STATUS REPORT

Chaceon erytheiae

2012

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1. Description of the fishery

1.1 Description of fishing vessels and fishing gear

Data within the SEAFO database indicate that the deep-sea red crab (DSRC) resource has been utilized by two nations primarily, *viz*. Namibia and Japan. The Namibian-flagged vessel, *FV Crab Queen 1*, known to fish crab in the SEAFO CA is a 49.61m, 1989-built steel vessel with an on-board holding capacity of 610m^3. The vessel can process on average 1200 traps per day at a rate of three sets, of 400 traps each, per day.

During 2005 an older Japanese-flagged vessel, *FV Kinpo Maru no. 58*, conducted crab fishing activities in the SEAFO CA. This vessel was built in 1986, is 62.60m in length and has an onboard holding capacity of 648m^3. The *Kinpo Maru*, however, has been replaced by the *FV Seiryo Maru* which is 37.06m in length, was built in 1987 and has an on-board holding capacity of 289 m^3.

The Namibian and Japanese vessels' gear setups (set deployment & design) are very similar. Both vessels use the same type of fishing gear – known as Japanese beehive pots (Fig. 1). The beehive pots are conical metal frames covered in fishing net with an inlet shoot (trap entrance – Fig. 1) on the upper side of the structure and a catch retention bag on its underside. When settled on the seabed the upper side of the trap are more or less 50cm above the ground ensuring fairly effortless access into the kitchen area of the trap.

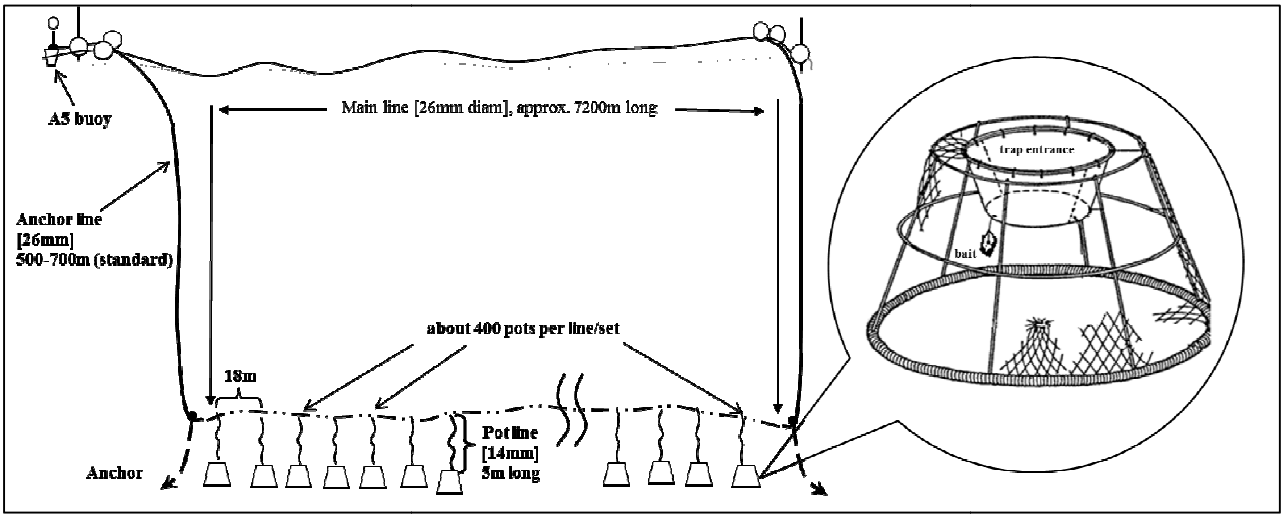

Figure 1: Deep-sea red crab fishing gear setup (set deployment and design) and illustration of a Japanese beehive pot (on the right).

One set/line consists of about 200-400 beehive pots, spaced roughly 18m apart, on a float line attached to two (start and end) anchors for keeping the gear in place on the seabed (Fig. 1). The start and end points of a set are clearly marked on the surface of the water with floats and one A5 buoy that denotes the start of a line. Under this setup (i.e. 400pots at 18m intervals) one crab fishing line covers a distance of roughly 7.2km (3.9nm) on the sea floor.

1.2 Spatial and temporal distribution of fishing

In the SEAFO Convention Area fishing for deep-sea red crab is focussed mainly on *Chaceon erytheiae* on Valdivia Bank – a fairly extensive seamount that forms part of the Walvis Ridge (Fig. 2). This seamount is located in Sub-division B1 of the SEAFO CA and has been the main fishing area of the crab fishery since 2005 when the resource was accessed by Japan. Records from the SEAFO database indicate that fishing for crab in this area occurred over a depth range of 280-1150m.

