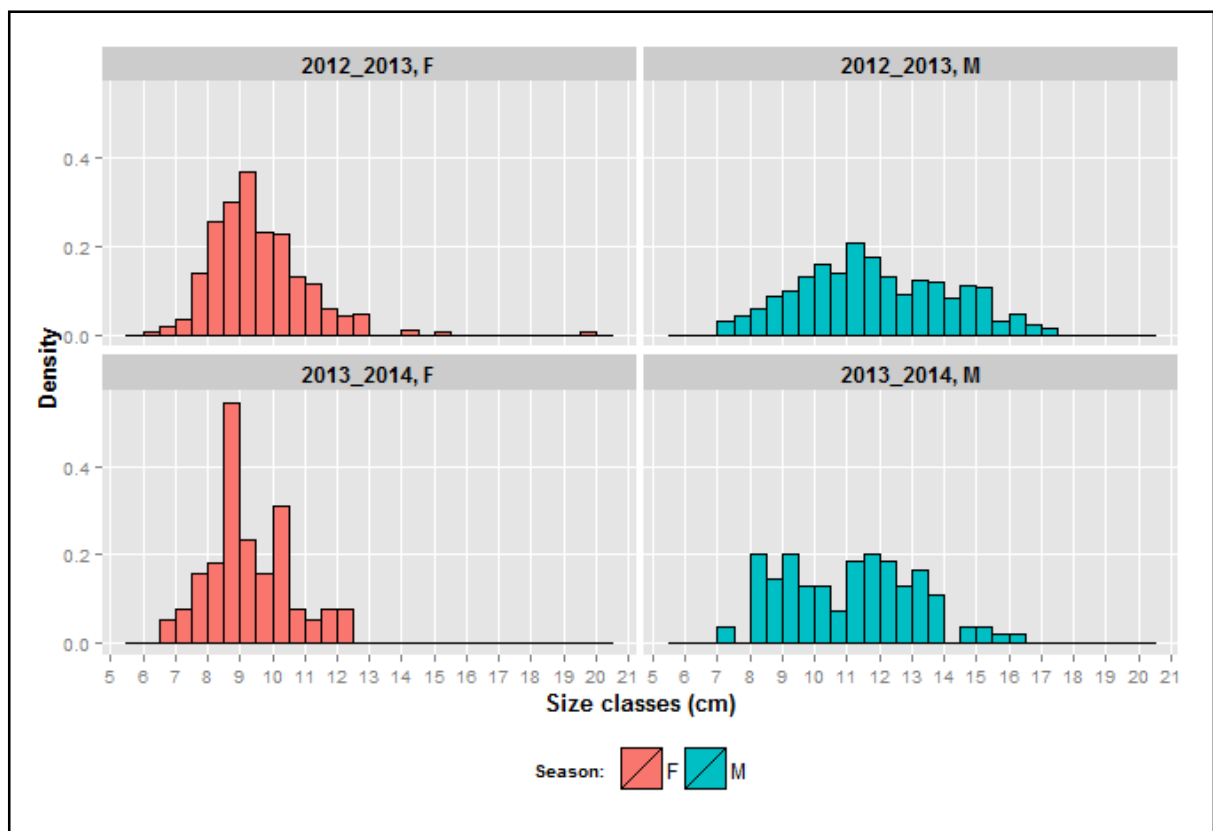


Figure 7: Size frequency distribution of male and female *P. penicillatus* over the last 2 open seasons

¹ ANOVA test: $F(1,410)=2.627$ $p=0.106$

² ANOVA test: $F(1,595)=11.56$ $p<0.001$

The relative size frequency distributions of male and female *P. longipes* sampled are shown in Figure 8. Female *P. longipes* sampled during the 2013/2014 season ranged in size from 5.6 to 9.8 cm. The average size was 7.4 cm with a mode at 7.2 cm and a median of 7.4 cm. In contrast, in 2012/2013, females sampled ranged in size from 5.9 to 11.1 cm. The average size was 7.7 cm and with a mode at 7.0 cm and a median of 7.6 cm. The average size of females sampled in 2013/2014 was significantly smaller than females sampled in 2012/2013³. The size frequency distribution of females shows a similar pattern between the two seasons, with the median lying around the legal minimum size limit of 7.5 cm. During the 2013/2014 season, 50% of females sampled were below the minimum legal size limit. Similarly, in 2012/2013, 41% of females were below the size limit.

Males *P. longipes* sampled in 2013/2014 ranged in size from 6.0 to 9.8 cm. The average size was 8.1 cm with a mode at 7.9 cm and a median of 8.3 cm. In contrast, males sampled in 2012/2013 ranged in size from 5.9 to 15.0 cm. The average size was 8.6 cm which was significantly larger than males sampled in 2013/2014⁴. The mode was 9.0 cm and the median was 8.6 cm. The size frequency distribution of males in 2013/2014 appears to be slightly uniform compared to the unimodal distribution of samples in 2012/2013 (Figure 8). A possible explanation for this distribution is the low number of samples collected in 2013/2014 (27) compared to 2012/2013 (365).

