MSC Pre-Assessment
for the Southern king crab (*Lithodes santolla*) trap fishery by artisanal fleet vessels in the Chilean XII Region

prepared by

CeDePesca

commissioned by

Royal Greenland

Beaver Street Fisheries

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AUTHORS:
Ángel Lugo
Mayra Palacios
Arturo Gonzáles
Gabriela Mc Lean
Ernesto Godelman

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1. Introduction

1.1. Aims and scope of the pre-assessment

This is a pre-assessment of the Southern king crab trap fishery conduct by artisanal vessels in Chilean Region XII against the Marine Stewardship Council (MSC) Standard, version 2.01. This provisional assessment is based on limited information gathered by the assessment team and provided by stakeholders up to the date of writing. The document is intended to provide actionable information on the status of the fishery against the standard. The document aims at identifying sustainability issues in the fishery that may need to be addressed for it to become certifiable against the MSC standard.

1.2. Constraints to the pre-assessment of the fishery

Some data related to the volumes of bycatch species caught by the fishery was not within CeDePesca's reach in order to perform a detailed identification of primary and secondary species as established by the MSC. Moreover, there is no information for the area under study regarding the illegal types of fishing. Regarding interactions with the habitat, data were scarce or non-specific to determine the interactions with the fishery.

1.3. Unit of Assessment

The MSC defines a Unit of Assessment (UoA) as the target stock(s) combined with the fishing method/gear and practice (including vessel type/s) pursuing that stock, and any fleets, or groups of vessels, or individual fishing operators or other eligible fishers that are included in an MSC fishery assessment.

For this pre-assessment, the UoA is defined as follows:

Target Species	Southern king crab (*Lithodes santolla*)
Geographical area	Pacific Ocean, Sub-zone 87.3 of the south, Division 87.3.1 (FAO). Chilean Region XII Region, between parallels 48°36' S to 56°30' S.
Fishing Gear	Traps
Fleet	Artisanal fleet with home port in the Chilean Magallanes Region XII.
Management system	Fishing regulations are established by the Secretariat of Fisheries and Aquaculture (SUBPESCA) of the Chilean Government, by means of establishing a ban on the registration of new operators, minimum catch size, temporary closures and female biological rests, among others.
Other potential fleets	Not applicable

2. GENERAL DESCRIPTION OF THE FISHERY

2.1. Scope of the fishery regarding the MSC program

The fishery under evaluation is within the scope of the MSC standard for sustainable fisheries:

- It is a capture fishery;
- The fishing operations are not performed using poisons or explosive substances;
- The fishery is not carried out according to unilateral exceptions that could be controversial in the face of international agreements;
- There have been no successful claims against the group of clients due to violations related to forced labor in the past two years; and,
- The fishery is not under controversy and/or conflict.

2.2. Description of the Fishery

The fishery is described hereafter, according to the contents of the three Principles of the MSC Standard.

2.2.1. PRINCIPLE 1: Stock Status

a) Description of the Species

King crab *Lithodes santolla* is a decapod crustacean (**Figure 1**) of the Lithodoidea superfamily (Anomura), benthic of temperate and cold waters. It is distributed mainly in the Pacific Ocean, from approximately 38° of South Latitude, from the X till the XII Regions in Chile, encompassing the Big Island of Chiloé (Lat. 42°40'36" S, Long. 73°59'36" O) till Cape Horn (Lat. 55°58'48.5" S Long. 67°17'21" O), including the Magellan Strait and the Beagle Channel (Vinuesa, 1991; Guzmán *et al*., 2004). In the Atlantic Ocean, it inhabits the south sector of the Big Island of Tierra del Fuego. In Patagonia, it is found from the San Jorge Gulf up to Uruguay. (Barrera, 2016). (**Figure 2**).

Figure 1. Southern King crab *Lithodes santolla*. Source: Olguín y Mora 2019.

a b

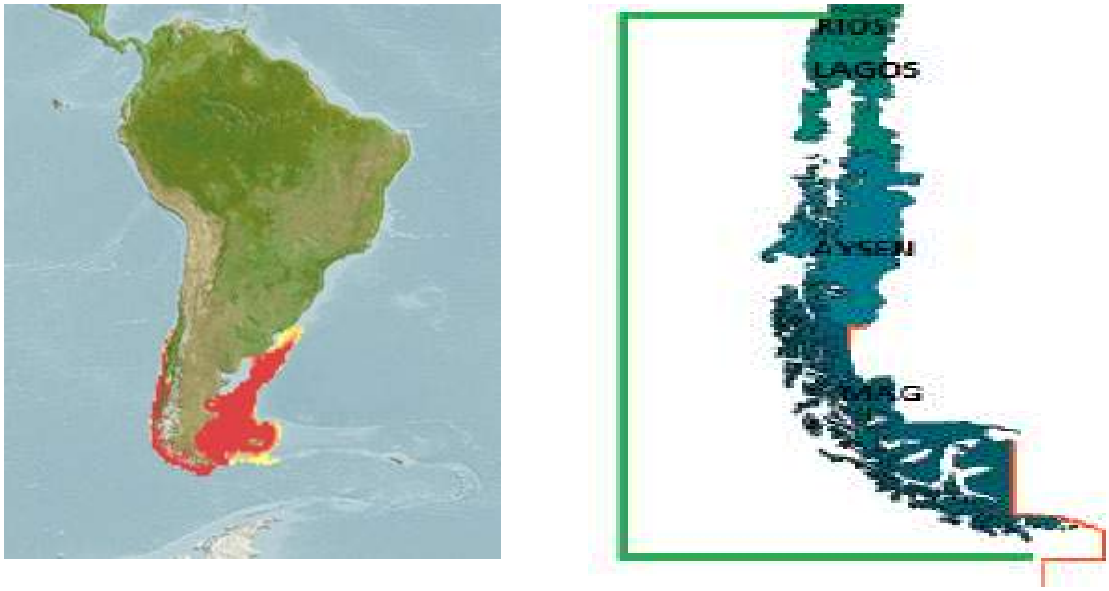

Figure 2. (a) Geographical distribution of the Southern King crab *Lithodes santolla* in the Pacific and Atlantic Oceans. (b) Artisanal King crab fishing area from the Los Rios Region to the Magallanes and Chilean Antarctica Regions. Source: FishBase and IFOP (Olguín y Mora. 2018).

Its bathymetric distribution ranges from the subtidal down to 700 m depth; it inhabits preferably sandy and stone bottoms. However, during the reproductive season it migrates to 30 to 120 m depths, facilitating the catch of adults. The common belief is that individuals do not perform significant latitudinal or longitudinal migrations. Therefore, it is considered that the stock in the Austral region encompasses multiple population units, with little or no mixture among them. (Boschi *et al*., 1992; Subsecretaría de Pesca y Acuicultura, 2009; and, Mejía, 2015).

Its general appearance is that of a crab, but it presents four pairs of pereiopods in dorsal view, as the fifth pair is reduced and lodged in the branchial chamber (Meglitsch, 1978).

King crabs can attain 19.8 cm carapace length (CL) and weight above 7 kg. Their life spans is in average 14 to 20 years approximately. Their growth is slow and they reach sexual maturity at 5 or 6 years (Vinuesa, 1984; 2000).

The species presents clear sexual dimorphism, that can be distinguished by their difference in size and weight. Among the primary sexual characteristics, in the case of females, there is the presence of abdominal appendices (pleopods) and the semicircular abdomen, asymmetric and expansive, that partially covers the basis of the walking legs. In the case of males, the abdomen is triangular and symmetric, and it has no appendices (Barrera, 2016).

Mating occurs between couples with a male in the intermolt stage and a female in recent postmolt stage, generally of smaller size than the male (Lovrich *et al*., 2002). Fertilization, likewise in other Lithodoidea is external (Powell y Nickerson, 1965). *L. santolla* reproduces annually, between November and January, throughout its distribution range. Reproduction occurs once a year with female spawning, carrying usually between 5400 and 30000 eggs or embryos, depending on the size, which are hatched between 9 to 10 months, till they are born into "zoea" larvae (Mejía, 2015).

The larval development of the King crab encompasses three stages: zoea, with an approximate total length of 25 days, under experimental conditions, and a postlarvae stage (Campodónico, 1971; Campodónico & Guzmán, 1981). According to Lovrich (1997), the larvae of this species would have benthodemersal habits, completing this cycle stage between 40 and 60 days. In the first stages, *L. santolla* would develop mainly in rocky seabeds (Lovrich, 1997).

Lithodidae have an opportunistic-generalist feeding strategy: they are predators feeding on the most abundant prey in the environment. The feeding strategy of the species is considered to be mainly opportunistic, predator and scavenger. Among the prey, there are squat lobster, *Munida subrugosa*, non-identified bony fish, some echinoderms, algae and other invertebrates (Mejía, 2015).

b) Stock Assessment

Stock Assessment is the most common tool used worldwide to offer scientific advice to the fisheries management agencies. In Chile, over the last decades, the Institute for Fisheries Development (IFOP), has been in charge of performing the stock assessments and the Total Allowable Catch estimates of the main fishery stocks, applying different methodologies that include the development and adaptation of statistical models to the reality of the Chilean fisheries, setting Biological Reference Points for each stock, and producing long and short term projections assessing different harvest strategies (IFOP (Yáñez e Ibarra, 2021)).

Historically, benthic crustacean fisheries, such as King crab, present a long trajectory, not only in terms of timing but also in terms of landed volumes. However, they have not received the adequate scientific attention that should be expected given the real economic and social value they represent for the country (IFOP, Yáñez e Ibarra, 2021).

King crab has a wide distribution in Chile. Barrera (2016) assessed and analyzed the genetic structure and variation of *L. santolla* in the Magallanes Region and Chilean Antarctica by means of mitochondrial molecular markers, indicating that there is no genetic differentiation, which points at a wide genetic flow. No distance isolation structure was found, thus in agreement with Mejía-Ruíz (2015), who performed an analysis of the population structure and genetic diversity in the North, Center and South of the Magallanes Region and Chilean Antarctica. Six microsatellite markers were used, identifying large genetic diversity in these areas that were defined as a genetic unit. In addition, Soto *et al*. (2007), performed a genetic analysis of the XII Chilean Region by means of ADN markers (RFLPs), as well as biochemical (alozymes), showing that the population of *L. santolla* has high levels of genetic diversity and it is panmictic, defined as a genetic unit.

Moreover, IFOP (Yáñez e Ibarra, 2021) mentions that the king crab little displacement feature could suggest the existence of meta-populations with a minimum level of mixture among them, from the recruitment stage onwards. It is thought that the stock in the region includes several population units with a low degree of interaction among them (Boschi *et al*., 1992; Subsecretaría de Pesca y Acuicultura, 2009; and IFOP (Yáñez e Ibarra, 2021)). According to Peñailillo (1990), King crab would include several populations with different features, as illustrated by the significant local variations observed in the size at first sexual maturity, degree of parasitism, fecundity, larvae release period, size-weight ratio, sexual ratio, etc.

The integrated king crab stock assessment in Chile is in its early stages. However, some approximations to the quantitative analysis have been developed, especially the work of Canales *et al*. (1997), Yáñez (2015 y 2017), Yáñez e Ibarra (2018), and Yañez (2019), based on size-structure models under long term equilibrium conditions for the Magallanes region. For example, Yáñez e Ibarra (2018), indicate that the stock condition throughout the history of the fishery allows to conclude that in 2016 the Spawning Biomass was in a “not overfished” area (54% BD/BDo), even if the fishing mortality was above that of the RMS, which introduces a future risk. This situation could derive from the gradual reduction in the fishing mortality rates over the last few years, compared to those applied in the early 2000s. In addition, high recruitments estimated by the model and a lower average size at sexual maturity than the average selectivity size (85 mm size at sexual maturity (TMS), 118 mm L50

Selectivity) could have also played a role, ensuring that the caught specimens have spawned at least once.

Figure 3 shows the contrast between fishing mortality and stock reduction: the years with the highest fishing mortality rates present the largest reduction in the king crab stock.

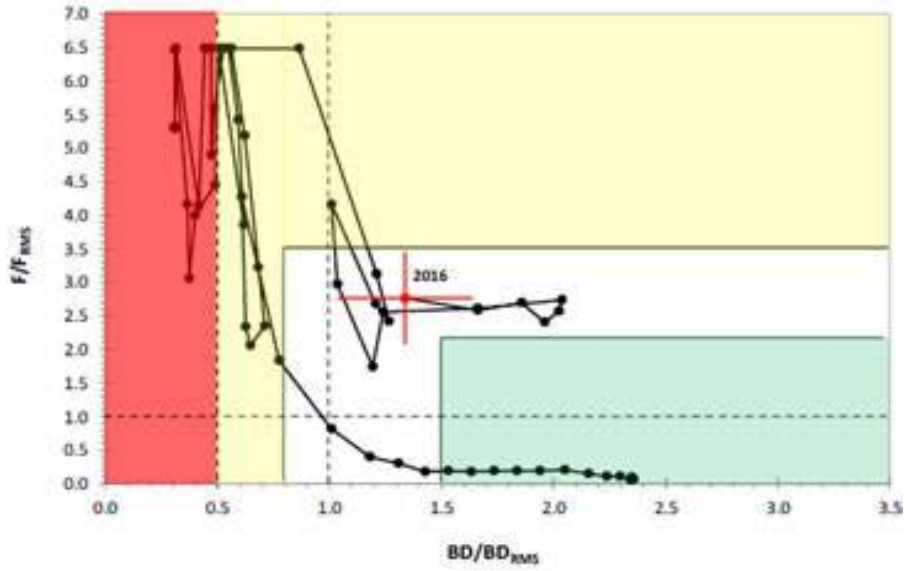

Figure 3. B-F king crab exploitation diagram 1961-2016. The red axes represent the relative limits at 40% of the virgin spawning biomass and at F40% of the relative fishing mortality for the last year (2016). Yáñez e Ibarra (2018).

Yañez (2019) performed a king crab stock assessment, using a structured model with size data. An assessment procedure using a methodology for data-poor fisheries was tested (method "Posterior Focused Catch-Only Method', Zhou *et al*., 2013). The assessment results with the size structured model led to the conclusion that the stock is at a level of 41% of the virgin spawning biomass (41% BD/BDo), which shows a reduced status in comparison to the 2016 model, even if the stock status remains in the "not overfished" areas. Nevertheless, the fishing mortality rates are still above those recommended (**Figure 4**).

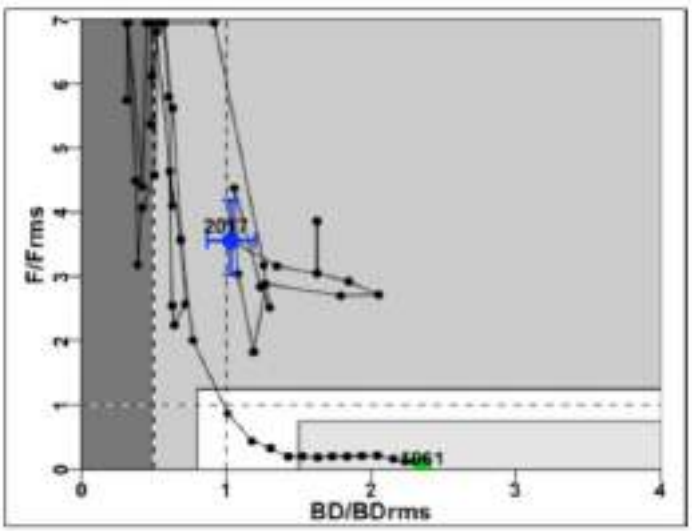

Figure 4. King crab conservation status. Model structured with size data. Source: IFOP (Yáñez, 2019).

The results of the assessment with the data-poor methodology represented in the phase diagram (**Figure 5**) indicate that, for most of the years, the stock was located in the underexploited area to move then towards the left upper area on the phase diagram indicating overfishing levels. As a result,

a reduction in the spawning biomass has been recorded, leading the stock beyond the reference point and placing it in an overexploitation condition.

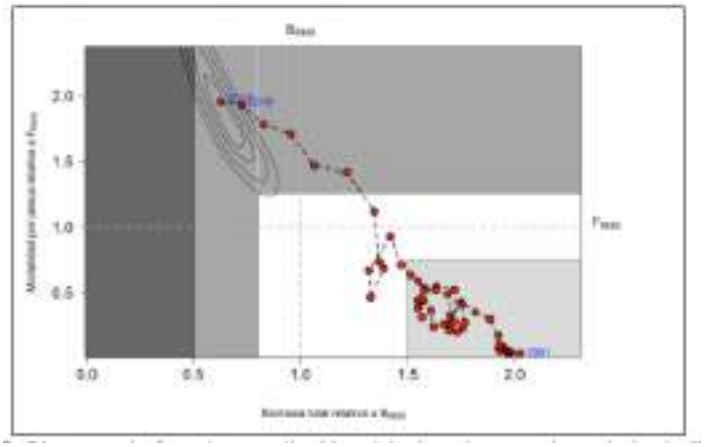

Figure 5. King crab phase diagram. Data-poor methodology (method "Posterior Focused Catch-Only Method", Zhou *et al*., 2013). Source: IFOP (Yañez, 2019).

In previous projects, king crab stock assessments (*Lithodes santolla*) were analyzed from a regional stand point, covering the most important ports in the region: a) Puerto Natales, b) Punta Arenas, c) Porvenir and d) Puerto Williams (**Figure 6**). The disadvantage of performing a regional analysis is that it can mask the effects of local depletion. The advantage that it ensues is the availability of a general diagnosis based in the history of the main fishing indicators. However, this is applicable when these fishing indicators present low uncertainty or are representative of the fishing and biological activity of the macro area under study. This is not the case with king crab, given the large magnitude of the area under study and the high geographical diversity where the data of the biological-fishing indicators are gathered.

Due to the previous reasons, IFOP performed assessments at smaller space scales than the one used until the previous IFOP project. Therefore, the latest stock assessment could not be structured in the same way as in previous years. However, the LB-SPR model for data-poor fisheries can be implemented. This IFOP project includes the king crab assessment for the Magallanes Region, based in three main areas: North Area, Center Area and South Area (**Figure 6**) (Yáñez e Ibarra, 2021). The boundaries of these areas are determined by the fishing operations, distance of the fishing grounds to the landing points (Puerto Natales, Punta Arenas, Porvenir, Puerto Williams), in addition to geographical features (Daza, *et al*., 2020). The specific area coverage is detailed here below:

- North Area: Fishing grounds located from the territorial boundary between the XI and XII Regions to the north mouth of the Magellan Strait (Faro Félix). 49°00′ LS – 52°30′ LS.
- Center Area: Fishing grounds located between the north mouth of the Magellan Strait (Félix Lighthouse) and Cape Froward. 52°30′ LS - 54°00′ LS.
- South Area: Fishing grounds south of Cape Froward till the Wollaston Islands. 54°00′ LS - 56°00′ LS.

Figure 6. Geographical distribution of fishing grounds visited by vessels with port of operations in Punta Arenas during the months of July and November 2015. (Daza *et al*., 2016) (Reference figure to show the area extension and the three study areas). Source: IFOP (Yáñez e Ibarra, 2021).

The most recent stock assessment from IFOP (Yáñez e Ibarra, 2021) for the XII Region was based on the Length Based-Spawning Potential Ratio (LB-SPR) model (Hordyk *et al*., 2015) using data gathered within the framework of the annual programs for projects "Follow-Up of Benthic Fisheries" (2000-2010) and "Follow-Up of Benthic Crustacean Fisheries" (since 2011). Both projects started gathering data from the area under study and were developed by IFOP (Olguín y Mora, 2021). Moreover, information collected by projects financed by the Fisheries and Aquaculture Research Fund (FIPA) and biological background data from sound scientific literature were also available.

As previously mentioned, this approximation is derived from an assessment based on Length Based-Spawning Potential Ratio (LB-SPR), developed by Hordyk *et al*. (2015). This technique uses life history rates (M/K and Lm/L∞) and the population size structure together with the forecast of size at maturity to estimate the fishing and the natural mortality rates (F/M) and the spawning potential ratio (SPR).

The spawning potential ratio of a stock is defined as the proportion between reproductive potential without fishing divided by any level of fishing pressure (Mace & Sissenwine, 1993; Walters & Martell, 2004). It is very useful when assessing poor data due to its relative simplicity (Brooks *et al*., 2010; Walters & Martell, 2004). Moreover, theoretical biological reference points have been developed which have been recognized by international fishing laws, such as $SPR_{40\%}$, which is considered as a conservative proxy for Maximum Sustainable Yield (MSY).

The model developed by Hordyk *et al*., (2015) and used in this assessment considers that the stock is in equilibrium, which means that the stock size composition is assessed against the expected size composition if the stock has suffered a constant level of fishing pressure and constant recruitment. The analytical models developed by these authors suggest that with the knowledge of the asymptotic length $L\infty$ of von Bertalanffy and the variation coefficient in $L\infty$ (CV$L\infty$), the reason of the total mortality to the growth coefficient of von Bertalanffy (Z / k) for a specific population can be estimated

from a representative sample of the catch size structure. If M/K is also known (from meta-analysis, the life history theory, expert opinions or biological studies of a population), then the results of Hordyk *et al*., (2015) suggest that it is possible to assess F/M from the catch composition. Often times the F/M ratio has been used as a biological reference point. (Zhou *et al*., 2013).