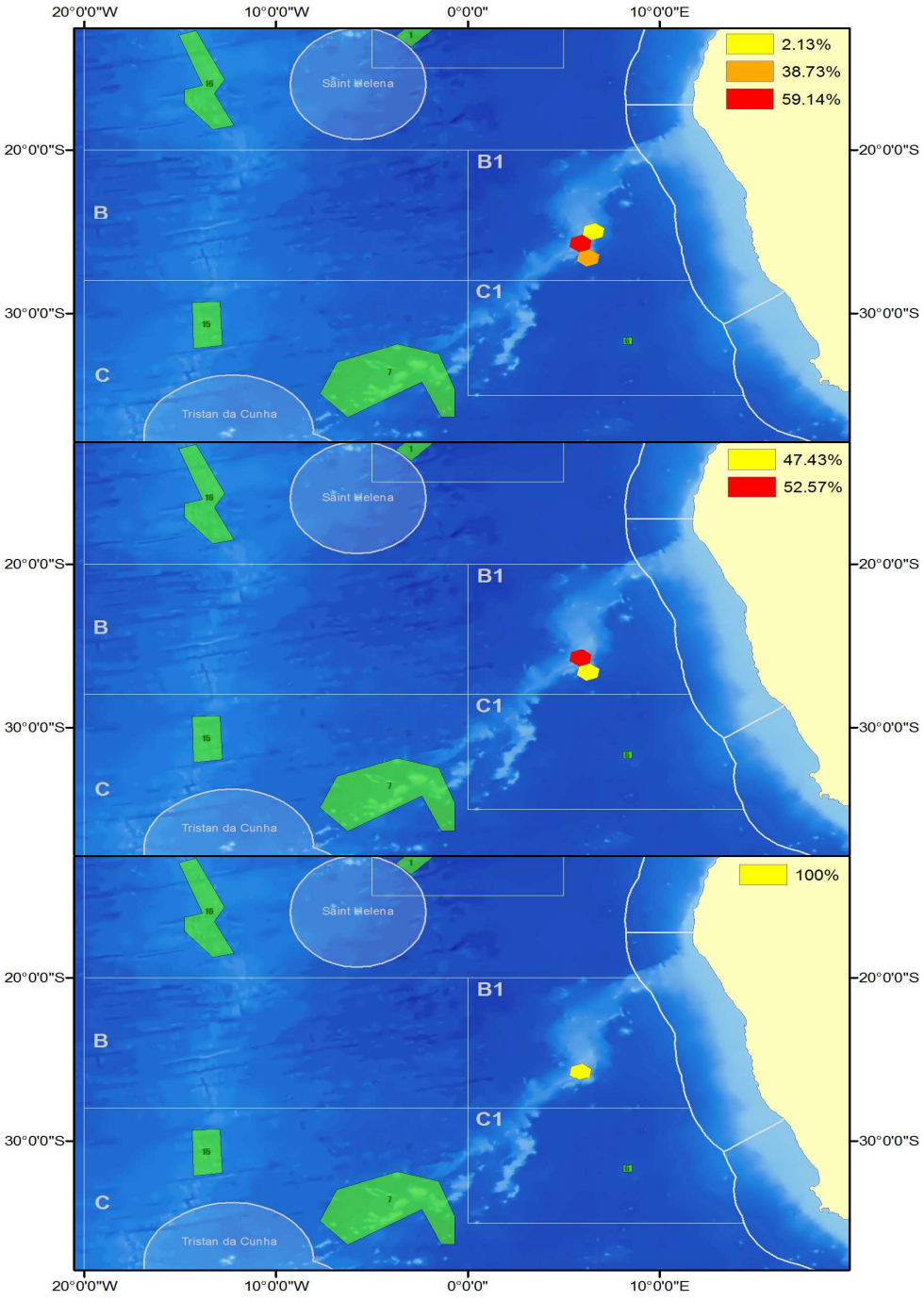

Figure 2: Annual estimated catch distributions from the observer for deep-sea red crab in SEAFO CA (2010-2012).

Although the fishery is open throughout the year, fishing within the SEAFO CA is limited to very short time (i.e. two to three month) periods (Table 1). Due to the processing capacity of the vessels (i.e. effort output of 1200 traps/per day) the TAC can be landed in very short periods of time – which was the case during 2012 when the *FV Crab Queen 1* landed 96% of the 200t TAC set for Sub-division B1 in just under two months (Table 1).