³ ANOVA test: $F(1,315)=4.384$ $p<0.05$

⁴ ANOVA test: $F(1,390)=6.328$ $p<0.05$

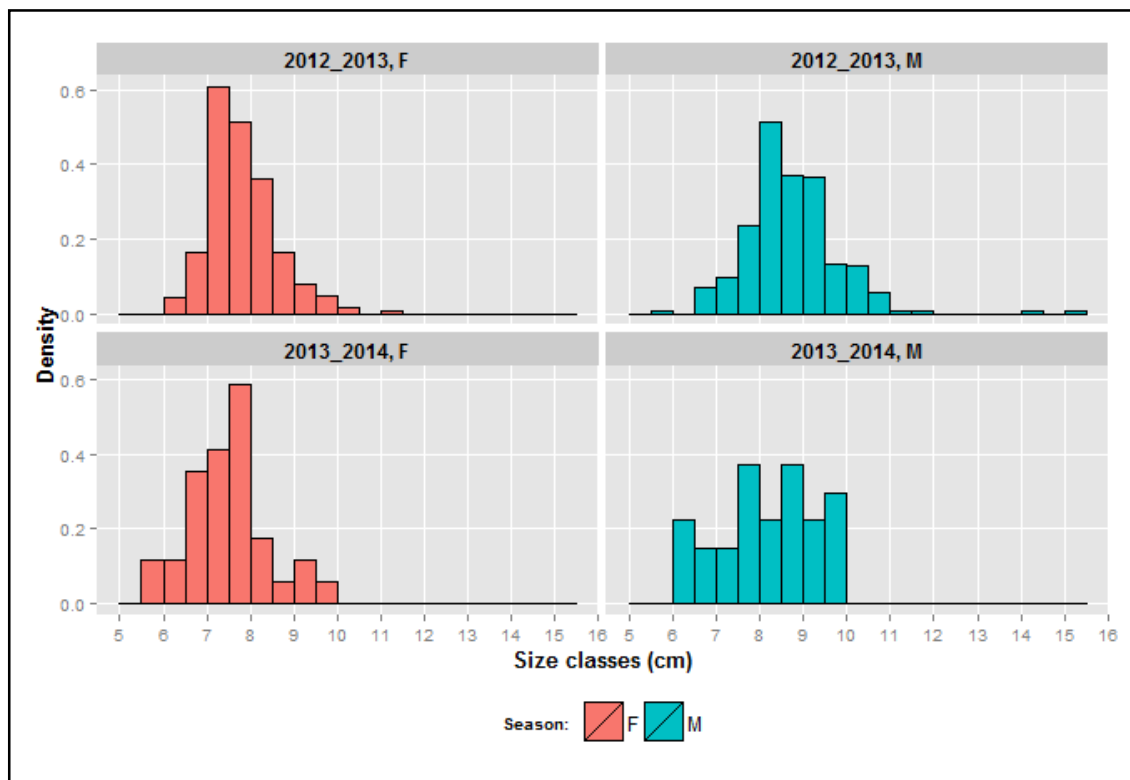


Figure 8: Size frequency distribution of male and female *P. longipes* over the last 2 open seasons

4. Discussion

The 2013/2014 lobster fishing season was opened for a period of only one month. As a consequence lower catches and total effort was recorded compared to the previous season whereby the fishery was opened for a period of three months. However, the CPUE was 82 % higher in 2013/2014 compared to the previous season. If we assume that the nominal CPUE is an accurate measure of the relative abundance, this suggests that there was an increase in the relative abundance of lobsters during the 2013/2014 season. However, this increase should be interpreted cautiously. The increase could be the result of a decrease in the fishing effort. Moreover, changes in environmental or weather conditions such as sea state, water turbidity and lunar phase can potentially affect the catchability of lobsters. Such conditions could have been favourable during the 2013/2014 season leading to an increase in the catchability of lobsters. In addition, the efficiency of the fishers can potentially influence the CPUE. If the fishers were more efficient at fishing lobsters, this can lead to an increase in the

CPUE. Moreover, due to the nature of the resource being mostly coastal with restricted movements, the CPUE may remain high even though the total biomass declines, a state described as hyperstability.

Changes in the average size of lobsters were observed over the last two fishing seasons. Male and female *P. longipes* and male *P. penicillatus*, were significantly smaller during the 2013/2014 season compared to the 2012/2013, whilst there was no significant differences in the size of female *P. penicillatus*. This indicates that there is a reduction in the number of larger individuals in the catch. However, the differences in size were quite small. Changes in the size composition of the catch is further highlighted by the high proportions of undersize female *P. longipes* lobsters recorded in the catch sampled over the last two fishing season (2012/2013= 41%, 2013/2014= 50%). This clearly indicates that the current minimum size of 7.5 cm is not being respected with regards to this species, in particular for females. The minimum size of capture is an important regulation since it allows smaller individuals the chance to reproduce before being recruited into the fishery. The extraction of large proportions of undersize lobsters can potentially have negative impacts on the reproductive potential of this species in the future. Monitoring, control and surveillance efforts should increase in order to ensure that fishers are complying with the current regulation.

Overall, data collected during the 2013/2014 season indicates that there was a potential increase in the relative abundance of lobsters. The data collected in conjunction with information collected from fisheries independent surveys carried out in 2013 and 2014 will be used to further assess the status of the lobster stocks and determine the status of the fishery. Such information and assessments will be useful for managers to decide whether the fishery should be open/remain close for the 2014/2015 season.

5. References

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