By definition, SPR is equal to 100% in a non-exploited population and zero in a stock without spawning (for instance, all the mature fish have been eliminated, or all the females have been caught). $F_{40\%}$, fishing mortality rate which translated into $SPR_{40\%}$, is considered risky for many species (Clark, 2002). Adequate biological points of SPR can be derived from the hypothesis regarding the slope of the population-recruit relation curve (Brooks *et al*., 2010). Hordyk *et al*. (2015) demonstrate that, according to the assumption of the knife-edge selectivity per size at Lc, and maturity at Lm, the SPR is determined by the M/K, F/M, Lm/$L\infty$, and Lc/$L\infty$ ratios.

The LB-SPR model requires the following parameters: an estimate of the M/K ratio (assuming that both values are known), $L\infty$, CV$L\infty$, knowledge of the proportion of mature individuals at length (maturity ogive). It uses catch size composition data to estimate SPR.

The parameters used in the king crab LB-SPR models in the different areas under assessment are shown in **Figure 7**. It is important to mention that for the north and center region of the Magallanes Region there was not enough data to estimate the maturity parameters for each of these areas. Therefore, the parameters estimated using data from the south area of the same region were used.

The LB-SPR model requires to work with the exploited population. Therefore, in this case the only information used is that of the individuals that could be fished (males), where the estimated maturity is generally higher than in females.

Zona	L Inf (mm)	K (año^{-1})	M (año^{-1})	L50 (mm)	L95 (mm)	Referencias
Norte Mag	176.76 (1)	0.151 (1)	0.19 (2)	103.5	111.99	Sur Magallanes
Centro Mag	176.76 (1)	0.151 (1)	0.19 (2)	103.5	111.99	Sur Magallanes
Sur Mag	176.76 (1)	0.151 (1)	0.19 (2)	103.5	111.99	Este estudio

(1) Contreras-Reyes et al. (2018); Yáñez et al. (2015)

Figure 7. King crab growth, natural mortality and maturity parameters. Source: IFOP (Yáñez e Ibarra, 2021).

King Crab LB-SPR North Magallanes Area

Here below are presented the results of using the LB-SPR model in the size structures obtained from monitoring the north area of the Magallanes region, between 2014 and 2019, for the king crab trap fishery.

In **Figure 8a**, it is possible to observe the size structures used to apply this model. **Figure 8b** shows the adjustment performed to those sizes by the LB-SPR model. There is good size adjustment for every year, considering that the data distribution is closer to a log-normal distribution that to a normal distribution. In 2015, the adjustment is not so good due to the variability in the proportion among the size ranges observed. Nevertheless, the adjustment is still adequate.

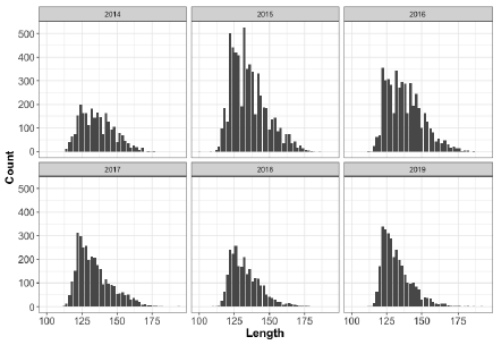

Figure 8a. King crab size structure, North Magallanes Area between 2014 and 2019 used in the analysis. Source: IFOP (Yáñez e Ibarra, 2021).

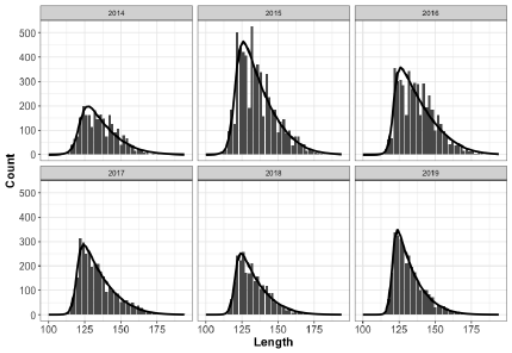

Figure 8b. Size structure (bars) and its adjustment (line) between 2013 and 2019, using the LB-SPR method for king crab. Source: IFOP (Yáñez e Ibarra, 2021).

The king crab harvest in the North Magallanes Area takes place entirely over mature individuals, with a significant difference between the sexual maturity ogive and the selectivity ogives estimated by the model (**Figure 9**).

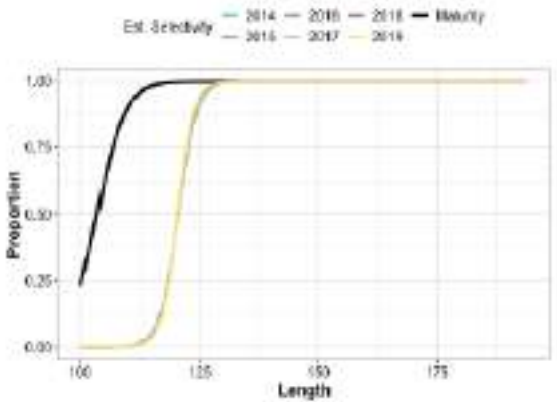

Figure 9. Selectivity per year and maturity ogive for king crab in the North Magallanes Area. Source: IFOP (Yáñez e Ibarra, 2021).

Figure 10 illustrates that the potential spawning rate for the last year equals 35%. Thus the stock is below the biological reference point of SPR40%, but very close to the definition of a healthy stock.

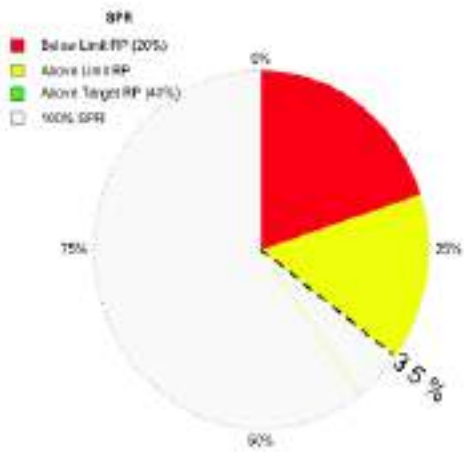

Figure 10. Pie chart indicating the value of SPR for the most recent year. (Red: proportion of SPR under 20%, Yellow: proportion of SPR between 20% and 40%). Source: IFOP (Yáñez e Ibarra, 2021).

Finally, **Figure 11** presents a summary of the main outputs of the method applied, showing that the size at 50% selectivity remained stable around 120 mm CL, corresponding to the catch minimum size (TML) of this stock in this area during all the years under observation. It should be highlighted that the increase in the fishing pressure indicator is correlated with the reduction in the SPR value for the last years of the series. This could be linked to the decrease observed in the selectivity size of 95% (**Figure 12**).

Años	SPR	I.C. (SPR)	Sel 50	Sel 95	F/M
2014	0.45	(0.43-0.46)	121.56	128.87	1.4
2015	0.45	(0.44-0.46)	120.51	126.87	1.3
2016	0.51	(0.49-0.52)	121.28	126.01	1.03
2017	0.41	(0.4-0.42)	119.61	124.56	1.55
2018	0.38	(0.36-0.39)	120.32	124.98	1.9
2019	0.35	(0.34-0.36)	120.36	124.13	2.22

Figure 11. SPR point estimates and their confidence interval, selectivity ($L_{50\%}$ y $L_{95\%}$) and fishing pressure measure (F/M) for king crab, North Magallanes. Source: IFOP (Yáñez e Ibarra, 2021).

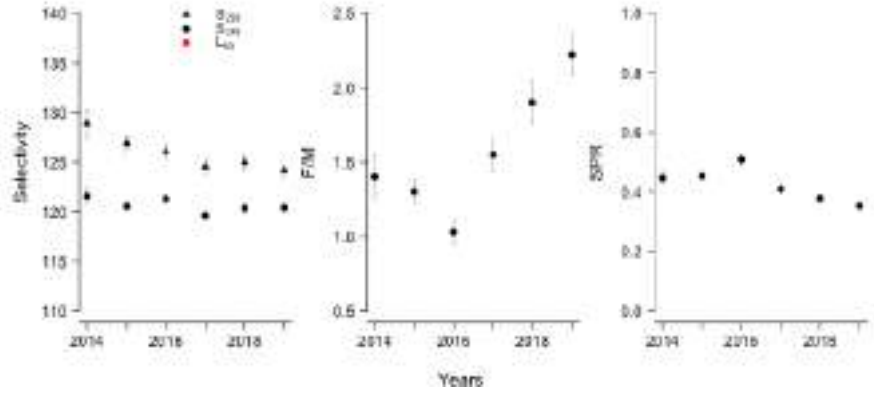

Figure 12 Selectivity (50% and 95%), F/M and SPR for king crab (North Magallanes) from 2014 to 2019. Red line corresponds to maturity at 50% used in the analysis. Source: IFOP (Yáñez e Ibarra, 2021).

King Crab LB-SPR Center Magallanes Area

Figure 13a illustrates the size structures used for applying this model; whereas **Figure 13b** shows the adjustment performed to these sizes by the LB-SPR model. There is good size adjustment for every year, considering the high variability in the proportions in the years observed, mainly 2015 and 2016 in comparison with the other years in the series.

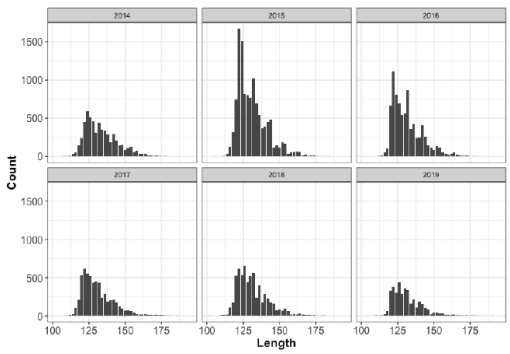

Figure 13a. King crab size structure, Center Magallanes Area between 2014 and 2019 used in the analysis. Source: IFOP (Yáñez e Ibarra, 2021).

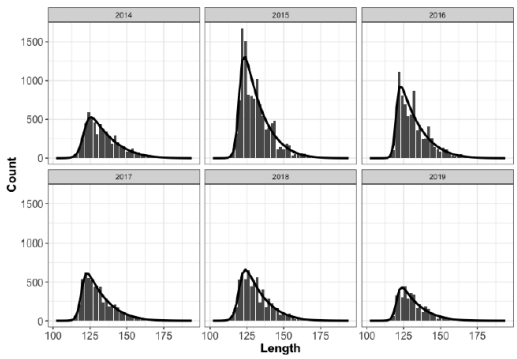

Figure 13b. Size structure (bars) and its adjustment (line) between 2014 and 2019, using the LB-SPR method for king crab. Source: IFOP (Yáñez e Ibarra, 2021).

The king crab harvest in the Center Magallanes Area takes place entirely over mature individuals, as observed in **Figure 14**, with a significant difference between the sexual maturity ogive and the selectivity ogives estimated by the model. It should be noted the consistency among the selectivity ogives for each ear, with no difference between one year and the other.

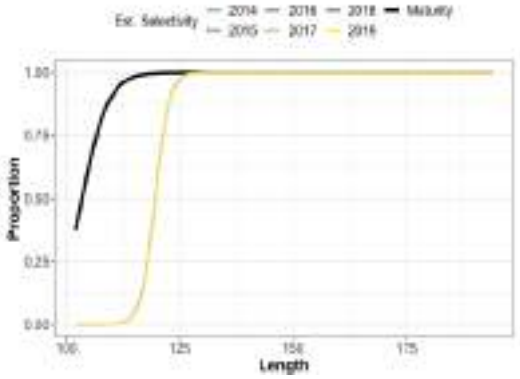

Figure 14. Selectivity per year and maturity ogive for king crab in the Center Magallanes area. Source: IFOP (Yáñez e Ibarra, 2021).

Figure 15 illustrates that the potential spawning rate for the last year equals 34%. Thus, the stock is below the biological reference point of SPR40%, but close to the definition of a healthy stock.

Figure 15. Pie chart indicating the value of SPR for the most recent year. (Red: proportion of SPR under 20%, Yellow, proportion of SPR between 20 and 40%). Source: IFOP (Yáñez e Ibarra, 2021).

Finally, **Figure 16** presents a summary of the main outputs of the method applied, showing the steadiness of the selectivity and the SPR estimate for all the years in the series. However, the fishing pressure has slightly increased during the last 4 years (**Figure 17**).

Años	SPR	I.C. (SPR)	Sel 50	Sel 95	F/M
2014	0.39	(0.38-0.4)	120.84	126.79	1.82
2015	0.34	(0.33-0.34)	119.73	123.68	2.36
2016	0.35	(0.34-0.35)	119.7	122.7	2.22
2017	0.34	(0.33-0.34)	119.11	123.46	2.26
2018	0.34	(0.33-0.35)	119.82	125.07	2.28
2019	0.34	(0.33-0.34)	120.16	124.11	2.42

Figure 16. SPR point estimates and their confidence interval, selectivity ($L_{50\%}$ y $L_{95\%}$) and fishing pressure measure (F/M) for king crab, Center Magallanes. Source: IFOP (Yáñez e Ibarra, 2021).

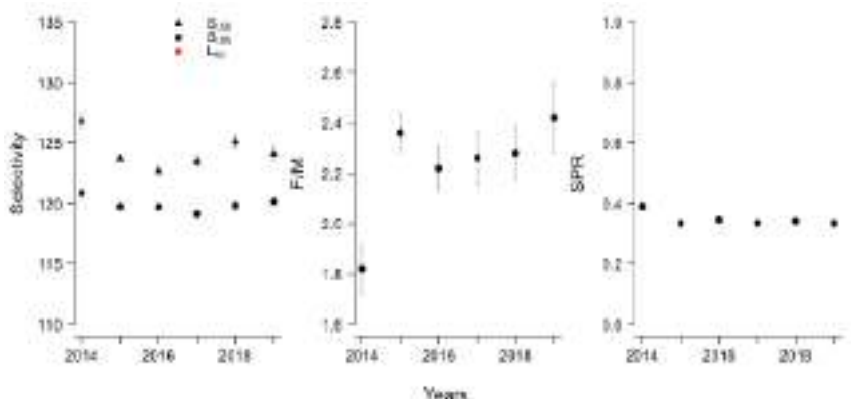

Figure 17. Selectivity (50% and 95%), F/M and SPR for king crab (Center Magallanes Area) from 2014 to 2019. Red line corresponds to maturity at 50% used in the analysis. Source: IFOP (Yáñez e Ibarra, 2021).

King Crab LB-SPR South Magallanes Area

Figure 18a illustrates the size structures used for applying this model; whereas **Figure 18b** shows the adjustment performed to those sizes by the LB-SPR model. There is good size adjustment for every year, considering that the data distribution is closer to a log-normal distribution that to a normal distribution. Years 2015 and 2016 record high proportions observed among 125 mm of CL. However, there is no significant reduction in the adjustment.

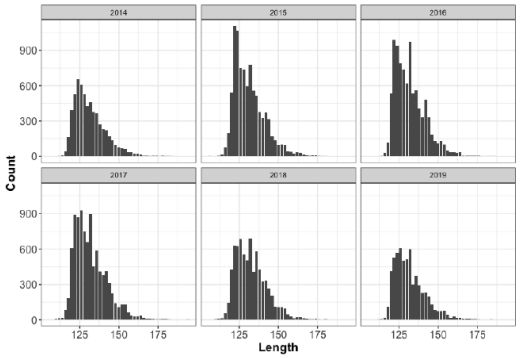

Figure 18a. King crab size structure, South Magallanes Area between 2014 and 2019 used in the analysis. Source: IFOP (Yáñez e Ibarra, 2021).

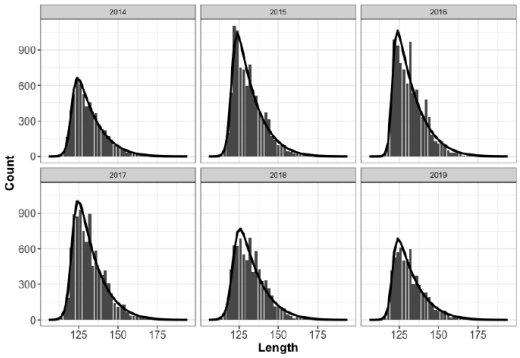

Figure 18b. Size structure (bars) and its adjustment (line) between 2013 and 2019, using the LB-SPR method for king crab. South Magallanes Area. Source: IFOP (Yáñez e Ibarra, 2021).

The king crab harvest trend in the South Magallanes Area coincides with that of the other two areas, with harvest taking place entirely over mature individuals, with a significant difference between the sexual maturity ogive and the selectivity ogives estimated by the model (**Figure 19**).

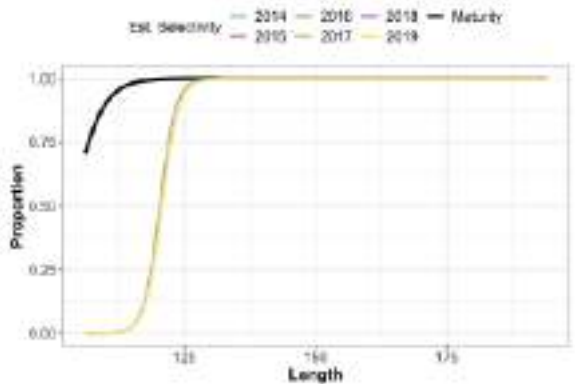

Figure 19. Selectivity per year and maturity ogive for king crab in the South Magallanes Area. Source: IFOP (Yáñez e Ibarra, 2021).

Figure 20 illustrates that the potential spawning rate for the last year equals 34%, likewise the Center Area. Thus the stock is below the biological reference point of SPR40%.

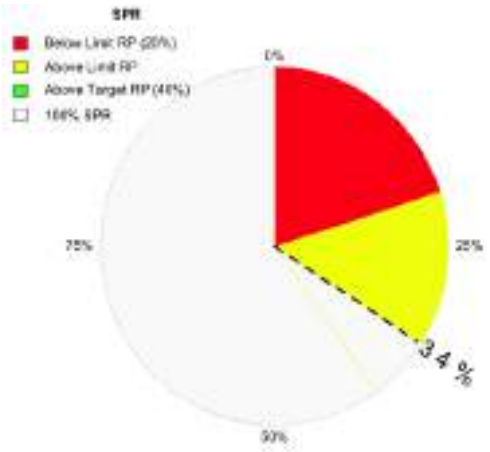

Figure 20. Pie chart indicating the value of SPR for the most recent year. (Red: proportion of SPR under 20%, Yellow, proportion of SPR between 20 and 40%). Source: IFOP (Yáñez e Ibarra, 2021).

Finally, **Figure 21** presents a summary of the main outputs of the method applied, showing the steadiness of the selectivity and the SPR estimate for all the series. However, there is high variability in the fishing pressure indicator, without a clear upward or downward pattern in the last few years (**Figure 22**).

Años	SPR	I.C. (SPR)	Sel 50	Sel 95	F/M
2014	0.34	(0.33-0.35)	120.52	125.16	2.43
2015	0.33	(0.33-0.34)	120.27	124.37	2.47
2016	0.35	(0.34-0.35)	120.48	123.76	2.31
2017	0.34	(0.34-0.35)	120.72	125.73	2.39
2018	0.35	(0.35-0.36)	121.33	126.9	2.32
2019	0.34	(0.33-0.35)	120.68	124.8	2.41

Figure 21. SPR point estimates and their confidence interval, selectivity ($L_{50\%}$ y $L_{95\%}$) and fishing pressure measure (F/M) for king crab, South Magallanes Area. Source: IFOP (Yáñez e Ibarra, 2021).

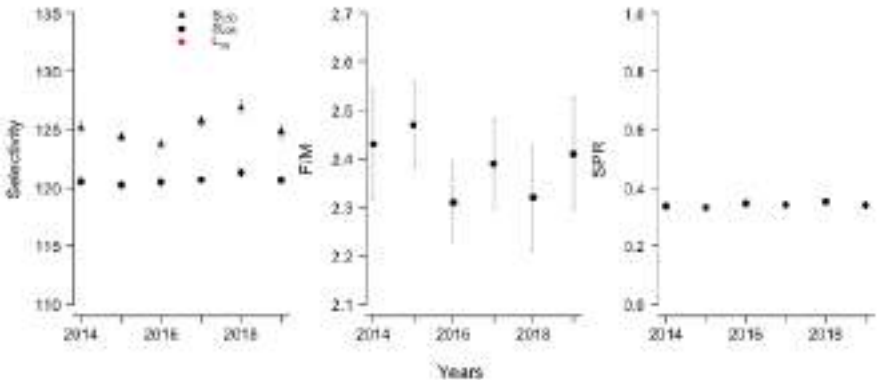

Figure 22. Selectivity (50% and 95%), F/M and SPR for king crab (South Magallanes Area) from 2014 to 2019. Red line corresponds to maturity at 50% used in the analysis. Source: IFOP (Yáñez e Ibarra, 2021).