Table 1: Visual illustration of the temporal scale of deep-sea red crab fishing in the SEAFO CA (2005-2012).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005												
2007												
2010												
2011												
2012												

Legend
Namibia
Japan

1.3 Reported landings and discards

Reported landings, illustrated in Figure 3, comprise only those made by the Namibian and Japanese-flagged vessels to date. Data presented in Figure 3 only constitute catches made in Sub-division B1 for the period 2005-2007.

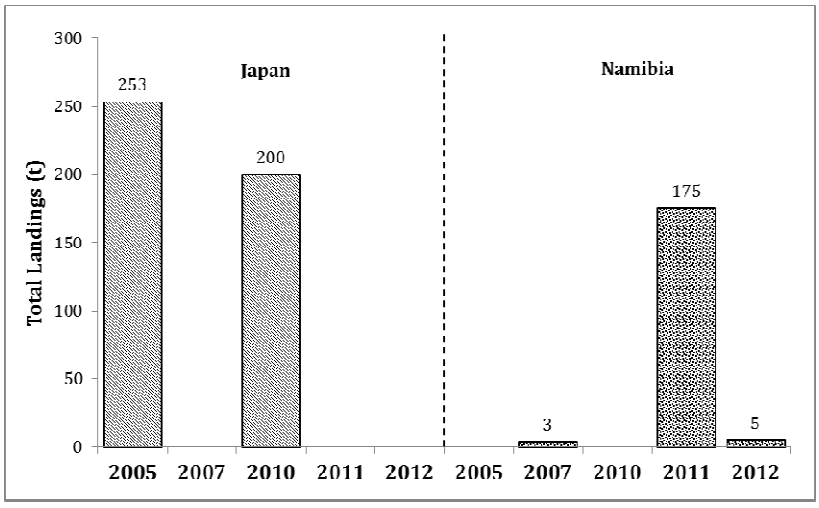

Figure 3: Total landings of deep-sea red crab recorded in the SEAFO CA (2005-2012).

With regards to discards, only 5kg of teleost have been recorded as discards from the deep-sea red crab fishery.

1.4 IUU catch

Apparent IUU fishing activity in the SEAFO CA has been report by vessel to the Secretariat, but the extent of this is at present unknown.

2. Stock distribution and identity

Two species of deep-sea red crab has been recorded in Sub-division B1, namely *Chaceon erytheiae* and *Chaceon chuni*. However, *C. erytheiae* is assumed to constitute the bulk of the catches recorded in the CA

and thus is considered the target species of this fishery. The stock structure for *Chaceon erytheiae* within the SEAFO CA is currently unknown.

3. Life history parameters and information

3.1 Length frequencies

The available length-frequency data for *Chaceon erytheiae* in the SEAFO database span a total of three months (Sep-Aug 2011, and Sep 2012) where the *FV Crab Queen 1* fished in Sub-division B1 (Fig. 4). The length-frequency data were separated into two groups in relation to the two areas fished in Sub-division B1 (note: the two areas fished in Sub-division B1 are separated by a distance of 24 nautical miles and thus are considered as two distinct fishing grounds). Data presented in Figure 4 constitute only sample data (i.e. not raised to the total catches) from 2011 and no temporal aggregation was considered as the area-specific aggregation (or effect) was considered to be more significant for this dataset.

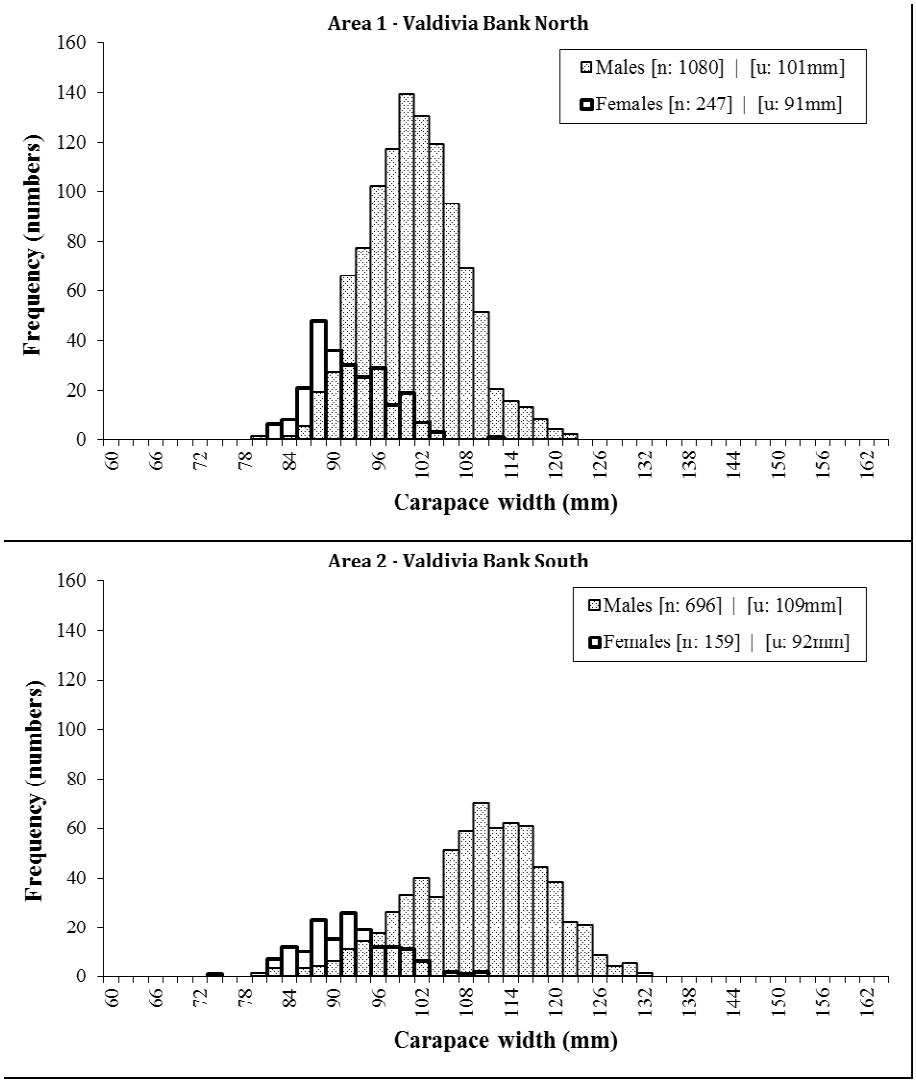

Figure 4: Length frequency distribution for *Chaceon erytheiae* from catches recorded on Valdivia Bank [Aug-Sep 2011].

Considering the data presented in Figure 4 two patterns are easily discernible. The first is the disparity in male and female numbers – since males dominate the sample at a ratio of 4:1 in both areas considered. This

skewed sex ratio is postulated to be an effect of the fishing gear related to the behaviour of male crabs (Le Roux 1997). Furthermore, it is clear that there are differences in the male and female growth rates as males attain much larger sizes than females. Overall, however, the dynamics between the two areas look similar although the average sizes for males and female crabs are slightly larger in the southern area of Valdivia Bank (Fig. 4).

3.2 Length-weight relationships

When considering the length-weight relationship derived from catches on Valdivia Bank the gender-specific growth inequality is once again apparent (Fig. 5). As is clear from Figure 5, male crabs grow at a faster rate than females and as a consequence attain much larger weights than female crabs. This feature, however, is not unique to *Chaceon erytheiae* as it has been recorded for other crab species in the *Chaceon* genus (Le Roux 1997).