In the case of king crab, a data-poor model was applied, giving priority to the analyses of smaller scale areas in comparison with a structured model that included grouped data from different sectors with no time continuity. As a result, there is no harvest forecast that would allow a future projection of the biomass or catch. It is expected that in the next report, a quantitative analysis would be performed so

as to solve this issue. Then, it would be possible to set short-term and long-term management objectives.

King Crab Maturity Estimate

South Area, Magallanes Region

In the case of the Magallanes Region, there was not enough data available to estimate the maturity parameters for the North or Center Areas of the region. Therefore, only the results of the South Magallanes Area are presented.

Figure 29 classifies the specimens as juveniles and adults, whereas the adjustment of the maturity curve (**Figure 30**) illustrates that the morphometric sexual maturity in king crab specimens from the South Magallanes Areas corresponds to 10.3 cm. Estimated parameters are shown in **Figure 31**.

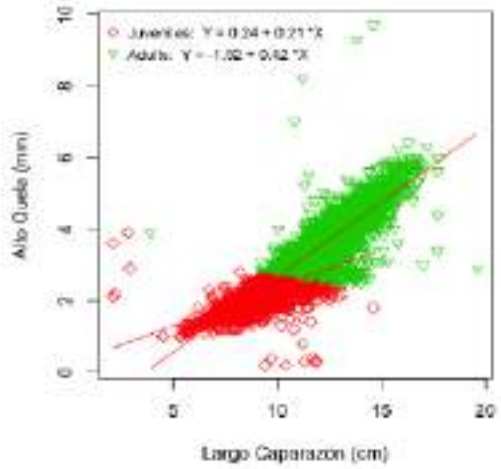

Figure 29. Classification of individuals in immature (red) and mature (green), in King crab males (*Lithodes santolla*), South Magallanes Area. Source: IFOP (Yáñez e Ibarra, 2021).

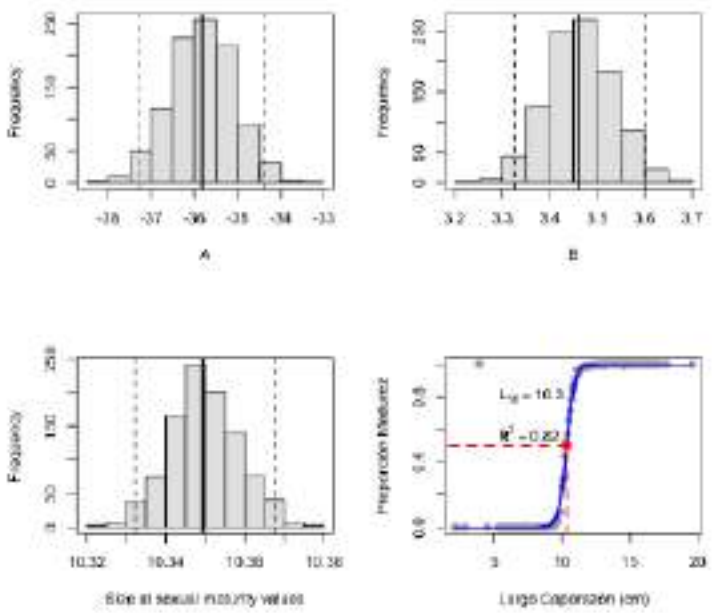

Figure 30. Estimates of: a) Parameter A estimation interval of the maturity curve, b) Parameter B estimation interval of the maturity curve, c) Sexual maturity size estimation interval and d) Sexual maturity curve, in king crab males (*Lithodes santolla*), South Magallanes Area. Source: IFOP (Yáñez e Ibarra, 2021).

Especie	Stock/Población	Parámetro	Valor	D.E
Centolla	Magallanes sur	a	-35,82	0,51
		b	3,46	0,05
		$L_{50\%}$	10,34	0,01
		$L_{95\%}$	11,20	0,02
		R2	0,82	-

Figure 31. Maturity curve parameters and size of mature individuals at L50% and L95%, in king crab male individuals (*Lithodes santolla*) in the South Magallanes Area. Source: IFOP (Yáñez e Ibarra, 2021).

Peer Review Process

By means of the Scientific Advice Continuous Quality Improvement Program (PMCCAC), a fulfillment checklist focused on the data, information and knowledge gaps was developed, regarding the general fishery status according to the advice requirements of the fishery administration. Based on this, the performance achieved is assessed, proposing the actions, activities and goals, time frames and conditions that are considered as necessary to reduce the gaps identified and meet the advice requirements previously established.

During the methodological development process, a fulfillment checklist was carried out, encompassing all the recommendations of the expert advisers, in order to verify the fulfillment of each one of the observations, corrections and recommendations highlighted by the reviewers.

The main activities are the following:

- Drafting a PMCCAC update, for each fishery and reported in the progress update.
- Implementation of the work program.
- Drafting a report including all the progress and results during each year of the project, the updated PMCCAC and a checklist (start/end) of its achievements.

Among the results of the peer review of the stock assessment performed by IFOP (Yáñez e Ibarra, 2021), there was a change in the stock assessment methodology, moving on from a size structured model for all the Magallanes Region to a data-poor model focused in three areas for the same region. This assessment gave the priority to smaller space scales against larger scales with more general premises. This is considered as an improvement within this assessment. Indeed, working with aggregate data for a whole region introduces a high degree of uncertainty given the inter annual variations (even intra annual) in the origin of the data used. In such case, it would be impossible to perform a continuous follow-up of a specific area. Hence, taking into account the size and geography of this particular region, this would result in a high degree of bias in the final results.

Performing alternative assessments for the king crab stock has been the most significant step ahead in terms of continuous improvement of this project. It led to the introduction of new areas/stocks to be assessed that, in turn, required the analysis of new data and the generation of results focused on the use of the new proposed model. These new data should be carefully analyzed. Therefore, according to the recommendations derived from the external peer review process, priority will be given to the sensitivity analysis through new estimates of annual mortality in those models based on poor data.

c) History and Characteristics of the Fishery

The most significant region in terms of king crab landing volumes is the Magallanes and Chilean Antarctica Region, representing until 2007 more than 90% of the total king crab catch at a national level. Over the last few years, it has represented around 75% (Tech. Rep. N° 247-2019 of the Subsecretariat of Fisheries and Aquaculture). Since its onset in 1928 till the early 1960s, the king crab fishery concentrated in the fishing grounds close to Porvenir and Bahía Inútil (north sector of the Great Island of Tierra del Fuego), adding later other harvesting areas such as the Dawson Island, the Seno Almirantazgo, the south of the Brunswick Peninsula and the Seno Otway, limits that were maintained till 1974. In 1975, harvest started in the south area of the region, in the Ballenero Channel and the Beagle Channel. In 1977, the Cape Horn Archipelago was added. During 1979, the geographical coverage of the fishery experienced significant changes, the most remarkable one being the expansion of the harvest activity towards the north of the Magallanes Region. In turn, as new harvest areas were incorporated, landings also increased. In addition to the space variability of the fishing operations in time, a very noticeable feature of this fishery has been the steep decline in landings.

At a national level, the king crab fishery (**Figure 32**) registers four periods since the official statistics began in 1945. A first period from 1945 to 1975, where the annual landings did not exceed 700 t, with an average of 220 t per year. The second period from 1976 to 1999, where despite some variations, landings did not decrease below 1,000 t, with an annual average of 1,823 t. A third period from 2000 to 2010, with landings above 2,000 t, and an annual average slightly above 3,000 t. Finally, a fourth period (2011-2020), whose average annual production exceeded 5,000 t, even though the preliminary figures for 2020 indicate that the landings did not exceed 4,000 t.

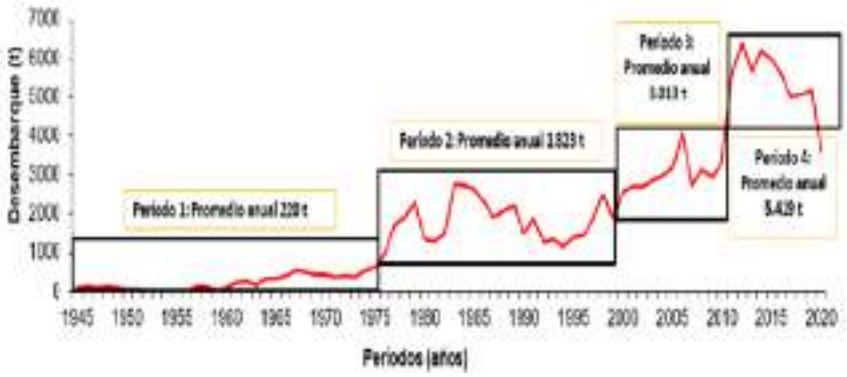

Figure 32. King crab landings in Chile. Period 1945-2020 (Source: Sernapesca) Note: Preliminary figures for year 2020. Source: Olguín y Mora, (2021).

According to Technical Report N° 247-2019 of the Subsecretariat of Fisheries and Aquaculture (SUBPESCA), the number of fishers registered for King crab has experienced a decline between 2014 and 2019, in all the regions. In general terms, 9968 fishers were registered in 2014, whereas 7200 fishers registered in 2019. As regards the Magallanes Region, the number of fishers varied between 858 (2014) and 579 (2019). As regard the number of vessels, there is also a reduction in national terms between 2014 and 2019, recording 3067 and 2399 respectively. As regard the number of vessels registered for king crab in the Magallanes Region, in 2014 those vessels of less or equal to 12 meters in length reached 586 and 91 vessels had more than 12 meters in length, whereas in 2019 it ranged between 504 vessels of less or equal to 12 meters in length and 80 of more than 12 meters in length.

The king crab fishery is based in fishing operations performed by independent harvesting vessels (EI) (**Figure 33a**), dependent harvesting vessels (ED) (**Figure 33b**), and shipping or hauling vessels (ET) (**Figure 33c**).

Figure 33a. Independent harvesting vessels (EI), fishing for King crab and Stone crab in the Magallanes Region in 2019. Source: IFOP 2019 (Daza, *et al*., 2020)

Figure 33b. Dependent harvesting vessels (ED), fishing for King crab and Stone crab in the Magallanes Region in 2019. Source: IFOP 2019 (Daza, *et al*., 2020)

Figure 33c. Shipping or hauling vessels (ET), fishing for King crab and Stone crab in the Magallanes Region in 2019. Source: IFOP 2019 (Daza, *et al*., 2020)

The dependent harvesting vessels (ED) usually set sail early in the season (July) and remain in the fishing area throughout the harvesting periods, receiving supplies from the shipping or hauling vessels (ET). The independent harvesting vessels (EI) play a multipurpose role. They fish and transport the catch to the landing points. In the Magallanes region the landing points are: Punta Arenas, Porvenir and Puerto Williams for stone crab and Puerto Natales, Punta Arenas, Porvenir and Puerto Williams for king crab.

Each harvesting vessel has a number of traps, usually ranging between 150 and 400 units depending on the vessel capacity. The traps are set in lines of 10 to 40 traps, placed at a distance between 10 to 20 m. The upper diameter of the trap ranges from 40 to 44 cm, with a height of 44 to 70 cm and a diameter below 119 to 135 cm. The weight of each trap varies between 15 to 17 kg. The range of the mesh covering the trap is of 1 cm. When turning them, the power of the devices used range between 600 and 1500 kg (**Figure 34**). So far, the dimensions of the fishing gear are not officially regulated (**Figure 35a, Figure 35b**).

When fishing, the activity usually starts in the pre-dawn hours with the turning of the traps set one or two days earlier (24 to 48 hours at rest). The setting and the turning are performed simultaneously, namely, when the traps are turned, they are emptied (if they contain fish) and baited again. Then, they are set again in the same sector or transferred to another sector depending on the level of catch obtained. The caught specimens are kept alive in "cages" or underwater mesh, waiting for the shipping vessel.

Each 5 to 10 days (depending on the weather conditions), the shipping vessels gather the catch of the dependent harvesting vessels, transferring the male specimens above the minimum legal size, recording the weight delivered by each vessel (**Figure 36**). The shipping vessels are endowed with circulating water nurseries, thus conveying the king crab specimens alive to the landing ports.

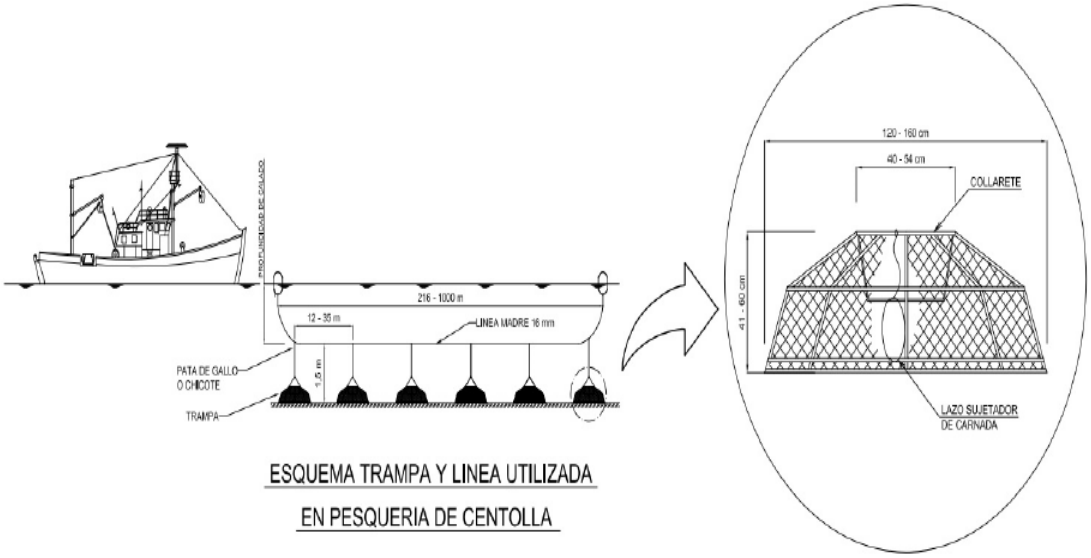

Figure 34. Line of traps used in the king crab and stone crab fishery in the Magallanes Region. Source: IFOP 2019

Medidas	Centolla
Diámetro superior (cm)	40 - 54
Diámetro Inferior (cm)	120 -160
Altura (cm)	41 - 60
Tamaño de malla (mm)	20 - 50

Figure 35a. Measurements of the traps used for harvesting king crab. Source: IFOP (Daza et al., 2020).

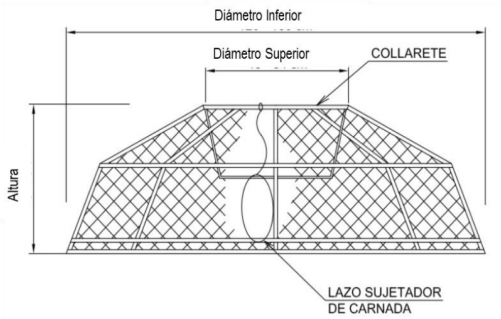

Figure 35b. Detail of the trap used in the king crab fishery in the Magallanes Region. Fuente: IFOP (Daza et al., 2020)

Figure 36. King crab fishing areas recorded by IFOP during the journey of the shipping vessel (ET) for king crab stocks, Follow-Up of Benthic Crustaceans (August 2019). From south to north: 1: Terhalten Island; 2: Windhond Bay; 3: Hately Bay; 4: Tekenika Bay, 5: Canacus Channel; 6: Seno Ponsonby; 7: Wulaia Bay; 8: Pomar Channel; 9: Seno Searle; 10: Seno Alfredo; 11: Port. Source: IFOP (Daza *et al.*, 2020).

In the Magallanes Region, since 2007, the number of fishing grounds has changed significantly depending on the landing port. Daza *et al*., 2020, in a later analysis, indicate that Puerto Natales has recorded catch from an average of 68 fishing grounds during the 12 years, remaining steady overtime. In the case of Punta Arenas, approximately 57 different fishing grounds have been recorded. However, between 2007 and 2018, this figure has been reduced to less than half. On the other hand, Porvenir has increased the number of fishing grounds from which they receive fish, up from 33 to 126. Instead, Puerto Williams, with the exception of 2018, has maintained a steady number of fishing grounds, with an average of 28 (**Figure 37**).

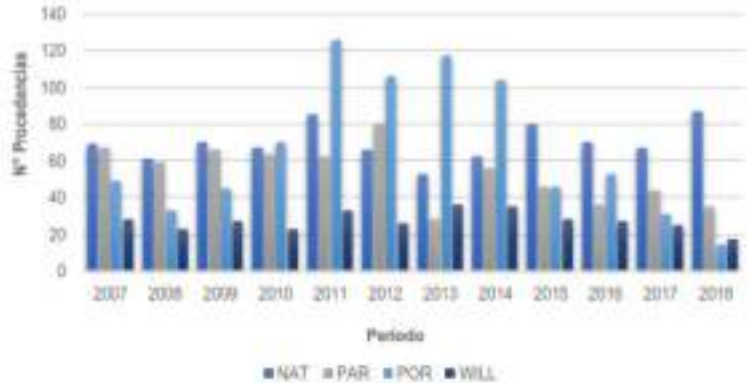

Figure 37. Number of king crab fishing grounds visited per landing port from 2007 to 2018. NAT (Puerto Natales), PAR (Punta Arenas), POR (Porvenir), WILL (Puerto Williams). Source: IFOP (Daza, et al., 2020).

2.2.2. PRINCIPLE 2: Interaction with other components of the ecosystem

The MSC Standard defines the term "primary species" as those non-target species caught by the fishery that are within the scope of the standard and have management measures and limit or target reference points. On the other hand, it defines the term "secondary species" as those non-target species within the scope of the standard that are not managed according to reference points; or those species outside the scope of the standard (amphibians, birds, reptiles, marine mammals) that are not considered as Endangered, Threatened and Protected Species (ETP).

Within the categories of primary and secondary species, the MSC standard defines "main species" as those that represent more than 5% or more of the catches of the UoA fleet, or those species considered as vulnerable that represent 2% of the catches of the UoA fleet The species below those thresholds are classified as "minor species". **Figure 38** shows the decision tree for the classification of species in Principle 2 according to the MSC Standard.

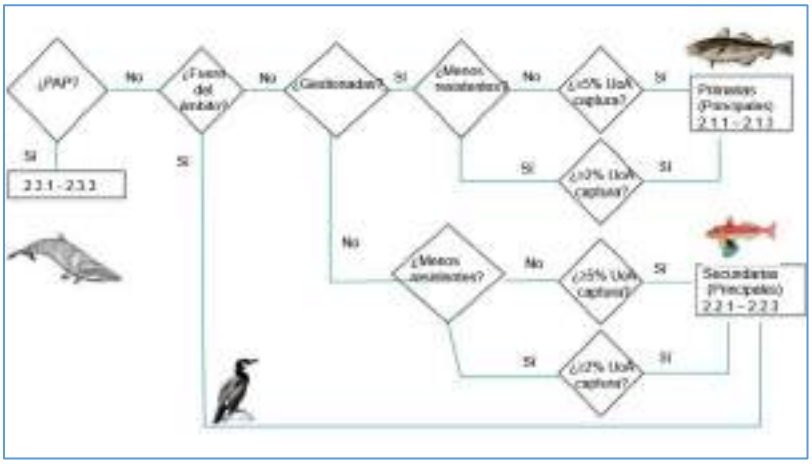

Figure 38. Decision tree to classify fishery non-target species in: ETP, primary, secondary, main and minor species. Source: MSC, 2017: MSC, 2017.

To categorize the bycatch species of the king crab trap fishery, the Benthic Crustaceans Fishery General Monitoring Program: Stone Crab and King Crab Magallanes Region from 2016 to 2020, carried out by IFOP (Daza *et al*., 2016, 2017, 2018, 2019 y 2020), was used. It describes the bycatch of the king crab artisanal fishery with data gathered by IFOP's Onboard Observers Program. It is important to highlight that the data regarding the volume of the species identified and recorded during the turning of the traps, per year and per harvest area for the Magallanes Region, is only available for the years 2019 and 2020.

a) Primary and Secondary Species

When analyzing the king crab fishery bycatch in the XII Region (IFOP, 2016, 2017, 2018, 2019 y 2020), 30 species have been identified. Four of them have been reported more frequently in all the fishing seasons (Three fish species and one mollusk species) (**Table 3**). In general, the bycatch records have gradually diminished, especially in comparison with 2009 when more species were recorded. No new species have been recorded, pending a more expert recognition, especially regarding some fish and cephalopods species. The expectations are higher for future seasons.

Table 3. Species recorded as bycatch in the king crab fishery since 2004 (Guzmán *et al*.2004) and follow-up from 2008 to 2019 (1: presence). (*) Generally corresponds to *Enteroctopus megalocyathus*, however, in some occasions it is difficult to identify the species (there is also *Robsonella fontaniana*). Prepared by the authors, based on: IFOP (Daza *et al*., 2020).