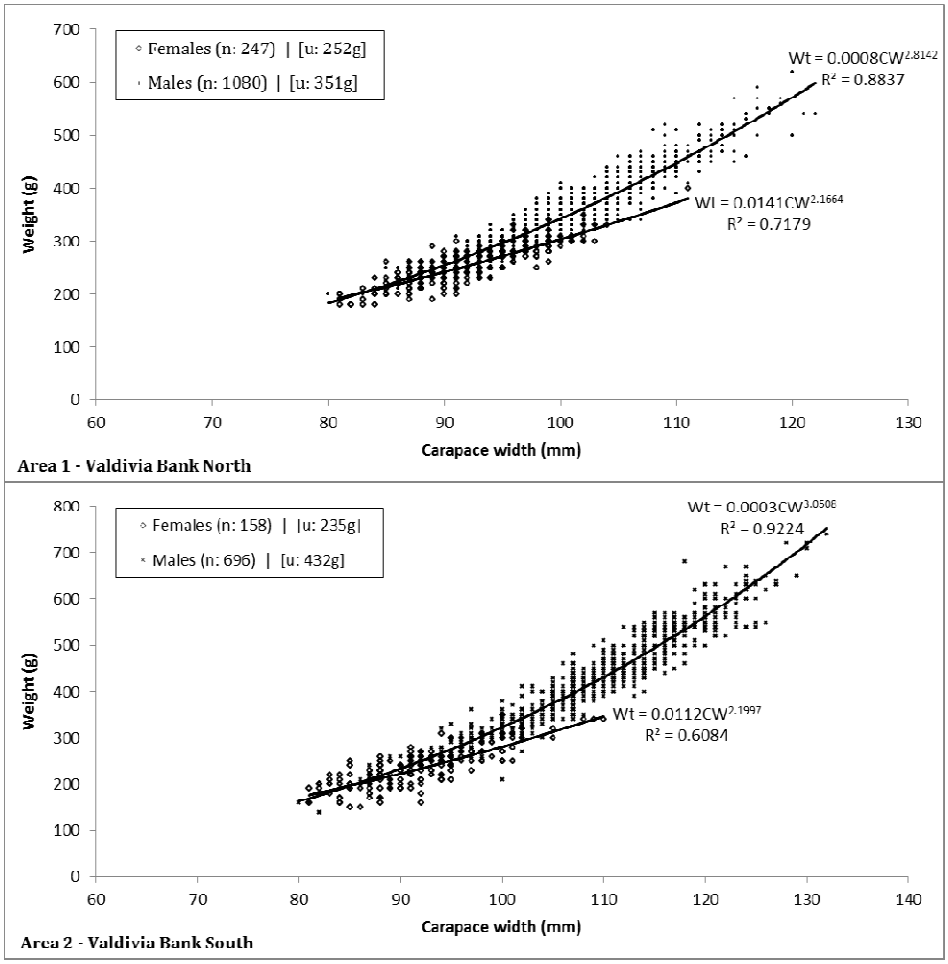

Figure 5: Length-weight relationship for *Chaceon erytheiae* from catches recorded on Valdivia Bank [Aug-Sep 2011].

3.3 Age data and growth parameters

No information exists on the age and growth rates of *Chaceon erytheiae*.

3.4 Reproductive parameters

No information exists on the reproductive attributes of *Chaceon erytheiae*.

3.5 Natural mortality

No natural mortality data exist for *Chaceon erytheiae*.

3.6 Feeding and trophic relationships (including species interaction)

No data exist for *Chaceon erytheiae.*

3.7 Tagging and migration

No data exist for *Chaceon erytheiae.*

4. Stock assessment

4.1 Available abundance indices and estimates of biomass

Currently the only data that can be used for the assessment for *C. erytheiae* abundance within the SEAFO CA are the catch and effort data from which a very limited Catch-per-unit effort series can be constructed.

4.2 Data used

For the current assessment catch and effort data were used and the nature of this dataset is outlined below:

- ⇨ Catch and Effort data
  - **Data Period:** 2005 (Jun-Aug), 2007 (June), 2010 ()-2012
  - **Data Description:** Data constitute set-by-set data for three pot-fishery vessels, two Japanese and one Namibian flagged, with similar effort outputs of roughly 1200 pots processed per day. Data fields include: Vessel ID, set number/ID, set and haul dates; set and haul positions; set and haul depths; set and haul effort (pot numbers); SEAFO division code; seamount ID; target species code; and catch per set.

4.3 Methods used

CPUE standardization to be completed inter-sessionally.

4.4 Results

Results pending

4.5 Discussion

4.5 Conclusion

5. Ecosystem implications/effects

5.1 Incidental and bycatch statistics (fish, invertebrates, seabirds, cetaceans, turtles)

Incidental and bycatch records from the deep-sea red crab fishery indicate that only one species is currently impacted by this fishery.

Table 2: Incidental (by-catch) catch from deep-sea red Crab fishery (kg).

	2009	2010	2011	2012
Species	**-**	**B1**	**-**	**-**
***MZZ**		5.23		

* Marine Nei fishes (*Osteichthyes*)

5.2 VME incidental catch

No data.

5.3 Incidental and bycatch mitigation methods

There currently exist no incidental and bycatch mitigation measures for the deep-sea red crab fishery in the SEAFO CA.

5.4 Lost and abandoned gear

No lost and abandoned gear data have been reported for the deep-sea red crab fishery in the SEAFO CA.

6. Biological reference points and harvest control rules

No biological reference points and/or harvest control rules have been established for this stock as yet.

7. Current conservation measures

- ⇨ Conservation Measure 04/06: On the Conservation of Sharks Caught in Association with Fisheries Managed by SEAFO
- ⇨ Conservation Measure 07/06: Relating to Interim Measures to Amend the Interim Arrangement of the SEAFO Convention
- ⇨ Conservation Measure 08/06: Establishing a List Of Vessels Presumed To Have Carried Out Illegal, Unreported And Unregulated Fishing Activities in the South-East Atlantic Fisheries Organization (SEAFO) Convention Area
- ⇨ Conservation Measure 13-09: Interim Prohibition of Transshipments - at – Sea in the SEAFO Convention Area and to Regulate Transshipments in Port
- ⇨ Conservation Measure 14-09: To Reduce Sea Turtle Mortality in SEAFO Fishing Operations.
- ⇨ Conservation Measure 15-09: On Reducing Incidental By-catch of Seabirds in the SEAFO Convention Area.
- ⇨ Conservation Measures 18/10 on the Management of Vulnerable Deep Water Habitats and Ecosystems in the SEAFO Convention Area
- ⇨ Conservation Measures 19/10 on Retrieval of Lost Fixed Gear
- ⇨ Conservation Measure 20/10: on Total Allowable Catches and related conditions for Patagonian Toothfish, Orange Roughy, Alfonsino and Deep-Sea Red Crab in the SEAFO Convention Area in 2011 and 2012
- ⇨ Conservation Measure 22/11: on Bottom Fishing Activities in the SEAFO Convention Area

8. State of stock and management advice

It was agreed that for the SAEFO deep-sea red crab stock assessment a standardized CPUE series will suffice at this time for management purposes. However, the standardization of the deep-sea red crab CPUE is not as straight-forward as was expected and thus could not be completed within the context of the SC meeting. It was thus agreed that the CPUE standardization will be completed inter-sessionally and management advice updated by the next SC meeting in 2013.

Against this background the SC recommends that the STATUS QUO be maintained with regards to the TAC set for the SEAFO CA in 2010 (i.e. 200t of Sub-division B1, and 200t for the remainder of the SEAFO CA).

9. References

Le Roux L. (1997) – Stock assessment and population dynamics of the deep-sea red crab *Chaceon maritae* (Brachyura, Geryonidae) off the Namibian Coast. M.Sc. thesis, University of Iceland, Department of Biology. 88 pp.

APPENDIX – Exploratory work on data from the Chaceon erytheiae fishery

Introduction

As a start to the management process of the *Chaceon erytheiae* resource an exploratory exercise was undertaken in an attempt to identify any technical and/or biological factors that may influence catch rates of the deep-sea red crab fishery. This serves as a start for more robust assessment approaches for data-poor areas.

Methods used

Available catch and effort data were screened for consistency and all data found to be unreliable (i.e. data with missing field/column entries) were not used in the analyses. The reliable data were then plotted to determine if there were any distinctions in catch area. CPUE data were correlated with depth to determine if any depth-related effects are discernible from the data. Temporal and fleet related differences (where possible) were also assessed by means of comparative analyses.

Results

Results for the comparative analyses conducted on the deep-se red crab catch and effort data are outline below:

⇨ Depth-related changes in CPUE

Results for the combined and area-specific correlations are presented in Figures 6 and 7, respectively.

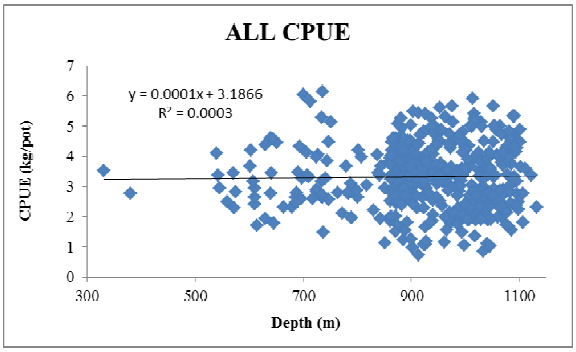

Figure 6: CPUE correlated with depth of all deep-sea red crab catch data contained in the SEAFO database [2005-2011].

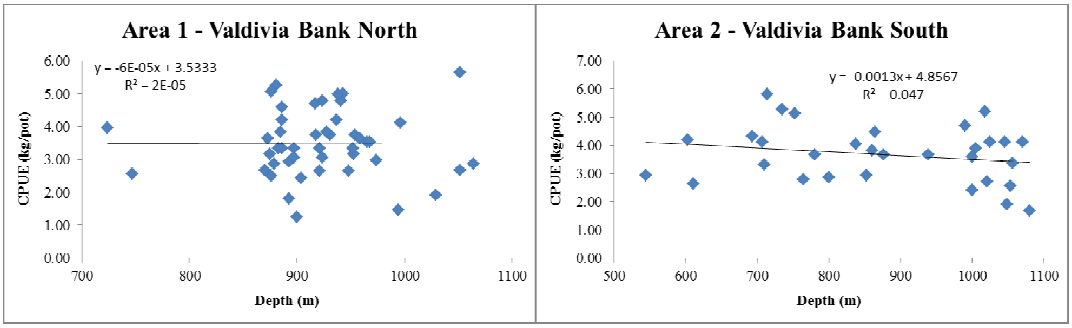

Figure 7: CPUE correlated with depth for the two fishing areas on Valdivia Bank [Aug-Sep 2011].