TAXONOMIC GROUP	SCIENTIFIC NAME	COMMON NAME	2004	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	TOTAL
Fish		Non-identified fish						1									1
	Salilota australis	Brótula	1	1	1	1	1	1	1	1	1	1	1	1			12
	Genypterus blacodes	Congrio dorado	1	1	1	1	1	1	1	1	1		1				10
	Bassanago albescens	Congrio negro												1			1
	Caulolatilus sp.	Non-identified fish				1	1	1									3
	Psychrolutes marmoratus	Pez coco				1	1	1	1								4
	Sebastes oculatus	Chancharro	1	1	1	1	1	1	1	1		1	1				10
	Cottoperca sp	Dormilóm														1	1
	Myxine sp.	Anguila	1	1	1	1	1	1	1	1							8
Chondrichthyans	*Schroederichthys bivius*	Pintarroja	1	1		1	1	1		1							6
	Mustelus mento	Tollo							1	1			1				3
	Zearaja chilensis	Raya volantín						1									1
Crustaceans	*Pseudocorystes sicarius*	Jaiba botón				1											1
	Metacarcinus edwardsii	Jaiba marmola			1			1	1	1	1	1					6
	Libidoclaea granaria	Centolla falsa-jaiba araña	1	1	1	1	1					1					6

	Eurypodius latreillii	Araña de mar común	1	1	1	1	1							1	1	1	8
	Paralomis granulosa	Centollón			1	1	1	1		1	1	1	1	1	1	1	11
	Munida gregaria	Langostino de los canales			1	1	1										3
	Propagurus gaudichaudii	Ermitaño colorado	1	1	1	1	1		1					1		1	8
	Peltarion spinulosum	Pancora chica	1	1	1	1	1								1	1	7
Molluscs Gasteropods	*Argobuccinum raneliforme*	Caracol palo-palo			1	1	1									1	4
	Adelomelon ancilla	Caracol piquilhue			1	1						1	1			1	5
	Aulacomya atra	Cholga				1											1
Molluscs Bivalves	*Chlamys sp.*	Nn-identified scallop	1														1
Molluscs Cephalopods		Non-identified octopus *	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14
Echinoderms	*Arbacia dufresnei*	Erizo verde						1						1		1	3
	Loxechinus albus	Erizo rojo	1	1		1								1	1		5
	Cosmasterias lurida	Estrella de mar morada				1	1			1		1		1	1	1	7
	Luidia magellanica	Estrella negra	1	1		1											3
	Solaster regularis	Estrella de mar				1											1

In the works of Daza *et al.* (2019, 2020) four taxonomic groups were identified: Bony fish, Crustaceans, Mollusks, Echinoderms. **Table 4** shows the number of individuals and the volume per taxonomic group.

Table 4. King crab fishery bycatch in the Magallanes Region, in number of specimens per year and taxonomic group during the years 2018 and 2019. Prepared by the authors, based on IFOP (Daza *et al*., 2019 and 2020).

Taxonomic group	2018		2019	
	Tons	N°	Tons	N°
Bony Fish				4
Crustaceans	0,896	1374	0,703	1784
Molluscs	0,017	36	0,059	158
Echinoderms	0,001	1	0,001	2

The king crab fishery bycatch included 12 taxa, 10 identified at the level of species, 1 at the level of gender, and 1 indeterminate (**Table 5**); gathered in 4 taxonomic groups. The most representative in terms of specimens and biomass was the Chilean snow crab (*Paralomis granulosa*), with 92% of the bycatch and fluctuating between 11% and 14% of the total catch.

Table 5. Bycatch of the king crab fishery in the Magallanes Region, recorded by the POAB of IFOP between 2018 and 2019. Values expressed in number of specimens and percentage of occurrence per species or per group. Prepared by the authors, based on: IFOP (Daza *et al.*, 2019 and 2020).

Taxonomic Group	Common Name	Scientific Name	2018			2019		
			Tons	N°	% of Total Catch	Tons	N°	% of Total Catch
Bony Fish	Dormilón	*Cottoperca sp.*			0	0	4	0
	Total		**0**		**0**		**4**	**0**
Crustaceans	Centollón	*Paralomis granulosa*	0,894	1362	13,79	0,7	1750	10,759
	Araña de mar común	*Eurypodius latreillii*	0,002	12	0,035	0,002	16	0,025
	Ermitaño colorido	*Propagurus gaudichaudii*			0	0,001	6	0,02
	Pancora chica	*Peltarion spinulosum*			0	0,001	9	0,008
	Jaiba botón	*Pseudocorystes sicarius*			0	0,001	9	0,008
	Total		**0,896**	**1374**	**13,825**	**0,705**	**1790**	**10,82**
Mollusks Gasteropods	Caracol piquilhue	*Adelomelon ancilla*			0	0,003	8	0,048
	Caracol palopalo	*Argobuccinum ranelliforme*			0	0,005	36	0,072
	Total		**0**	**0**	**0**	**0,008**	**44**	**0,12**
Mollusks Cephalopods	Pulpo del sur	*Entheroctopus megalocyathus*	0,015	9	0,234	0,04	25	0,62
	Total		**0,015**	**9**	**0,234**	**0,04**	**25**	**0,62**
Echinoderms	Erizo Rojo	*Arbasia dufresnei*	0,001	1	0,008			0
	Erizo de mar				0	0,001	2	0,008
	Estrella de mar morada	*Cosmasterias lurida*	0,002	27	0,035	0,01	83	0,146
	Total		**0,003**	**28**	**0,046**	**0,011**	**85**	**0,146**
Total Bycatch			**0,914**	**1411**	**14,102**	**0,762**	**1948**	**11,714**
Total Target Species				**5,569**	**85,898**		**5,744**	**88,286**
Total				**6,483**	**100**		**6,506**	**100**

As regards the use by the artisanal fishery of certain species as bait for the king crab fishery in the Magallanes Region, IFOP's Onboard Observers Program (Daza *et al*., 2016, 2017, 2018, 2019 and 2020) determined that there were three main sources of bait: 1) imports from Argentina and Spain, in addition to other national locations (Coihaique, Chacabuco and Puerto Montt), 2) waste of the production processes on board of factory vessels and processing plants, and 3) self-caught bait (referring to some cases where they catch their own bait). The proportion of these three sources has varied over time (**Figure 39a, 39b, 39c**). For instance, in the last two years of the follow-up, the use of self-caught bait has not been recorded by IFOP observers, with the waste from processing plants representing 100% of the bait (IFOP (Daza *et al*., 2019 and 2020). However, it has been documented that there are limitations in the king crab fishery coverage. Hence, the self-caught bait practice could be taking place in reality and, it would be necessary to establish a follow-up that could determine the list of current species and volume to ascertain the potential impact of the stocks harvested.

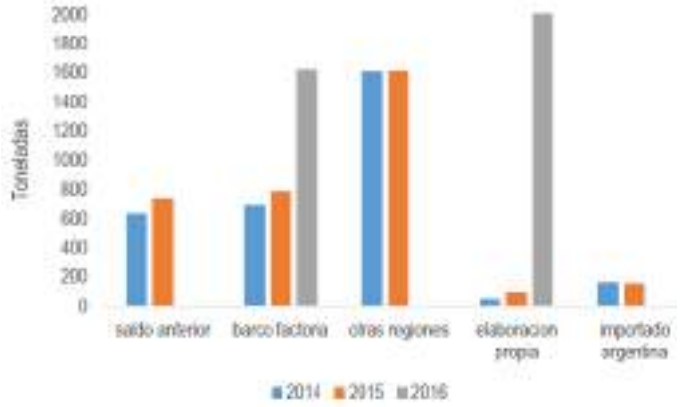

Figure 39a. Bait volume (t), used from 2014 to 2016 for the extraction of king crab and stone crab. Source: IFOP (Daza *et al*., 2017)

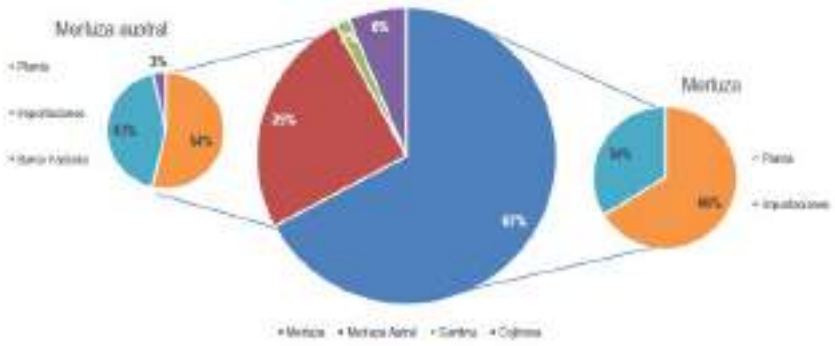

Figure 39b. Percentage of the main resources according to their origin, used as bait for the king crab and stone crab fisheries, fishing season 2018. Source: IFOP (Daza *et al*., 2019)

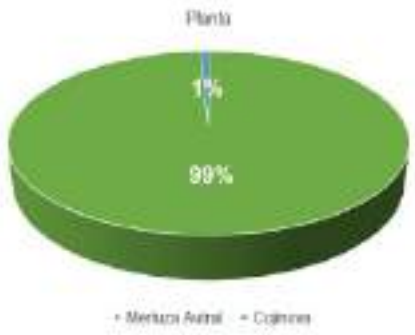

Figure 39c. Percentage of bait coming from processing plants, fishing season 2019. Source: IFOP (Daza *et al*., 2020).

Self-caught bait is harvested by those vessels fishing for king crab that are endowed with some fishing gear (Line/Lienza -67%-, net -18%-, horizontal longline -7%-, longline -4%- and others -4%-) that provides them with fresh bait for their traps. This happens when there are bad weather events and the transport vessels carrying the bait are delayed (IFOP (Daza *et al*., 2016 and 2018)). **Table 6** illustrates species caught for fishers as bait. 42% of the vessels caught Patagonian redfish (*Sebastes oculatus*), followed by tadpole codling (*Salilota australis*) with 21%. Unfortunately, the information available regarding self-caught bait does not allow for a projection of the percentage of each species in the total catch. Therefore, it would be difficult to classify the species used as bait in main and minor. Therefore, we will use the information available about the stock status of the reported species to classify them, on a preliminary basis, until it is reviewed and documented through onboard samplings.

Table 6. Species used as fresh bait during the king crab and stone crab fishing operations for fishing season 2015. Prepared by the authors, based on: IFOP (Daza *et al*., 2016)

Common Name	Scientific Name	% of Registers
Chancharro	*Sebastes oculatus*	42
Brótula	*Salilota australis*	21
Raya volantín	*Zearaja chilensis*	12
Congrio dorado	*Genypterus blacodes*	9
Róbalo	*Eleginops maclovinus*	7
Merluza del sur	*Merluccius australis*	5
Tollo	*Mustelus mento*	4

The following species are classified as primary species, as they are managed according to biological reference points: yellownose skate, golden kingclip and Southern hake. The rest should be considered as secondary species. Among the primary species, on a preliminary basis, as there is no available data on the percentage of each species in the total catch, they are considered as minor. Among the secondary species, Chilean snow crab is considered as main species as it is above 5% of the total catch of the target species; the rest are considered as minor species as their volume is significantly low (**Table 7**).

Table 7. Classification of king crab fishery bycatch species, registered by the POAB of IFOP. Prepared by the authors, based on: IFOP (Daza *et al*., 2016, 2017, 2018, 2019 y 2020).

MSC Category		Common Name	Scientific Name
Primary			
	Main or minor	Raya volantín	*Zearaja chilensis*
		Congrio dorado	*Genypterus blacodes*
		Merluza del sur	*Merluccius australis*
Secondary	**Main**	Centollón	*Paralomis granulosa*
	Minor	Chancharro	*Sebastes oculatus*
		Brótula	*Salilota australis*
		Róbalo	*Eleginops maclovinus*
		Tollo	*Mustelus mento*
		Araña de mar común	*Eurypodius latreillii*
		Pancora chica	*Peltarion spinulosum*
		Centolla	*Lithodes santolla*

		Jaiba botón	*Pseudocorystes sicarius*
		Caracol piquilhue	*Adelomelon ancilla*
		Dormilón	*Cottoperca sp.*
		Ermitaño colorido	*Propagurus gaudichaudii*
		Caracol palopalo	*Argobuccinum ranelliforme*
		Erizo verde	*Arbasia dufresnei*
		Erizo de mar	
		Pulpo del sur	*Entheroctopus megalocyathus*
		Estrella de mar morada	*Cosmasterias lurida*

From these reported species, IFOP (Pérez *et al*., 2018) indicates that the **yellownose skate** stock exploitation status was assessed in comparison with the virgin status, estimated from the virgin recruitment or long-term average under no-exploitation conditions. The analysis of this ratio, the Reproductive Potential Ratio (BD/BD0) and its confidence interval is illustrated in **Figure 40a.** This figure shows a constant reduction till 2000, when the target reference point was exceeded. In 2002, the limit reference point was exceeded, and the stock remains in this situation for more than 10 years. In 2016, the stock is at 24% of BDo.

The phase diagram of the ratio between the spawning biomass at the maximum sustainable yield versus the fishing mortality relative to the fishing mortality associated to the maximum sustainable yield (F_{MRS}) (**Figure 40b**), shows that the high exploitation level since 1999 caused the biomass to reach values around 45% of the virgin status, biological reference point used as target. In 2002, it fell below the collapse limit (<0.5 referred to BD_{MRS}). Without prejudice to this, and despite the fact that in the last year the fishing mortality levels are slightly above the value that allows to reach the maximum sustainable yield (F_{MRS}=0.063), the reproductive stock is close to the level of collapse, placing the yellownose skate in a status of overexploitation (<0.5 referred to BD_{MRS}).

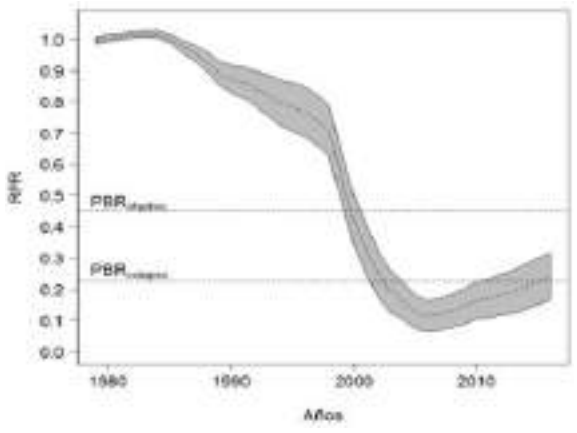

Figure 40a. Yellownose skate Reproductive Potential Ratio (RPR) and confidence interval estimated by the assessment model in the UP. Source: IFOP (Pérez, *et al*., 2018)

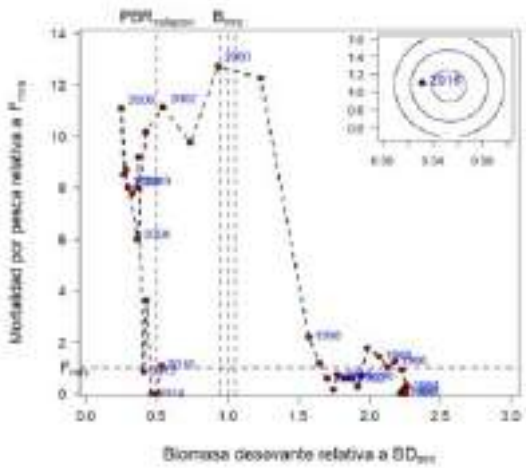

Figure 40b. Phase diagram of yellownose skate exploitation in the UP (FRMS=0.063 year-1, BRMS=1864 ton). Source: IFOP (Pérez, *et al*., 2018).

According to the SUBPESCA reports (https://www.subpesca.cl/portal/616/w3-article-840.html), the yellownose skate is in an overexploitation status. There is limited access to new entries in the fishery, a global catch quota of 300 tons and 4,290 tons of bycatch quotas (SERNAPESCA, 2020), as well as a national season closure between December and February.

As regards the **golden kingclip**, according to the results of the stock assessment from IFOP (Contreras and Quiroz, 2018), the reproductive fraction of the golden kingclip for 2017 in the north area of the Austral demersal fishery (PDA), between latitude 41°28,6'S and 47°S, reached 8,000 tons, a 36% reduction in the spawning biomass in comparison with the virgin spawning biomass. These reduction levels point at a situation of overexploitation in the north stock of the PDA, with a high likelihood of reaching below the recommended mortality (F45%).

The north area of the PDA has shown high levels of fishing mortality since the beginning of the golden kingclip fishery. With the arrival of the longlines in 1987, the stock moves away, in the Kobe chart, from the area considered as sustainable, shifting towards the overfishing risk area. Due to the high levels of catch resulting from trawlers and longlines in 1989 and 1990, this fishery was in an overexploitation status due to the depletion of the spawning biomass. After catch quotas were implemented, in 1994, the situation did not change. For the last 5 years, due to the low catch levels recorded, the stock would have presented some signs of recovery; it would move closer to the target area represented by 40% of the ratio between current spawning biomass and virgin reproductive biomass.

Figure 41 illustrates the current population status, above the limit reference point (20% of the virgin biomass), but likely below the target level. Regarding the allowable catch levels for the last four years, it can be observed that they have reduced the mortality levels below the target level, to a sustainable exploitation level related to FRMS, so the recovery process is expected to continue.

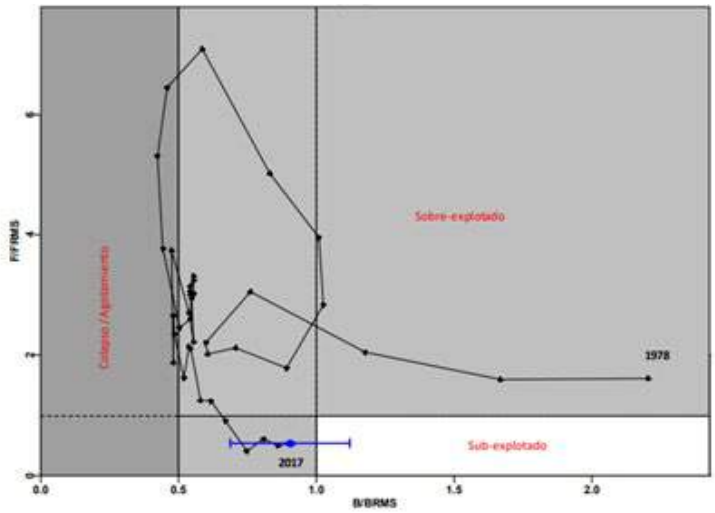

Figure 41. Phase diagram of the PDA north area. Source: IFOP (Contreras and Quiroz, 2018)

According to SUBPESCA (https://www.subpesca.cl/portal/616/w3-article-829.html), the golden kingclip fishery is still in a state of overexploitation. There is limited access to new entries in the fishery, a global and individual annual catch quota for the industrial and artisanal fleets with 534 tons and 53 tons of bycatch quotas (SERNAPESCA, 2020) for the artisanal fishery. The fishing gear is also under regulation, with a minimum mesh size of 13 cm for the industrial trawlers.

As regards Southern hake, for the year 2016, IFOP estimates (Pérez and Espinosa, 2018) indicate a total approximate biomass of 562 thousand tons and a spawning biomass of 125 thousand tons, which represent a reduction of around 30%. The depletion trends in the spawning and total biomass (**Figure 42**) show a progressive reduction during the whole series, with a slight stabilization over the last four years in the spawning biomass and a significant improvement in the total biomass, reaching a 56% reduction.

The spawning biomass reduction is shown in **Figure 43**, with a 100% status at the beginning of the period. Later, the high levels of catch maintained during the 1990s brought about a sharp decline of the stock reproductive potential, going below its target reference point in 1991. In 2016, the Southern hake was at 31% of the initial status. Currently, the stock is overfished, with a biomass at the Maximum Sustainable Yield of 167,456 tons, the value of F_{MSY} is of 0.26/year. The fishing mortality value in 2016 was of 0.36/year, generating an overfished status (**Figure 44**).

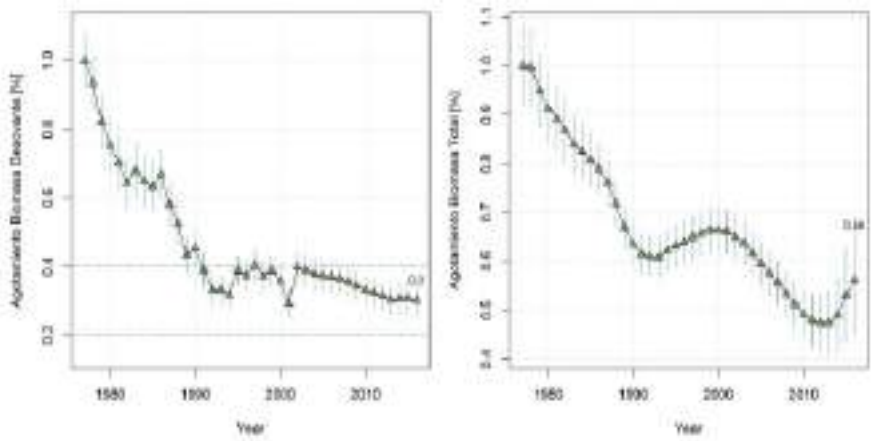

Figure. 42 Reduction in spawning biomass (BD/BDO) and total biomass as a percentage. Source: IFOP (Pérez y Espinosa, 2018).