⇨ Vessel, area and season effect

Results from the vessel and area effect comparative analyses are represented below.

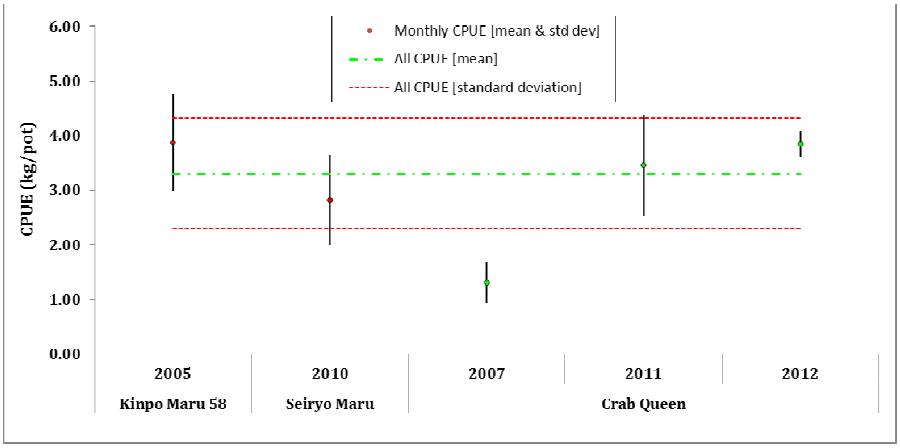

Figure 8: CPUE comparison for vessel effect [2005-2011].

Table 2: All CPUE statistics for vessel effect (Figure 8).

	n	u	δ	SD
All CPUE (Vessel Effect)	**482**	**3.31**	**1.030**	**1.015**

Note: n = Sample number | u = Sample mean (kg/pot) | δ = Variance (kg/pot) | SD = Standard deviation (kg/pot)

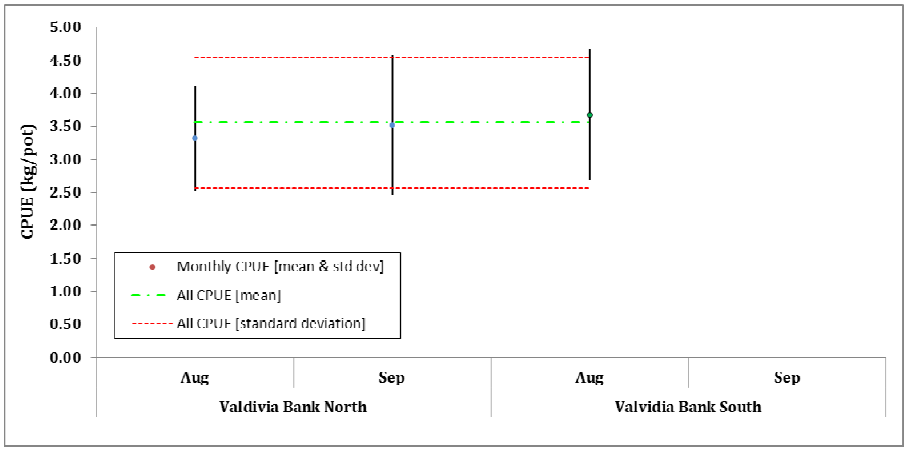

Figure 9: CPUE analyses for records from the fishing two areas on Valdivia Bank [Aug-Sep 2011] – no data for Sep 2011.

Table 3: All CPUE statistics for area effect (Figure 9).

	n	u	δ	SD
All CPUE (Area Effect)	**77**	**3.56**	**0.992**	**0.996**

Note: n = Sample number | u = Sample mean (kg/pot) | δ = Variance (kg/pot) | SD = Standard deviation (kg/pot)

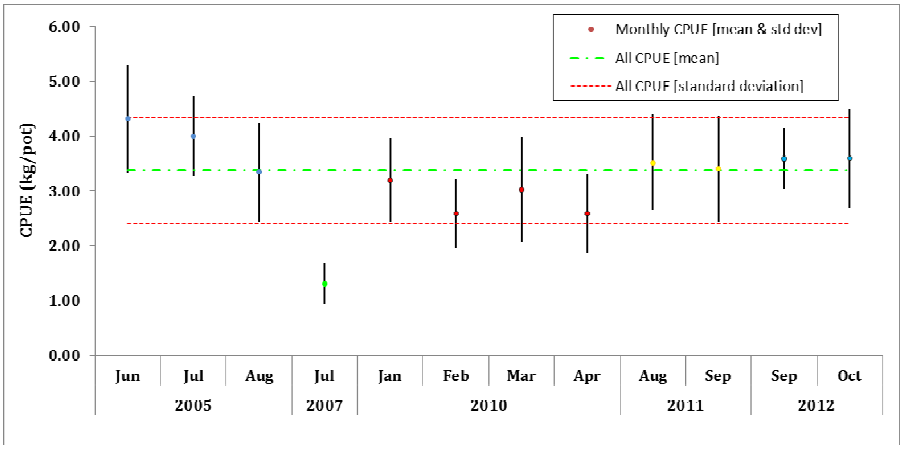

Figure 10: Monthly CPUE comparisons for records from the fishing two areas on Valdivia Bank [2005- 2012].

Table 4: All CPUE statistics for season effect (Figure 10).

	n	u	δ	SD
All CPUE (Season Effect)	**608**	**3.37**	**0.932**	**0.965**

Note: n = Sample number | u = Sample mean (kg/pot) | δ = Variance (kg/pot) | SD = Standard deviation (kg/pot)

Discussion

Working with the limited data available in the SEAFO database for the deep-sea red crab fishery an initial attempt was made at some quantitative analyses. With the most important aspect of this status report being to garner as much information about the target fishery in the SEAFO CA, for purposes of management advice towards the utilization of the resource, some baseline aspects first have to be understood. These baseline aspects include issues such as the biology, temporal and geographical dynamics of the species the fishery targets. With these issues as yet still undefined for the SEAFO deep-sea red crab fishery the time has come to assimilate all available data to get an initial quantitative description of the fishery. Thus, for this baseline assessment evaluation of three biological and one fishery-related (technical) features of the crab fishery were undertaken under the following topics:

⇨ Influence of depth on CPUE

Results from this assessment are fairly conclusive (see Figures 6 & 7). Although there were slight negative correlations within the "All CPUE" and area-specific datasets, it is safe to conclude that there are no depth-related influences on CPUE within areas covered by the fishery since 2005. This is because the negative correlations observed from this initial assessment are too weak to constitute any significance.

⇨ Vessel effect

Considering the effect differences in technical aspects of the different vessels that have fished the SEAFO crab resource may have on CPUE, the results are not as forthcoming as was expected (see Figures 8 & 10; and Tables 2 & 4). It is it generally agreed that the technical attributes of the Japanese and Namibian-flagged vessels that fished for deep-sea red crab in the SEAFO CA are comparable since effort output between these vessel are within a narrow range of each other (see section 1.1 for specifics). However, the results from the "vessels effect" suggest that this may not

necessarily be the case. Although four of the results from this test lie well within the standard unit of variability for the "All CPUE" mean, there is a concern that this standard unit it quite large (1.015 kg/pot – in relation to the mean of 3.31 kg/pot). Then there is also the concern related to 2007 result recorded by the Crab Queen that lies well outside of the standard variation limit of the "All CPUE" mean. This result however may be impacted by sample size (n = 10 for 2007, compare to average sample sizes of 157 for 2005, 2010 & 2011) and there was a strong view to omit this result from the assessment. However, more information is required about this fishing trip before any firm positions can be taken on removing the dataset from the analyses.

⇨ Area effect

No strong trends were observed from the results of the area effect analyses as the variation around the "All CPUE" mean was relatively wide and means for the two areas compared were very close to each other as well as the "All CPUE" mean. Thus, it is safe to conclude that there were no area effects on CPUE in historic catches as contained in the database.

⇨ Season effect

Again no strong seasonal trends were discernible from this assessment, primarily because of the severe limitations in the temporal coverage of the data used. At best the 2005 season showed a minor internal decease in CPUE over the 3-month span of the dataset, but that trend in itself is not conclusive enough. On a more liberal context monthly comparisons can be made for a few months (i.e. July 2005 & 2007; August 2005 & 2011; and September 2011 & 2012) and that CPUE results from these months, with the exception of July 2007, are fairly similar in magnitude. Overall, it can be concluded that no seasonal effects could be detected from the data that currently exists in the SEAFO database for the deep-sea red crab fishery.

Conclusion

Initial assessments of the SEAFO deep-sea red crab fishery yielded no conclusive results that may be of use toward the better understanding of the resource. More needs to be done to ensure better qualitative data are obtained from this fishery. Thus progress in the SEAFO deep-sea red crab status report is balanced on a precarious compromise in the preservation goals and economic aspirations of this resource.