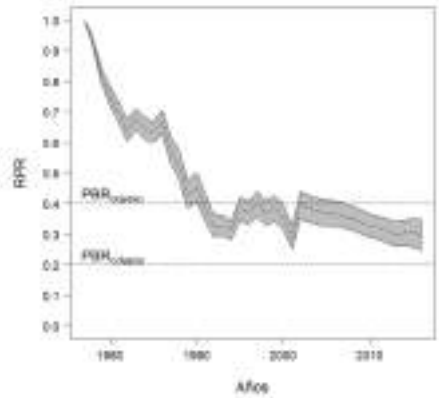

Figure. 43 Reduction of the reproductive potential (BD/BD0) as a percentage, period 1977-2016. SBLIM=167456 tons and SBCOLLAPSE= 83728. Source: IFOP (Pérez y Espinosa, 2018).

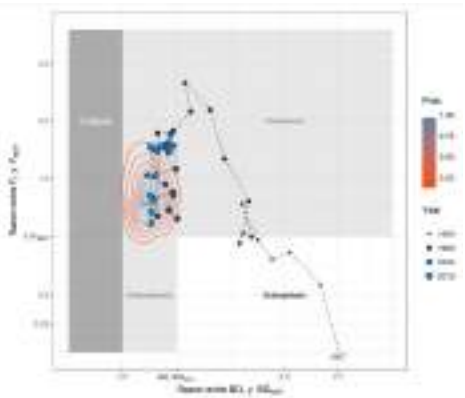

Figure. 44 Phase diagram of the Southern hake, period 1977-2016. BMSY=167456 ton, FMSY=0,26 year-1. Source: IFOP (Pérez y Espinosa, 2018).

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The Southern hake fishery restricts access to new entries; with catch global and individual quota, with fishing gear restrictions; hook size N° 6 and minimum mesh size 13 cm (http://www.sernapesca.cl/medidas/merluza-del-sur).

As regards secondary species, more information is required, especially in the case of those species used as bait, in order to establish main and minor categories with less uncertainty. Probably it will be necessary to use the RBF to understand the fishery related risks.

b) ETP Species

The southeastern Pacific is one of the less exploited ocean regions worldwide. This large region includes one of the most productive marine systems in the world: The Humboldt Current System. This system sustains a large part of the world pelagic fisheries and its productivity is a classic example of waters rich in nutrients that promote the primary and secondary production. Along the Chilean coastline, the injection of nutrients in surface waters through the upwelling events triggers high

primary production; this promotes zooplankton and fish production over large areas. In turn, this supports upper trophic levels, including large populations of marine birds and mammals (Osman *et al*., 2008).

Given this important primary and secondary productivity, the Chilean Patagonia hosts significant populations of higher order predators, such as marine birds and mammals. Some of them are migrating species, such as the blue and humpback whales, as well as numerous marine birds (albatross, shearwaters, South American tern); whereas some others are residents and keep annual presence in the area, such as sea lions, otters, dolphins, porpoises, black-browed albatross, imperial cormorants and Magellanic penguins, among others (Hucke-Gaete *et al*., 2021).

As regards birds, in Chile are recorded 109 species, representing 30% of the species richness nationally. Moreover, the Chilean Patagonia hosts almost 50% of the marine birds recorded in Chile, among them the sooty shearwater (*Ardenna grisea)*, the Humboldt penguin (*Spheniscus magellanicus),* Southern rockhopper penguin (*Eudyptes chrysocome),* wandering albatross (*Diomedea exulans),* northern royal albatross (*Diomedea sanfordi)*, royal albatross (*Diomedea epomophora)*, Salvin's albatross (*Thalassarche salvini*) and the westland Petrel (*Procellaria westlandica),* Southern giant petrel (*Macronectes giganteus)*, Southern fulmar (*Fulmarus glacialoides),* Magellanic diving-petrel (*Pelecanoides magellani), S*outhern storm-petrels (*Oceanites oceanicus)*, and Procellariiformes relatively common in certain times of the year (Hucke-Gaete *et al*., 2021).

Moreover, in the country there is wide variety of cetacean species, 38 of the 76 known worldwide (50%). The species of mysticetes are 8 of the 12 recognized as whales (66.7%) and the odontocetes are 30 of the 65 marine species (46.2%) (Aguayo-Lobo 1999). In the south of Chile, the most representative species of cetaceans include the Chilean dolphin (*Cephalorhynchus eutropia*), the Peale's dolphin (*Lagenorhynchus australis*), the thorny porpoise (*Phocoena spinipinnis*), the bottlenose dolphin (*Tursiops truncatus*), the killer whale (*Orcinus orca*) and the dusky dolphin (*Lagenorhynchus obscurus*) (Osman *et al*., 2008).

Pinnipeds (common seals and fur seals) are high trophic level marine predators. In Chile, 5 species can be found: South American sea lions (*Otaria flavescens*), Juan Fernández fur seal (*Arctocephalus philippii*), South American fur seal (*A. australis*), Antarctic fur seals (*A. gazella*), and the Sub Antarctic fur seal (*A. tropicalis*) (Osman *et al*., 2008).

According to the Benthic Crustaceans Fishery General Monitoring Program: Stone Crab and King Crab Magallanes Region from 2016 to 2020 carried out by IFOP (Daza *et al*., 2016, 2017, 2018, 2019 and 2020), the fishery reports almost no interactions with any marine mammal, bird or reptile. So far, only the bycatch of one bird species has been reported, with very low frequency, no more than three specimens of imperial shag (*Phalacrocorax atriceps*) from 2014 to 2018 (IFOP (Daza *et al*., 2019). However, the species does not meet the conditions set by the standard to be considered ETP species and, consequently, it will be analyzed as a main secondary species.

There has been an interaction between the trap lines and whales. Recently, SUBPESCA published a Technical Report (RPESQ) N°198-2021 that recommends the introduction of changes when building the trap lines with non-buoyant material, or anchoring them so that the trap lines remain in the seabed. Moreover, they recommend not to set trap lines in areas where there is evidence of the presence of whales. The presence of whales should be reported, as well as entanglements in the fishing logbook, to SERNAPESCA, to avoid interactions with large mammals. The idea is to reduce their interaction with the fishing gear used by the artisanal fishery. These recommendations were followed by Exempt Resolution N° 2827 of SUBPESCA, dated October 2021, that transformed those recommendations into legislation to protect those cetaceans.

In the coasts of Chile, the cetaceans were declared natural monuments by means of Decree N°230/2008 of the Ministry of Economy, Development and Reconstruction. In addition, Law N°20.293 is approved, protecting any cetacean species that inhabits or sails the maritime waters under national jurisdiction. This Law prohibits to kill, hunt, catch, harass, hold, possess, transport, land, process or perform any transformation process, commercialization or storage of any of this cetacean species. In order to promote the protection and the non-lethal use of the cetaceans, the Law aims at protecting key areas for the development of their life cycle, putting in place additional protective measures in the areas of breeding, mating, parental care, feeding and migrating routes. Moreover, all the fishing vessels should have a contingency plan in case of collision, damage or accidental extraction of a cetacean, in accordance with the corresponding legislation.

Chile is signatory of CITES, the International Convention for the Regulation of Whaling and the Convention on Migratory Species. SERNAPESCA (National Fisheries and Aquaculture Service) is in charge of regulating the trade on those species listed in CITES, Appendices I and II. Moreover, there are national strategies to reduce the interaction with chondrichthyans, marine birds and mammals with the Chilean fisheries, for instance, the adoption of the National Action Plan to Reduce the Interaction between Seabirds and Fisheries in Chile (PAN-Aves).

c) Habitat

According to Barrera (2016), the king crab *L. santolla* habitat encompasses a complex network of channels, coves and land masses that create a system of basins whose hydrographic and ecological peculiarities are barely known; yet Fjords in this region are of the estuary type (riverbed that has been invaded by the sea due to tidal influence and subsiding riverbanks), generally presenting steep slopes, rocky bottoms (that could be finally covered by sediments) and marine effusions. Thus, they are considered as glacier valleys covered by the sea. Fjords are highly influenced by the west winds and the Polar Front. The latter is influenced in turn by the waters of the Antarctic Circumpolar Current (ACC) and Cape Horn Current; moreover, the rainfall, continental run-off and glacier melting make of these fjords a complex ecosystem of brackish water.

King crab has a bathymetric distribution that ranges from subtidal to depths close to 700 m; it inhabits mainly seabeds with sand and rocks. However, it migrates during the reproductive seasons to waters above 120 meters, thus facilitating the catch of adults. The fishery, according to IFOP (Daza, *et al*., 2020), develops in depths between 19 to 64 meters, concentrating 95% of the sets in a range above 30 and 40 m in depth, as illustrated in **Figure 45**.

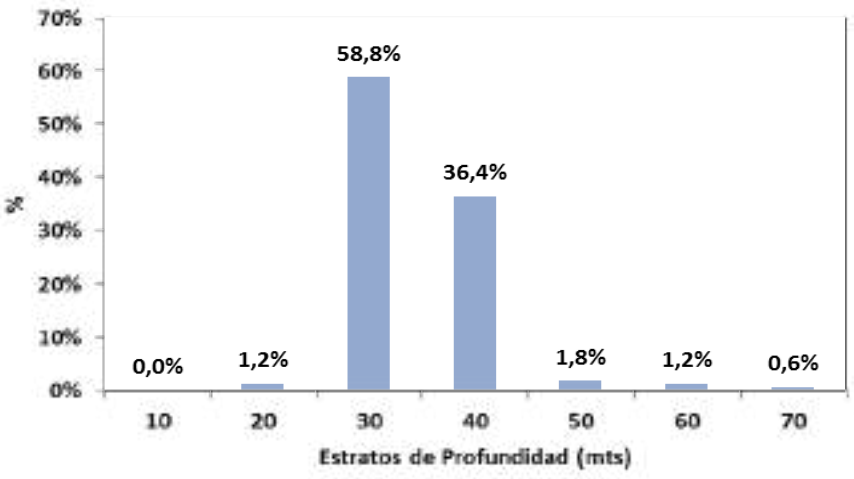

Figure 45. Depth for setting traps. Prepared by the authors, based on: IFOP (Daza, *et al*., 2020).

According to IFOP (Daza *et al*., 2020), since 2007 to date, the number of king crab fishing grounds has varied significantly with respect to the landing port. This would be related to the fleet dynamics that operates according to the abundance levels of the king crab stock, vessel capacity and equipment, distance of the fishing ground and weather conditions.

In the Magallanes Region, the trap artisanal fishery has spread around different fishing areas. Between July and December, IFOP observers recorded a total of 94 king crab fishing grounds corresponding to Puerto Natales as landing port. The fishing grounds were located from the Castillo Channel in the north to Lomas Bay in the center of the region (**Figure. 46**). The vessels stopping at Punta Arenas, landed king crab catches from 28 fishing grounds located from Parker Island in the north to Lennox Island in the south of the region (**Figure 47**). Those landing at Porvenir, registered 15 fishing grounds, from the Labbe passage in the center of the region to the Wollaston Islands in the south (**Figure 48**). In turn, Puerto Williams registered a total of 19 fishing grounds, all of them located in the south of Magallanes. These sectors spread from Chasco Cove (Seno Chasco) in the north to New Island (Isla Nueva) in the southern end (**Figure 49**).

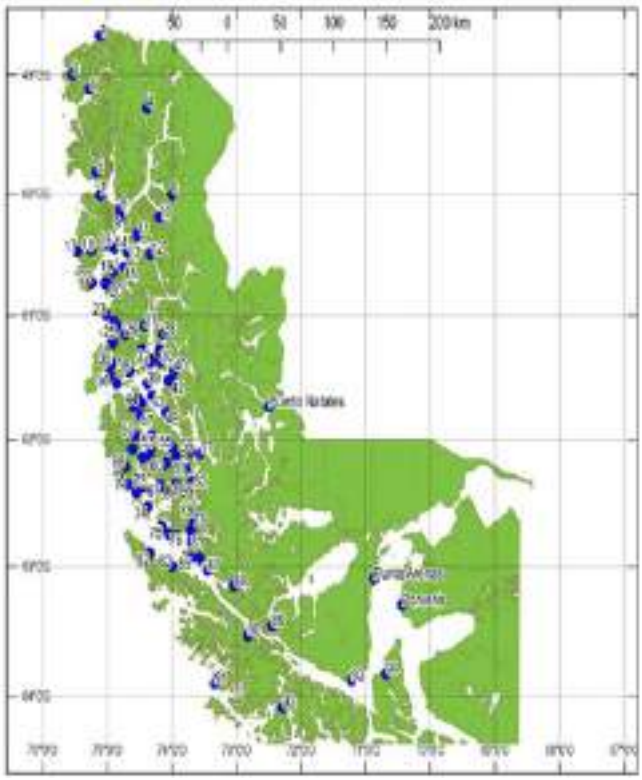

Figure 46. Geographical distribution of fishing grounds visited by vessels from Puerto Natales landing port from July to December 2019. 1: canal del Castillo; 2: canal Riquelme; 3: canal Ladrilleros; 4: canal Crossover; 5: canal Picton; 6: Guía Angostura; 7: canal Trinidad ; 8: paso Coffin; 9: isla Stratford ; 10: seno Europa; 11: canal Andrés; 12: canal Pitt; 13: canal Artillería; 14: canal Concepción; 15: isla Hocico de Caimán; 16: canal Oeste; 17: paso Metalero; 18: canal Inocentes; 19: isla Froilán; 20: canal Rayo; 21: isla Doñas; 22: isla Negra; 23: isla Solar; 24: canal Elena; 25: canal Ignacio; 26: isla Armonía; 27: bahía Morena; 28: isla Lucia; 29: paso Sharpes; 30: isla Vancouver; 31: islas Solari; 32: isla Madrid; 33: isla Carmona; 34: canal San Blas; 35: seno de los Torrentes; 36: canal Elías; 37: estrecho Nelson; 38: canal Castro; 39: islas Angelotti; 40: isla Doble Pico; 41: punta Oeste; 42: canal Sarmiento; 43: islas Gómez Carreño; 44: islas Wilson; 45: paso El Túnel; 46: islas Torres; 47: isla Flora; 48: isla Palermo; 49: paso Riquelme; 50: canal Nuevo; 51: isla Maldonado; 52: canal Ballena; 53: islas Bordes; 54: isla Juan Guillermo; 55: canal Cutler; 56: canal Smyth; 57: seno Unión; 58: paso Toro; 59: canal Pacheco ; 60: canal Rocoso; 61: paso Marazzi; 62: isla Summer; 63: canal Gray; 64: seno Membrillar; 65: canal Bambach; 66: canal O'Higgins ; 67: bahía Cochrane; 68: canal Huemul; 69: isla Alta; 70: islas Cuarenta Días; 71: isla King; 72: paso Summer; 73: canal Wilson; 74: isla Condor; 75: islas Parker; 76: bahía Parker; 77: cabo Phillips; 78: paso Shoal; 79: isla Guarello; 80: canal Córdova; 81: paso Labbe; 82: bahía Vio; 83: barranco Colorado; 84: estrecho de Magallanes; 85: bahía Monsón; 86: isla Providencia; 87: islas Richardson; 88: golfo Xaultegua; 89: canal Jerónimo; 90: seno Nevado; 91: islas Las Rachas; 92: isla Guardián Brito; 93: bahía Rosa; 94:bahía Lomas . Source: IFOP. (Daza, *et al*., 2020)

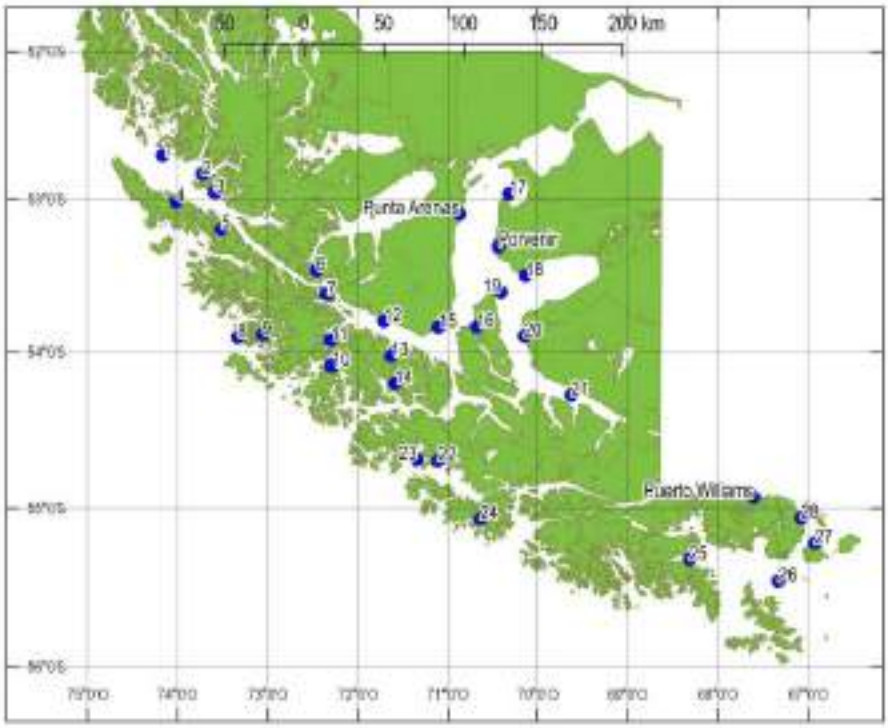

Figure 47. Geographical distribution of fishing grounds visited by vessels from Punta Arenas landing port from July to December 2019. 1: isla Parker; 2: paso Labbe; 3: isla Providencia; 4: barranco Colorado; 5: estero Córdova; 6: canal Jerónimo; 7: isla Carlos III; 8: isla Las Rachas; 9: canal Ciprés; 10: isla Guardián Brito; 11: canal Bárbara; 12: cabo Holland; 13: seno Pedro; 14: seno Mónica; 15: bahía San Nicolás; 16: bahía Lomas; 17: punta Paulo; 18: cabo Boquerón; 19: cabo Valentín; 20: puerto Yartou; 21: seno Almirantazgo; 22: seno Ladrones; 23: bahía Desolada; 24: seno Escondido; 25: bahía Tekenika; 26: bahía Nassau; 27: isla Lennox; 28: puerto Toro. Source: IFOP. (Daza, *et al*., 2020)

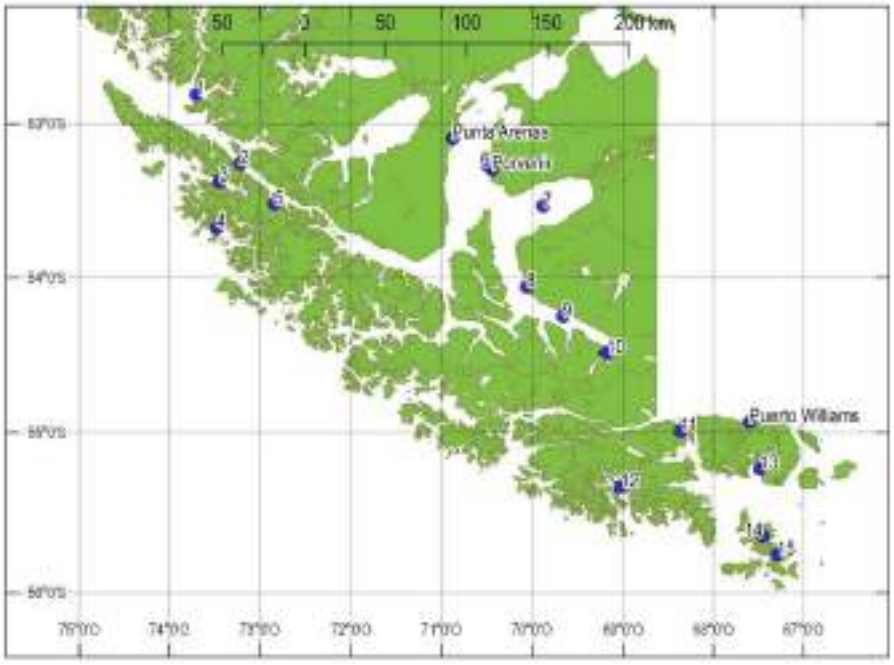

Figure 48. Geographical distribution of fishing grounds visited by vessels from Porvenir landing port from July to December 2019. 1: paso Labbe; 2: canal Largo; 3: canal Abra; 4: seno Profundo: 5: seno Nevado; 6: sector Los Chatones; 7: bahía Inútil; 8: puerto Arturo; 9: seno Almirantazgo; 10: bahía Parry; 11: puerto Corriente; 12: seno Año Nuevo; 13: bahía Windhond; 14: seno Alberto; 15: islas Wollaston. Source: IFOP. (Daza, *et al*., 2020)

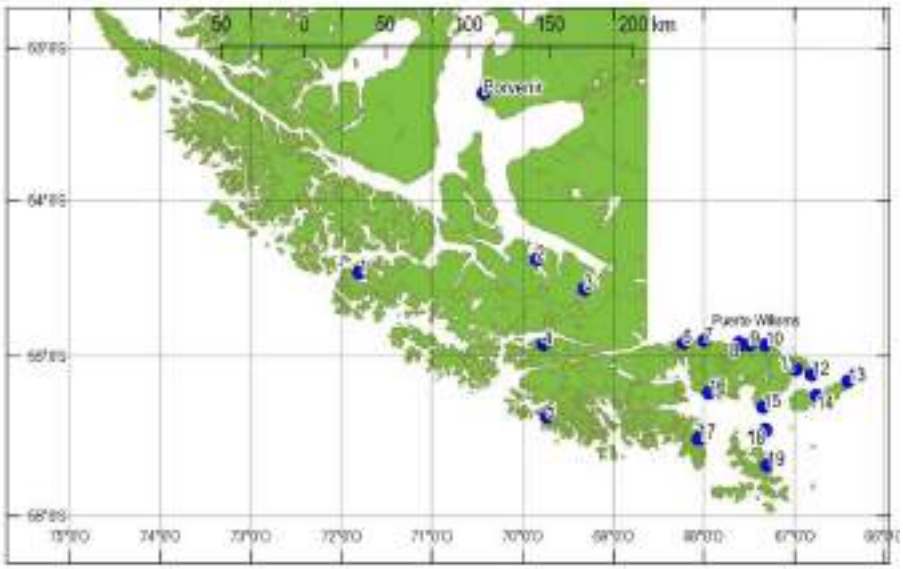

Figure 49. Geographical distribution of fishing grounds visited by vessels from Puerto Williams landing port from July to December 2019. 1: seno Chasco; 2: seno Brook; 3: bahía Parry; 4: bahía Tres Brazos; 5: isla Thomas; 6: bahía Honda; 7: caleta Mejillones: 8; banco Herradura; 9: paso Mackinlay; 10: puerto Eugenia;11: paso Picton; 12: cabo María; 13: frente a Isla Nueva; 14: paso Richmond; 15: isla Navarino; 16: isla Bertrand; 17: bahía Orange; 18: bahía Nassau; 19: islas Wollaston. Source: IFOP. (Daza, *et al*., 2020)

Considering the limited technical documentation related to the habitats where the king crab artisanal fishery operates, this report is based on the existing literature: for instance, Pineda *et al*. (2002), in their study in the south area of the Magallanes region (**Figure 50**), whose objective was to determine the textural properties, mineralogical composition and Au, Ag, Pt, Pd, Cr, Co, Ni, V and Mn content in the sediments, onboard of the oceanographic vessel AGOR "Vidal Gormaz" of the Chilean Navy, during Cruise Cimar-Fiordo 3, led by the National Oceanographic Committee.

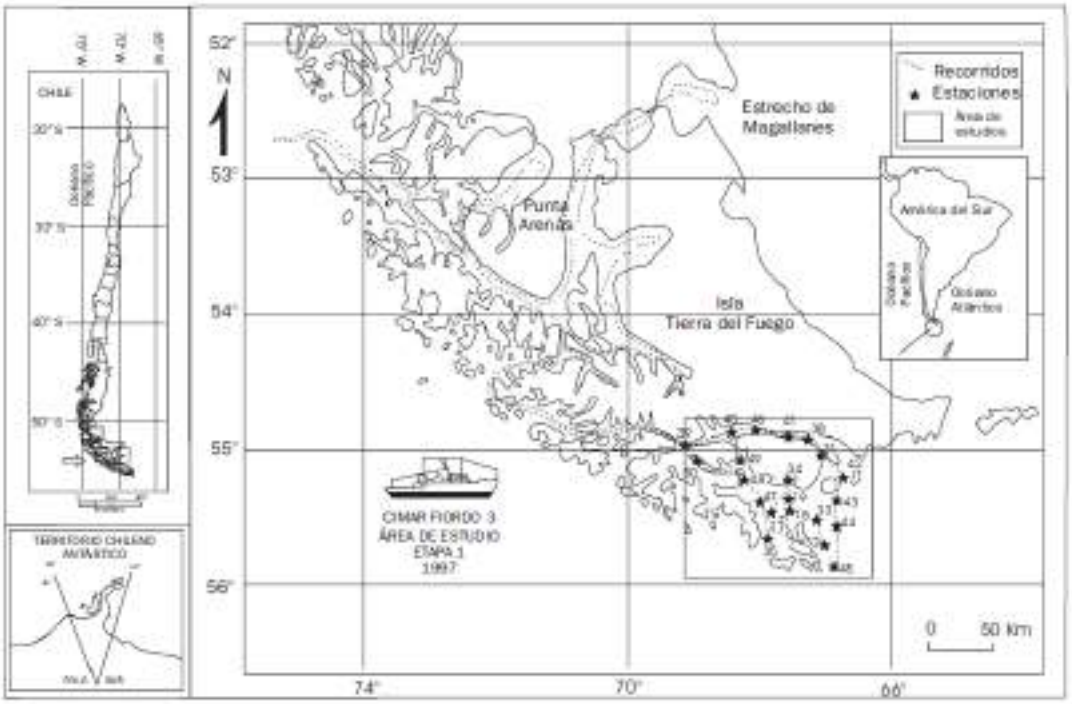

Figure 50. Map of the Cruise Cimar-Fiordo 3 journey and location of the UoA. Source: Pineda *et al.* (2002).

Pineda *et al*. (2002) mentioned that, according to the study of texture, sands predominate in 53% of the stations and are widely distributed in the Nassau Bay, shelf area with an average depth of 80 m. The sand-mud mix represents 23%, whereas mud on its own represents 6% of the samples and is mainly distributed in areas of the Beagle Channel and Murray Channel, where the average recorded depth is of 165 m. The sediments composed of sand-gravel, mud-gravel and mud-sandy gravel represent each one 6% of the total stations (**Figures 51 and 52**).

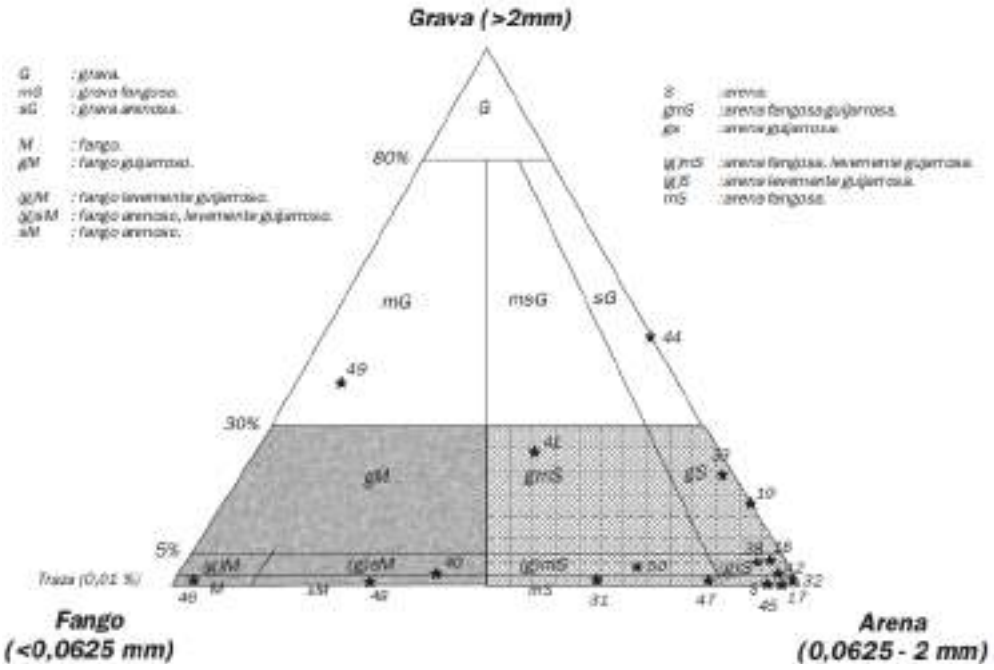

Figure 51: Location of samples in the "Diagram of textural classification of sediments with two or more major granulometric classes". Revised from Folk, 1980. Source: Pineda *et al*., 2002.

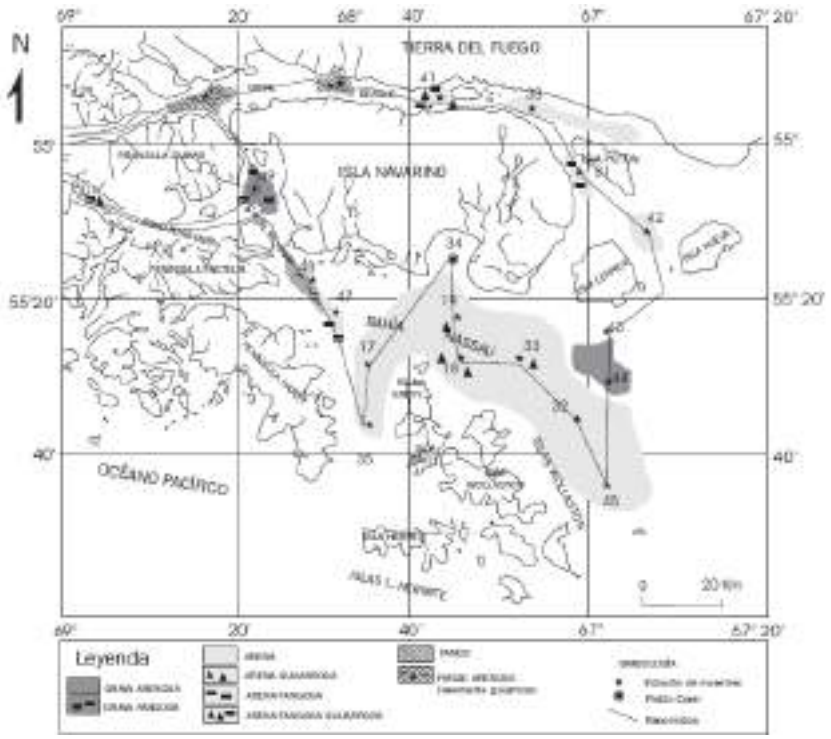

Figure 52. Sedimentological map and location of sampling stations. Source: Pineda *et al*., 2002.

Gravel is less frequent than sand and mud. Gravel is more significant (percentages above 20%) in the Beagle Channel stations (station 41), Murray Channel (station 49) and in the Nassau Bay (stations 33 and 44). Sediments in the Nassau Bay contain numerous shell fragments (between 65% and 98%) and the sand fraction predominates above gravel (**Figure 53**).

In the southeast of the Murray Channel (station 49), sediment consists mainly of gravel and mud and, in contrast with the previous stations, it does not contain shell fragments. In the Nassau Bay area, there is clear predominance of sand and gravely sand in the sediments, with poor or moderate selection. Instead, the sediments from the Beagle Channel present poor selection and are composed of gavel, sand and mud fractions (**Figure 53**).

Estación (profundidad)	Grava (%)	Arena(%)	Fango (%)	Nomenclatura del Sedimento	*
Est. 17 (80 m)	0,0	97,6	2,4	*arena*	*S*
Est. 18 (66 m)	6,7	90,3	3,0	*arena gujarrosa*	*gS*
Est. 19 (77 m)	14,5	85,1	0,4	*arena gujarrosa*	*gS*
Est. 31 (124 m)	0,0	68,0	32,0	*arena fangosa*	*mS*
Est. 32 (73 m)	0,8	97,6	1,6	*arena*	*S*
Est. 33 (89 m)	20,6	77,8	1,6	*arena gujarrosa*	*gS*
Est. 38 (41 m)	3,9	90,0	6,1	*arena levemente gujarrosa*	*(g)S*
Est. 40 (136 m)	2,5	39,9	57,6	*fango arenoso, levemente gujarroso*	*(g)sM*
Est. 41 (35 m)	25,2	45,0	29,8	*arena fangosa gujarrosa*	*gmS*
Est. 42 (52 m)	2,4	95,9	1,8	*arena levemente gujarrosa*	*(g)S*
Est. 44 (53 m)	45,5	54,4	0,1	*grava arenosa*	*sG*
Est. 45 (86 m)	0,0	95,2	4,8	*arena*	*S*
Est. 46 (201 m)	0,0	0,2	99,8	*fango*	*M*
Est. 47 (115 m)	0,0	86,1	13,8	*arena fangosa*	*mS*
Est. 48 (173 m)	0,4	30,3	69,2	*fango arenoso, levemente gujarroso*	*(g)sM*
Est. 49 (334 m)	37,3	7,8	54,8	*grava fangosa*	*mG*
Est. 50 (40 m)	5,9	71,3	22,7	*arena fangosa gujarrosa*	*gmS*

En la estación 35 la escasa muestra obtenida (arena) se utilizó sólo para los análisis químicos.

*: Nomenclatura según Folk, 1980.

Figure 53. Study of texture of the sediments. Source: Pineda *et al.*, 2002.

Among the Vulnerable Marine Environments (VME) in the Magallanes Region, there is the Vulnerable Marine Coastal Environment (VMCE) Francisco Coloane created by Decree 276/2003. It is located at 180 kilometers southwest of Punta Arenas and it includes the Magellan Strait area and fjords close to the Carlos III Island (**Figure 54**). This heterogeneous area is biologically unique. It is located at the heart of the Magellan Strait, in the convergence of the Sub Antarctic waters of the south Pacific and the Atlantic Ocean. Its peculiar geographical, oceanographical and climatic conditions make of it a privileged site in terms of biodiversity. Indeed, it is one of the last refuges of the southern river otter and a strategic area for the preservation of the humpback whale.

The features that underpin the declaration of Francisco Coloane as Multiple Use Vulnerable Marine Coastal Environment (MU-VMCE) refer basically to its ecological significance. It is the biological passage of the humpback whale and, occasionally of the minke whale. Moreover, it is the main known feeding site of the humpback whale in the southern end of the continent outside of the Antarctic waters. The most representative seabeds of the region are present in the benthic communities within the area. Even though the species of benthic stocks are not abundant enough to allow significant fishing operations, there is extraction of sea urchins and king crabs. However, harmful algal blooms seem to act as deterrence.

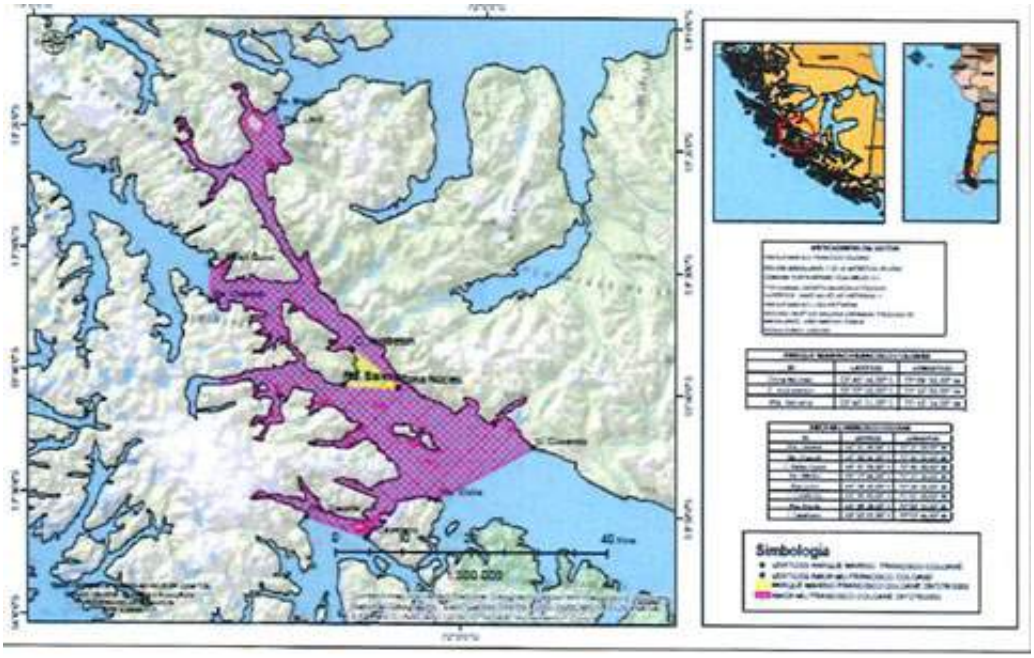

Figure 54. Vulnerable Marine Coastal Environment Francisco Coloane. Magallanes Region and Chilean Antarctica. Source: Sernapesca. 2003

Data available for the Magallanes Region identifies the presence of cold water corals in the Chilean Patagonia in the island and continental slope and shelf, between latitude 52°43' S (Desolation Island) and 57°05' S (Drake Passage) and longitude 65°48' O (Nassau Bay) and 75°46' O (Desolation Island) below 1000 meters in depth. As a result, bearing in mind the depths and areas where the king crab is harvested according to IFOP (Daza *et al*., 2020), the king crab fishery would not be operating on seabeds where the corals are present.

d) Ecosystem

In Rovira and Herreros (2016), there is a classification of the Chilean marine ecosystems. The fishing area under study appears located within the Oceanic Southern Pacific Ecoregion suggested by Jaramillo *et al*. (2006) (**Figure 55**), considering the background of benthic habitats, depth, seabed substrate, upwelling areas and sea mounts. Exception is made of the three Patagonian ecoregions that were divided according to the proposal of Häussermann and Försterra (com. pers., 2015) and WCS (com. pers., 2015).

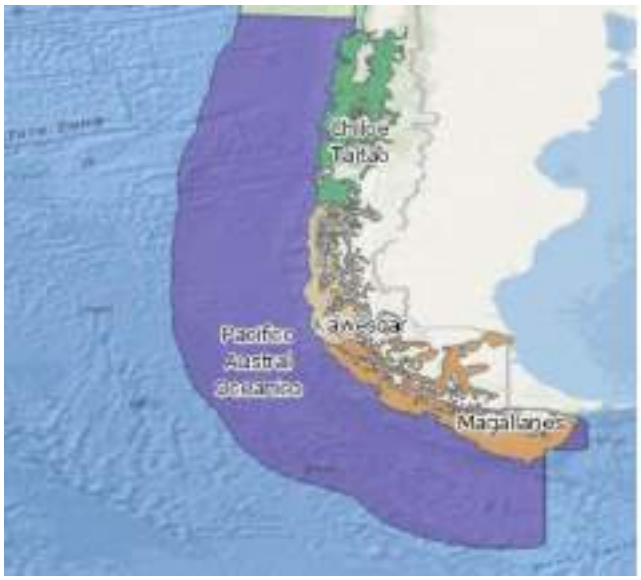

Figure 55. Marine ecoregions in the Chilean Patagonia. Source: Rovira and Herreros (2016).

The NGO Wildlife Conservation Society proposes changes in the Häussermann and Försterra classification for the Magellan Strat area, based mainly in the consideration of inner sea basins more or less under the influence of the inflow of waters from the Atlantic and Pacific Oceans. It is an updated version of Tarsicio Antezana (1999), published by Valdenegro and Silva (2003), digitalized by Alejandro Kush of WCS, for the Ministry of Environment classification project (**Figure 56**). It has the consensus of the academic and technical communities specialized in the Magallanes Region and the researchers from Huinay Foundation. This proposal defines oceanographic basins, considering bathymetric profiles throughout the Magellan Strait to Beagle Channel transect, bearing in mind the water origin and flow (Rovira and Herreros, 2016).

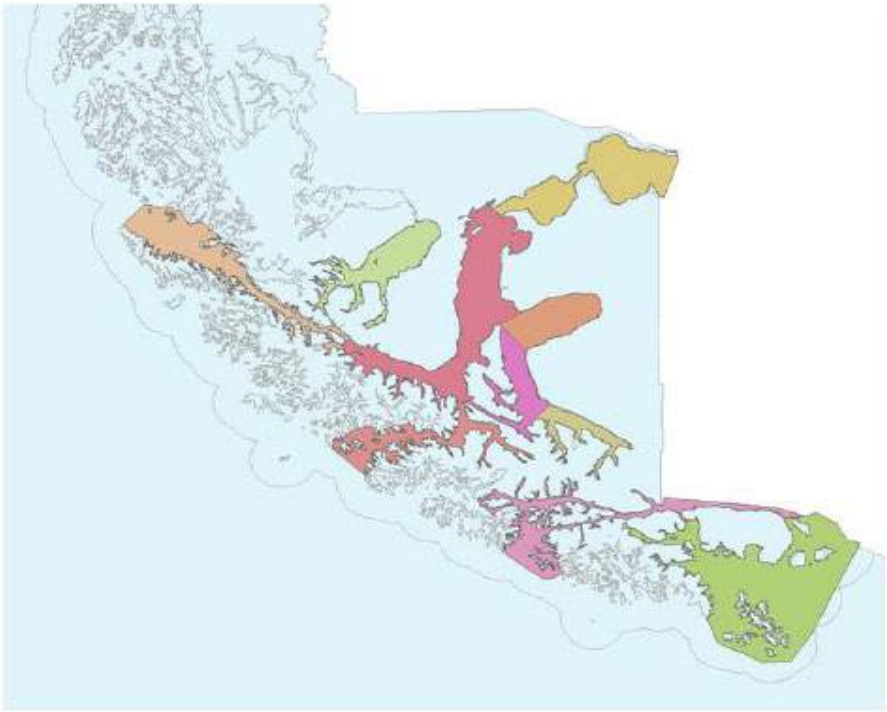

Figure 56. Digitalization of the WCS proposal for the ecosystems of the Magallanes area. Source: Rovira and Herreros, 2016

Ríos *et al*. (2010) performed a study about the animal community and its relation to the granulometric features of the sediments based on quantitative samples taken from the subcoastal area of the Atlantic mouth of the Magellan Strait (**Figure 57**). They indicate that studies about the structure of marine communities carried out through environmental gradients existing in the Magallanes Region, in connection to the setting of national patterns, have shown that the values of diversity, biomass and numerical abundance are highly heterogeneous in time and space. The high heterogeneity in environmental factors existing in the Magallanes marine systems, among them the presence/absence of glaciers, the speed of currents and tides, the type of sediments and the rates of physical disturbance, seem to be significant parameters in the distribution and abundance of benthic organisms. The high environmental variability in these systems and the impact on the distribution of species, community structure and differences, has also been observed in Norwegian fjords and channels (for instance, Holte 1998; Oug 2000). A common characteristic of some Magallanes marine communities is the relatively high level of diversity of species, suggesting a significant replacement rate of species both in time and space.

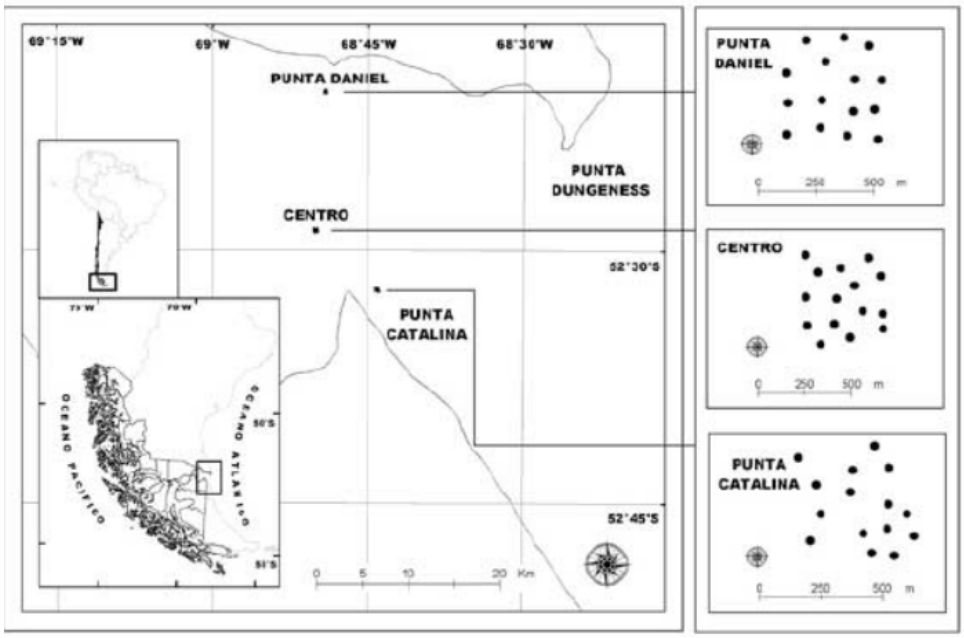

Figure 57. Study areas in the Atlantic mouth of the Magellan Strait. The point for each area in particular represent the specific sampling sites. Source (Ríos *et al*., 2010)

In the three sampling areas in Ríos *et al*. (2010), a total of 49 taxa were identified, belonging to 9 higher taxonomic categories (**Figure 58**). The most diverse taxon was polychaetes with 27 taxa (56% of the macrobenthic groups). Crustaceans included 11 taxa (20%), mollusks 4 taxa (8%) and echinoderms 3 taxa (6%). The cnidarian, nemertea, priapulid, ascidian and brachiopod groups were represented by one species each (10% in total). The species with the highest rate of occurrence were polychaetes *Kinbergonuphis dorsalis* (present in 7% of the samples), *Scoloplos* (Leodamas) ohlini (4%) and the echinoderm *Athyonidium chilensis* (5%).

CNIDARIA
Cnidaria Indet.
NEMERTINI
Nemertini Indet.
SIPUNCULIDA
Themiste sp.
MOLLUSCA
Photinula caerulescens King, 1831
Mytilus chilensis (Hupé, 1854)
Mactra cf. patagonica
Eurhomalea exalbida (Chemnitz, 1795)
POLYCHAETA
Aglaophamus polyphara (Schmarda, 1861)
Aglaophamus cf. peruana
Aglaophamus virginis (Kinberg, 1866)
Nephtys imbricata Grube, 1857
Nephtys sp.
Ninoe leptognatha Ehlers, 1900
Lumbrineris cingulata (Ehlers, 1897)
Notocirrus lorum Ehlers, 1897
Maldanidae Indet.
Euclymene grossa (Baird, 1871)
Glycinde armata (Baird, 1871)
Hemipodus heteropapillatus Hartmann-Schröder, 1962
Eteone sculpta Ehlers, 1897
Eteone aurantiaca Schmarda, 1861
Onuphidae Indet.
Kinbergonuphis dorsalis (Ehlers, 1897)
Scoloplos (Leodamas) ohlini (Ehlers, 1900)
Scolelepis sp.
Boccardia wellingtonensis Rood, 1975
Polynoidae Indet
Harmothoe sp.
Terebellidae Indet.
Thelepus setosus (De Quatrefages, 1866)
Gymnonereis hartmannschroederae Pettibone, 1970
Amphicrete sp.
Capitellidae Indet.
Pilargidae Indet.
CRUSTACEA
Gammaridae Indet.
Munna sp.
Cirolana albinota Vanhöffen, 1914
Cristaserolis convexa (Cunningham, 1871)
Acanthoserolis schythei (Lütken, 1858)
Neastacilla magellanica (Ohlin, 1901)
Antarcturus americanus Beddard,1886
Edotea sp.
Edotea transversa Menzies, 1942
Peltarion spinosulum (White, 1843)
ECHINODERMATA
Anasterias antarctica (Lütke, 1857)
Amphiura magellanica Ljungemon, 1867
Athyonidium chilensis (Semper, 1868)
UROCHORDATA
Ascidea Indet.
BRACHIOPODA
Magellania venosa (Solander, 1786)

Figure 58. Taxonomic list of benthic subcoastal macroorganisms collected with a Smith-McIntyre grab sampler in the Eastern sector of the Magellan Strait. Source: Ríos *et al*. (2010).

The results obtained by Ríos *et al*. (2010), show that the benthic subcoastal component of the Atlantic mouth of the Magellan Strait is characterized by a relatively simple diversity of species, with dwindling population in numerical terms and relatively low specific dominance. Moreover, there is a high degree of species replacement, both in terms of the samples within each studied sector as well as among sampling sectors. This points at the high biotic heterogeneity in the area, linked to strong environmental disturbances that generate significant environmental heterogeneity in the sector. Similar features have been identified in other subcoastal sectors studied in the Strait.

If we compare the diversity of species of the macrobenthos existing in the area with the limited list of similar species detected in the king crab traps, in addition to the low number of harvested specimens (most of them are returned alive to the sea), it does not seem likely that the king crab fishery has a measurable impact on the structure and functions on this benthic ecosystem, although more attention should be paid to the potential effect of the setting of trap lines on the cold water coral communities.

Other impact difficult to measure is that of the ghost fishing, when traps are lost but they continue fishing until their material degradation. However, fishers declare that these situations are very rare and mainly occur when their fishing gear is stolen (PUCV, 2012). Anyhow, very simple measures such as the use of biodegradable materials for certain mesh sewings in the traps could reduce this potential impact.

Lithodidae present an opportunistic-generalist feeding strategy: they are predators feeding on the most abundant prey in the environment. In captivity, king crabs are cannibals: the cannibalism rates are higher the greater the stage and size, greater density, lesser availability of refuge, or the proximity of moulting. Cannibalism occurs both in the intermoulting period (between individuals in the same juvenile stage), as well as during moulting (Lovrich, 2014).

L. santolla is able to sustain relatively prolonged fasting and recover from that nutritional stress. Fasting strategies would prioritize the use of proteins stored in the hepatopancreas as sources of energy.

From the ecological viewpoint, King crabs are top predators in the trophic chain and can cause important changes in the communities they inhabit. The best known “natural experiment” is that of the introduction of the king crab from Alaska, *Paralithodes camtschaticus*, in the Barents Sea. This environment was adequate for its development, so much so that its presence reduced the diversity and the benthic biomass in the invaded areas. Moreover, its prey included large epibenthic organisms that act as bio-engineers in the community, in turn having a negative impact in commercial species such as fish (Falk-Petersen *et al*., 2011). In addition, if there was an increase in the water temperature of the sea in the Antarctic continental shelf, it is to be expected that the Lithodidae would produce an equivalent effect on the polar benthic communities (Lovrich, 2014).

The large size, the exoskeleton hardness and the presence of spines most likely offer them protection against predation. Juveniles might be prey of the *Comasterias lurida* star, *Tachyeres pteneres* Fueguian steamer-duck, *Larus dominicanus* kelp gull, octopus and kingclips and the *Lutra feline* marine otter. At the time of moulting, possibly adults are more vulnerable and might be the prey of mammals, for instance the *Arctocephalus australis* South American fur seal or *Larus spp* seagull. However, apparently the main cause of mortality might be parasitism during the early juvenile stages.

Among other anthropogenic factors that have an impact on the Chilean fjords ecosystem, there is the salmonids aquaculture, increasingly present in the north area (**Figure 59**). The expansion of this activity met with lack of knowledge about the vulnerability of the socio-ecological system, representing 185,106 ha, 7,7% of the total national concessions and producing 109,812 tons (12% of the national production) in 2017. The regional productive model establishes a maximum of 40 active

concessions, and a production between 130 and 150 thousand tons, all farming centers included (Nahuelhual, *et al*., 2019).

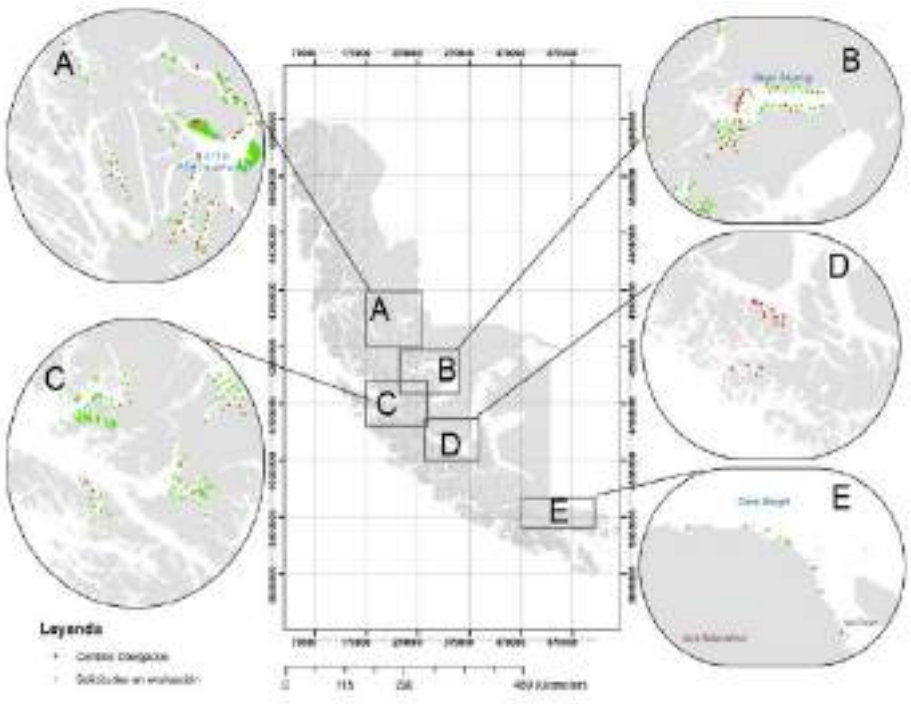

Figure 59. Zoning of active concessions in the period 2010 - 2018 (red circles) and pending resolution (green circles) for different geographical areas of the Magallanes Region. Location of salmon farms in the Los Lagos Region. Source: SERNAPESCA, 2018.

Chile has decided to make progress on the integrated management of its fisheries based on the ecosystem approach in view of preserving the hydrobiological resources of economic interests incorporating biophysical, environmental, economic and social variables. One of the main objectives of the General Fisheries and Aquaculture Law (LGPA) is *"… the conservation and the sustainable use of hydrobiological resources, applying a precautory approach, as well as an ecosystem approach in the fisheries regulation and the protection of the marine ecosystems that those resources inhabit*" (http://www.subpesca.cl/portal/615/articles-88020_documento.pdf) (IFOP (Garay-Flühmann, *et al*., 2019)).

The "Supporting the Ecosystem Approach to Fisheries Management through Scientific Research & Capacity Building in the framework of Chilean Benthic Fishery Management Committees" Project (abbreviated SEAFISHMAN) aims at contributing to the sustainability of four benthic fisheries developed in the southern areas of Chile, supporting the corresponding Management Committee that operate or are on their way to start their operations: king crab and snow crab from the Magallanes and Chilean Antarctica Region. Thus, the SEAFISHMAN Project aims at contributing with its knowledge to the Management Committee, drafting, implementing and assessing Management Plans based on the ecosystem approach.

A scientific expert workshop took place on April 24th and 25th, 2019, in the city of Puerto Montt, with the participation of 17 expert representing different areas of the marine sciences, with wide knowledge of the resources of interest and the environmental and oceanographic components related to the areas under study. Conceptual models and marked digraphs were presented, with a special focus on the environmental and ecological components linked to the harvest of king crab (*Lithodes santolla*) in the Magallanes and Chilean Antarctica Region.

The DPSIR framework (Driver-Pressure-State-Impact-Response Framework; Bradley & Yee, 2015) described a total of 34 components/variables for king crab, all of them organized according to the

ecosystem approach dimensions, namely: biological, social, economic and environmental. These components were related to the species life cycle stages (larvae, juveniles and adults), their trophic interactions (predators and prey and/or species resources in the management plan) and their ecologic interactions. Most of the variables identified describe the system status according to the categorization of the DPSIR framework. Of all the variables, they found that for king crab, 20 are biological variables, whereas 13 are variables related to the environmental conditions. They also worked with 1 variable that is part of the economic dimension and 1 that corresponds to the social variable.

Figure 60 summarizes and illustrates some of the components of the ecological system (biological environmental) related to the king crab fishery. In the biological environment, it highlights the significance of the larvae (L), juvenile (J) and adult (A) stages, of the life cycle of the species of interest (connected with blue arrows) and the trophic and ecological interactions of each stage. Octopus, eels, slugs, small sharks, fish, and other crustaceans, are main predators of king crab juveniles and adults; a species of cirripedes and isopods interact as parasites affecting mainly adults and larvae. A commensalism relationship is also described between king crab adults and a fish species. Moreover, only juveniles and adults feed on carrion, polychaetes, gasteropods, bivalves and, apparently, some algae that, in addition to offering a habitat, seem to be an important part of their diet. The habitat is another key element in the biological environment, represented specially by the type of support grain associated to the substrate, with an impact on all the life cycle stages.

In environmental terms, there are significant factors such as currents, tides, rainfall and thaws, that have an impact on the one hand, by adding particulate organic matter and nutrients to the system and, on the other, modifying conditions such as temperature and salinity.

As regards the socioeconomic aspect, the discard mainly of females and the fishing activity have negative impacts especially on certain components related to reproductive processes, such as the male/female size ratio, sex proportion and female size.

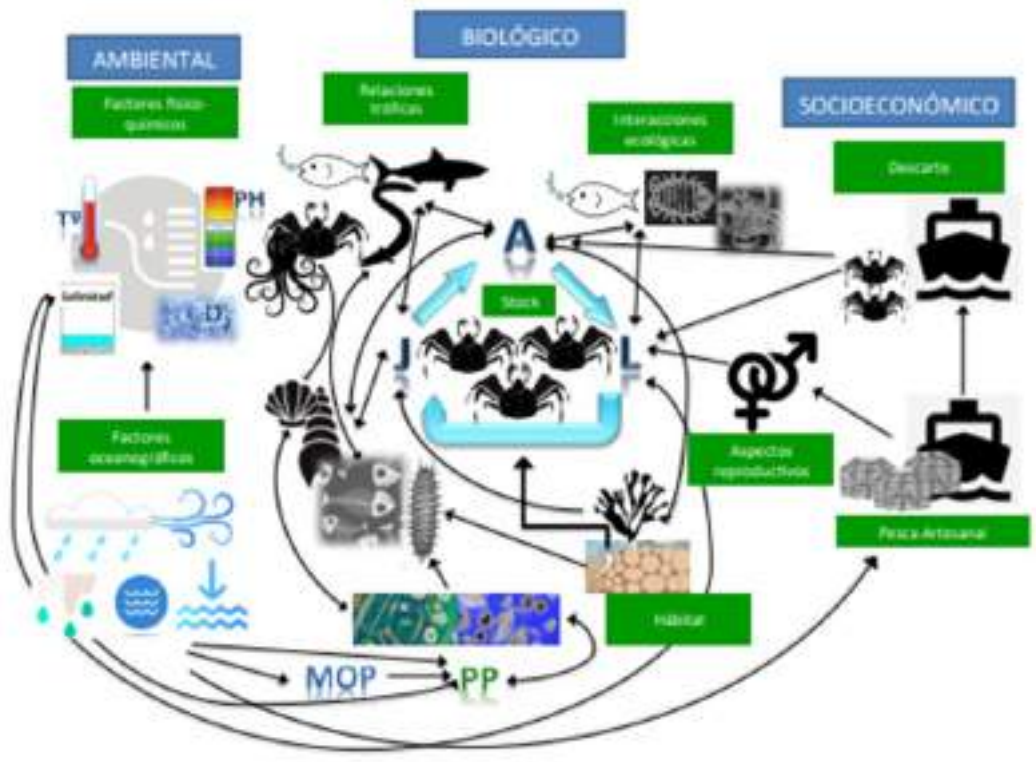

Figure 60. Conceptual model of the ecological dimension related to the king crab (*Lithodes santolla*) artisanal fishery, Magallanes and Chilean Antarctica Region. Source: IFOP (Garay-Flühmann, *et al*., 2019).

2.2.3. PRINCIPLE 3: Management System

a) Fishery Operating Area

The king crab (*Lithodes santolla*) fishery in Chile develops from the Los Lagos Region (XIV Region) down to the Magallanes and Chilean Antarctica Region (XII Region), traditionally south of 47 LS; since 2010, this fishery has increased its landing range in the inner Chilean sea from ~41° S to ~47° S and has increased its fishing grounds in the high seas (Molinet *et. al*. 2020).

The activity of the king crab fishery has historically concentrated in the Southern Cone of Chile, more specifically in the X, XI, XII regions and lately, with the new regionalization, in the XIV Region. In this fishery, the XII Region is the most important as regards fleet size and landing volumes. However, during 2012 – 2014, the X Region, in particular the Province of Chiloé, has increased the landings and the number of vessels that harvest this resource (SUBPESCA, 2014).

There are regional landing registers since 1953 that correspond mainly to the Los Lagos Region. However, since 1961 to 2019, landings become significantly higher in the Magallanes Region (IFOP, 2018 and IFOP, 2021 A).

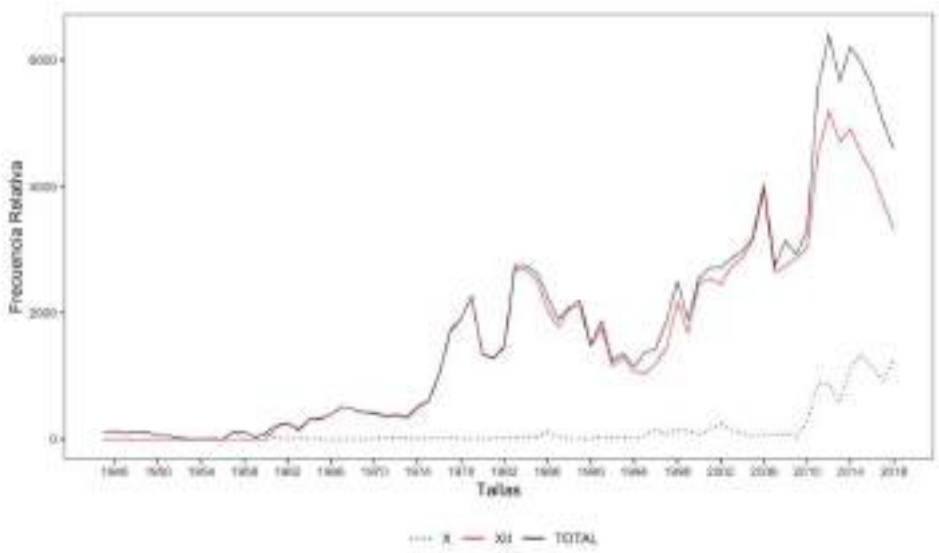

Figure 61. King crab regional landings throughout its distribution from 1945 to 2019. (Source: IFOP, 2021 A)

As explained elsewhere in this document, the king crab fishery in the XII Region, since the beginning to the early 1960s, concentrated in the fishing grounds close to Porvenir and Useless Bay (Bahía Inútil) (north area of the Big Island of Tierra del Fuego). Later, it spread to other harvest areas such as Dawson Island, Almirantazgo Fjord, south of the Brunswick Peninsula, and Otway Fjord. These limits were maintained till 1974. In 1975, harvest started in the south area of the region, in the Ballenero and Beagle Channels, with the addition since 1977 of the Cape Horn Archipelago. In 1979, the geographical coverage of the fishery went through significant changes, including the expansion of the harvest activity towards the north area of the Magallanes Region. As the harvesting areas increased in number, so did the landings, reaching 2,688 tons in 1983. Between 1984 and 1994 there was a decline in the landing levels, from 2,746 tons down to 1,673 t. Since 1996, landings rose again, reaching 5,122 tons in 2014. Since then, there has been a downward trend to 3,675 tons in 2017, 3,323 tons in 2018 and, finally, 3,360 tons in 2019 (IFOP, 2021 B).

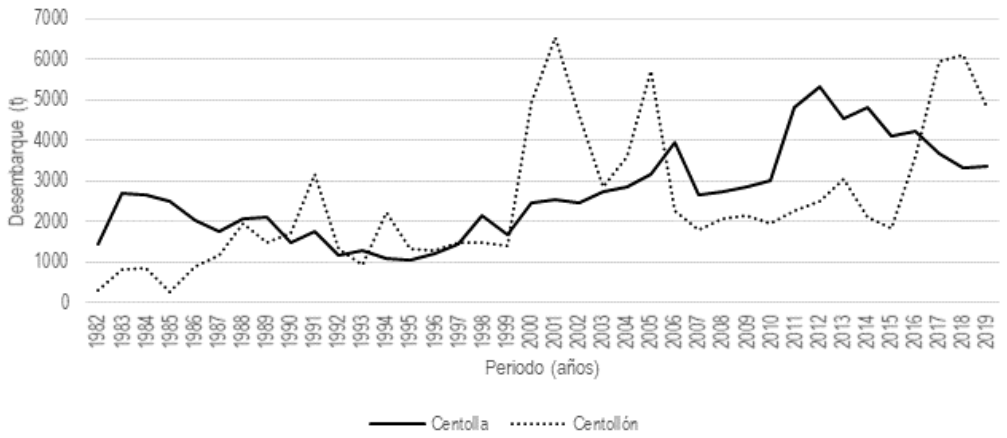

Figure 62. King crab and Chilean snow crab landings in the Magallanes and Chilean Antarctica Region. Period 1982 – 2019[1].(Source: IFOP, 2021 B).

During the period 2008-2020, the Benthic Crustaceans Follow-Up Program developed by IFOP, observed that the king crab fishery under evaluation is developing almost throughout the entire Magallanes Region. Historically, the most visited fishing grounds are Parker Bay and Labbe Passage, in the north area; Año Nuevo Fjord (Seno Año Nuevo) in the center area; Nassau Bay and Wollaston Islands in the south area of the region (IFOP, 2021 B).

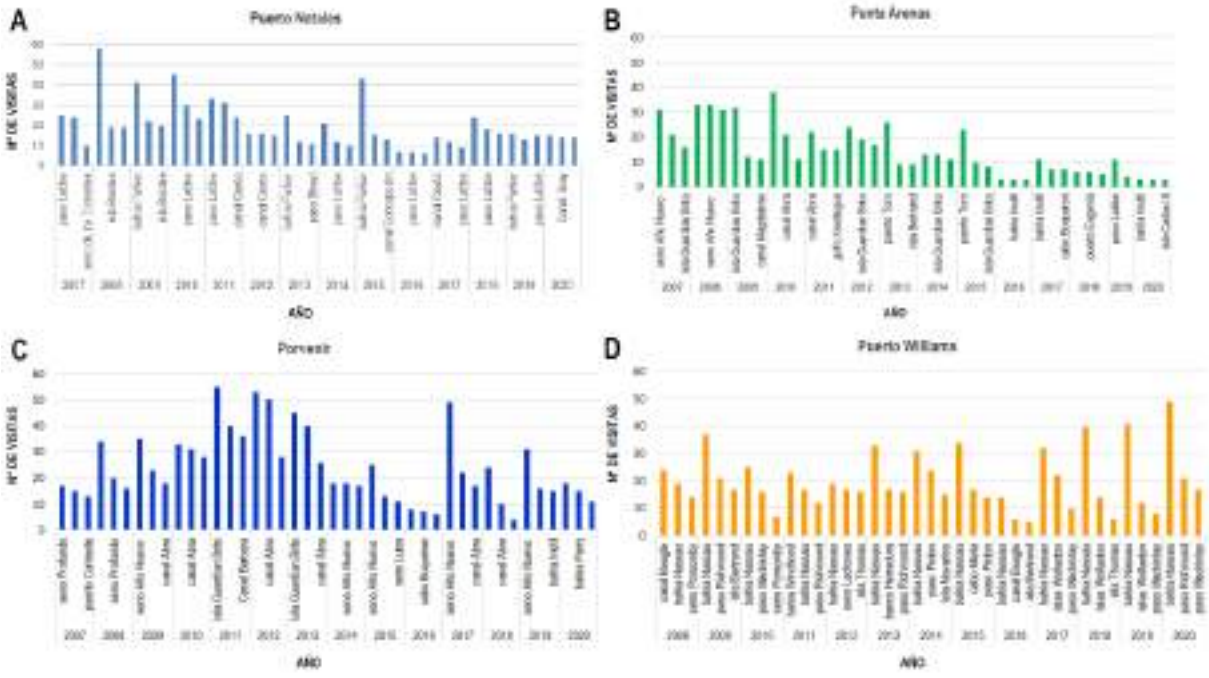

Figure 63. Most frequent king crab fishing grounds between 2008 to 2020. A: Puerto Natales; B: Punta Arenas; C: Porvenir; D: Puerto Williams. (Source: IFOP, 2021 B).

b) Federal Fisheries Law Background

The General Fisheries and Aquaculture Law is the legal basis for fisheries management in Chile. It sets the framework for the management of the fisheries sector, as well as recognizing that the objective of the Law is "the conservation and sustainable use of the hydrobiological resources". It establishes that it will be enforced using a "precautionary approach, an ecosystem approach in the fishery

[1] Official data from the Fisheries and Aquaculture National Service 2020.

regulation and the protection of the marine ecosystems that those resources inhabit". Moreover, it considers the conservation and management measures that would be required in order to attain that objective.

Moreover, it defines sustainable use as "the responsible use of hydrobiological resources, according to local, national and international rules and regulations, as applicable, so that the social and economic benefits derived from this use can be maintained in the future without compromising the growth and development opportunities of future generations."

As regards the institutions, after the amendment to the LGPA in 2013 (Law N° 20.657), the concept of Fisheries Consultative Committees was introduced. They are an advisory body for managing the sector. According to the amendment, the LGPA establishes the regulatory guidelines based on which the national fishery sector is structured and interacts as follows:

- General authorities
- National Fisheries Council
- Zonal Fisheries Councils
- Technical Scientific Committees
- Management Committees

This measure includes subheadings dealing with violations, sanctions and procedures applicable to the fishing activities; moreover, it categorizes special offenses and penalties applicable to the fishing sector, such as the termination of fishing authorizations, permits and transferable licenses, as well as being the origin of management and harvest plans for the management zones.

c) Institutions Managing, Controlling and Implementing Measures Regarding Fisheries

The stakeholders that participate in the different stages of the management process are the following:

- **Ministry of Economy, Development and Reconstruction:** It is the Secretariat of State that sets the basic policies to manage and coordinate the activities corresponding to the State regarding the fisheries sector. According to Decree Law 2.442, dated 1978, its actions should promote the development of the national fisheries sector, the protection, conservation and full use of the hydrobiological resources and the aquatic environment of the country. The Ministry of Economy, Development and Reconstruction has the same functions and attributions in order to meet its ends:

  a) Plan and coordinate the national fisheries policy and set general binding guidelines;
  b) Put in place measures to avoid the introduction and spread within the national territory of diseases that have an impact on the marine and continental hydrobiological resources and to combat the existing ones;
  c) Enforce the laws and rulings regarding marine fishing and hunting, and
  d) Pass resolutions related to the allocation of funds that the Budget Law appoints to the Subsecretariat of Fisheries for fishery research projects.

- **Subsecretariat of Fisheries and Aquaculture (SUBPESCA):** regulating body depending from the Ministry of Economy, Development and Reconstruction. It is in charge of the design and implementation of management policies and measures focused on the conservation and sustainability of the hydrobiological resources, in cooperation with the economic stakeholders in the sector through the participatory bodies established by the Law. The implementation of administrative and management measures should be backed by a technical report and meet, as applicable, the consultation, approval or notification requirements set by the LGPA.

- **National Fisheries Service (SERNAPESCA):** Body depending from the Ministry of Economy, Development and Reconstruction, created by Decree Law 2.442, dated 1978. It is in charge of enforcing the national fisheries policy and monitoring compliance with the fisheries regulations and any other form of exploitation of the hydrobiological resources. It also manages the Fishery Records, that allows the practice of extractive activities of the artisanal fishers and the industrial fishery sector. It is also in charge of gathering and processing data about landings, catch and processing of hydrobiological resources.

- **Management Committee:** Advisory body created by Law number 20.657 in 2013. One of its main functions is to draft the Management Plan proposal for the fisheries under its jurisdiction, as well as defining its period of assessment (this period cannot exceed 5 years since the respective plan was approved). The Committee includes representatives from the artisanal fishery, the industrial sector, processing plants, SERNAPESCA and SUBPESCA. So far, the king crab fishery has three management committees: i) Stone Crab and King Crab Management Committee of the Aysén del General Carlos Ibáñez del Campo Region; ii) Benthic Crustacean Fishery Management Committee of the Chiloé Province, Los Lagos Region; and, iii) King Crab and Snow Crab Management Committee of the Magallanes and Chilean Antarctica Region. The latter is the Management Committee that corresponds to the XII Region UoA.

- **Technical Scientific Committees:** Scientific advisory bodies of SUBPESCA for the management of fisheries with closed access. It also offers advice regarding environmental and conservation issues. These committees can offer advice pertaining to one or more fisheries. The names of the current members of each committee, appointment rules and minutes of the meetings are available on the SUBPESCA website.

  Each Committee will have no less than three and no more than five members (in the case of the Scientific Committee of Benthic Resources and the Committee of Pelagic Resources, it might be composed by a maximum of 7 members). To participate, the applicants should demonstrate that they have a professional title and experience in marine sciences related to the management and conservation of the fishery resources. The members are appointed by public tender organized by the Minister, that stay in office for four years and may be reelected under the same selection modality. At least one of the members must come from research institutions or universities whose headquarters are located in the regions where the main fishery or target activity of the Committee is distributed. Moreover, two representatives of IFOP and SUBPESCA should also be members. In addition to this number of participants, two additional members might participate for whom some cause of inability has been found but without the right to vote.

  According to article 153 of the LGPA, this Committee should determine, among others: (i) the fishery status, (ii) the biological reference points and (iii) the range of the total allowable catch to be established by the authority. Moreover, SUBPESCA might consult with them on other issues such as: design of management and conservations measures and the formulation of management plans. To draft its reports, the Committee should consider the information provided by IFOP, as well as data collected from other sources.

  In the case of the king crab fishery, even if there is no specific committee for this resource, the Demersal Crustaceans Technical Scientific Committee has contributed as regards the management requirements for this resource.

- **National Fisheries Council:** Problem-solving, consultative and advisory body. Its objective is to allow the participation of the fishery stakeholders at a national level in issues related to the fishing activity. It gives advice and recommendations, issues proposals and technical reports

based on sound knowledge to SUBPESCA, in all matters pertaining to the LGPA, as well as in any other of sectorial significance.

Moreover, it is consulted by the Subsecretariat regarding the National Plan for Fisheries Development; the International Fishing Policy; amendments to the General Fisheries and Aquaculture Law; measures for the promotion of the artisanal fisheries, and the National Plan for Fisheries Research. Moreover, the Council may also give its advice in any other relevant sectorial matter.

Its headquarters are located in the city of Valparaíso, holding its meetings in the SUBPESCA offices. It is composed of 28 members and chaired by the SUBPESCA Secretary. In addition, it includes the General Director of the Maritime Territory and Merchant Navy; the Director of the SERNAPESCA; the Executive Director of IFOP; five representatives of the legally constituted trade unions within the business sector; seven representatives of the legally constituted trade unions within the labor sector (one representative of the skippers of fishing vessels; one representative of the crew members of fishing vessels; and four representatives of the processing plants of hydrobiological resources, and a representative of the encarnadores (those that stick the bait on the fishhook) of the artisanal fishery); five representatives of the trade unions of the artisanal fishing sector; and seven advisers appointed by the President of the Republic with the agreement of three fifths of the Senate.

The National Fisheries Council has been in operation since 1993. The names of its current members, appointment rules and minutes are available on the SUBPESCA website.

- **Zonal Fisheries Councils**: this body contributes to decentralize the administrative measures taken by the authority and to make effective the participation of the fishery sector stakeholders at the zonal level, in matters related with the fishing and aquaculture activities. They have a consultative and decision-making character, as applicable.

  There are 8 Zonal Fisheries Councils in the country, each one of them has 18 members that represent the regional or local public sector, universities related to marine sciences, industrial trade unions, fishing fleet and processing plant workers, the small scale sector and non-profit organizations whose objective is the defense of the environment, the preservation of natural resources and focus on research. The names of the members of the Regional Fisheries Boards, the appointment rules and minutes of the meetings are published on the SUBPESCA website.

  In the area where the king crab fishery is developed, four Zonal Fisheries Councils have been identified. Zonal Council XII of Magallanes and Chilean Antarctica Region is the one that corresponds to the UoA.

  - Zonal Council IX of La Araucanía and XIV Los Rios Region Regions
  - Zonal Council X Los Lagos Region Region
  - Zonal Council XI of Aysén del General Carlos Ibáñez del Campo Region
  - Zonal Council XII of Magallanes and Chilean Antarctica Region

- **National Institute for Sustainable Development of Artisanal Fisheries and Small-Scale Aquaculture (INDESPA):** Created by Law 21069 as decentralized public service under the supervigilance of the President of the Republic through the Ministry of Finance, Development and Tourism. Its objective is to promote the development of the artisanal fisheries, small-scale aquaculture and their benefits. Hence, it has the following functions and powers:

  - Contribute to improve the productive and commercial capacity of the artisanal fisheries and small-scale aquaculture sectors.

- Promote the productive diversification of the artisanal fisheries and small-scale aquaculture sectors.
- Strengthen the integral and harmonious development, as well as the national, cultural and economic heritage of the coves and their neighboring areas.
- Develop infrastructure works for the artisanal fisheries and small-scale aquaculture, to be put in practice through agreements with the responsible bodies of the State Administration.
- Facilitate the access to credit of the artisanal fishers and small-scale aquaculture farmers, to finance productive or product quality improvement projects.
- Offer technical assistance and training to artisanal fishers and small-scale aquaculture farmers, as regards productive and commercialization issues.

- **Fisheries Development Institute (IFOP):** Created in 1964, IFOP is a technical body specialized in fisheries and aquaculture scientific research. It is permanent partner and advisor of SUBPESCA in decision-making regarding the sustainable use of the fishing resources and the marine environment conservation, according to the last amendment of the LGPA (Ley 20.657, 2013). The IFOP develops integral assessments for decision-making in fisheries and aquaculture matters, as well as in research projects regarding the status and assessment of sustainable exploitation strategies, estimates of total allowable catches of the resources of commercial interest, evaluation and follow-up of benthic resources management areas, programs on hydrobiological health, environment and repopulation and cultures.

  IFOP performs constant research as part of the annual SUBPESCA research program. It also manages the databases generated during the fisheries research and follow-up activities. These databases are State property and of public access.

- **Ministry of Foreign Affairs:** it is the Secretariat of State in charge of collaborating with the President of the Republic in the design, planning, prospection, conduction, coordination, execution, control and information of the foreign policy, proposing and assessing policies and plans aiming at strengthening the international presence of the country, protecting the Chilean interests in view of improving the quality of the development, security and national wellbeing.

  It also coordinates and integrates the different ministries and other bodies of the State Administration that have an impact on foreign policy. This includes international cooperation, cultural promotion outside the country, attention to the needs of fellow nationals in foreign countries, international peace and security. It also encompasses international economic relations, considering the roles of the civil stakeholders, thus generating a Foreign Policy National System.

  Moreover, the Minister must intervene in any issue related to the Chilean frontiers and borders, border areas, general air space and maritime space, and those issues related to the Antarctic territory and the Antarctic policy.

d) Specific Framework for the King Crab Fishery

The king crab fishery in the XII Region is regulated by the Ministry of Economy, Development and Tourism / Subsecretariat of Fisheries and Aquaculture. The regulatory framework for this fishery over the last 30 years has included the following measures, aiming at a regulating the catch effort, reducing the impact of the fishery on juveniles, protecting the reproductive processes of the target stock and avoiding non desirable impacts of the fishery on the species and habitats:

- Resolution N° 2569, dated 1999, suspending from January 1st, 2000 till December 31st, 2004, the registration in the Artisanal Register of the XII Region, in all its categories, under the section king crab fishery. Moreover, this resolution suspends for the same period the registrations in the Artisanal Register of the XII Region, of all the species that are considered as bycatch of the king crab trap fishery.

- Exempt Resolution N° 3630, dated 2004, suspending from January 1st, 2005 till December 31st, 2009, the registration in the Artisanal Register of the XII Region, in all its categories, under the section king crab fishery. Moreover, this resolution suspends for the same period the registrations in the Artisanal Register of the XII Region, of all the species that are considered as bycatch of the king crab trap fishery.

- Exempt Resolution N° 4415, dated 2009, suspending from January 1st, 20010 till December 31st, 2004, the registration in the Artisanal Register of the XII Region, in all its categories, under the section king crab fishery. Moreover, this resolution suspends for the same period the registrations in the Artisanal Register of the XII Region, of all the species that are considered as bycatch of the king crab trap fishery.

- Exempt Resolution. N° 3556, dated 2014, suspending from January 1st, 2015 till December 31st, 2019, the registration in the Artisanal Registers of the IX Region of the Araucanía, XIV Region of the Los Rios Region, X Region of the Los Lagos Region, XI Region of Aysén and XII Region of Magallanes and Chilean Antarctica, in all its categories, under the section king crab fishery. Moreover, this resolution suspends in the same areas and for the same period the receipt of applications and allocation of industrial permits related to this fishery.

- Exempt Resolution N° 3963, dated 2019, suspending from January 1st, 2020 till December 31st 2024, the registration in the Artisanal Fishery Registers of the regions of the Los Rios Region, the Los Lagos Region, Aysén del General Carlos Ibáñez del Campo, Magallanes and the Chilean Antarctica, under the section king crab and snow crab. This suspension is extended to all the categories, with the exception of the artisanal fishers category (skipper or crew member). The later will be able to register in the fisheries previously mentioned. Moreover, this resolution suspends in the same areas and for the same period the receipt of applications and allocation of industrial permits related to this fishery.

- Decree N° 375, dated 1986, modifying decree 442, dated 1981. It sets the minimum catch size for king crab at 10 centimeters in the area between the parallel corresponding to the north limit of the X Region and parallel 46° 30' 00" L.S.; and at 12 centimeters south of that parallel. The sizes set are measured from the eye orbit to the medium rear end of the carapace.

- Decree N° 39, dated 1983, banning the catch of king crab females and setting the obligation to return to the sea, in the place where they were caught, any female individual caught, even if they are above the minimum catch size.

- Decree N° 442, dated 1981, establishing the use of traps as only fishing gear authorized to catch king crab.

- Decree N° 443, dated 1990, establishing a season closure for king crab in all the coastline of the XII Region (Parallel 36°30´00" L.S. and the Magallanes and Chilean Antarctic Region), during the period from December 1st of the calendar year till June 30th of the following calendar year. During this period, it is forbidden to hold, own, use for industrial or commercial activities or transport of king crab. This measure also forbids the maintenance, storage or transport of any type of king crab entangling nets, in processing plants or transportation

vessels. Such period was modified due to COVID 19, with December 15th 2020 as the new starting date and July 15th 2021 as finishing date (Exempt Decree Page 202000103, dated 2020). Later, through Exempt Decree 20210062, dated May 2021, the Exempt Decree previously mentioned was amended, extending to June 30th, 2021 the closure period, in accordance with the provisions of Decree N° 443.

- In the case of the biological rest for the period 2021-2022, Exempt Decree 224, dated 2021, of the Subsecretariat of Fisheries and Aquaculture, the period has been modified for the Magallanes and Chilean Antarctica Region, from December 8th, 2021 till June 30th, 2022.
- Exempt Resolution N° 2827, dated 2021, sets the construction features for the trap lines used in the catch of benthic crustaceans in order to reduce the buoyancy of the mother line, thus decreasing the risk of interfering with marine mammals. Moreover, this resolution establishes the prohibition to anchor the trap lines in areas where there is presence of whales and dump waste that could cause entanglements. Moreover, it is compulsory to communicate to the nearby fleet in the fishing area the presence and geographical location of the whales.
- Exempt Resolution N° E-2021-263 (modified by Exempt Resolution N° 1531 of 2021) authorizes IFOP to carry out a fishing research campaign, according to the Reference Technical Terms of the Project "Fishing gear evaluation and improvement proposals for the sustainable exploitation of king crab (*Lithodes santolla*) in the Magallanes Region". The goal is to contribute to the sustainability of the king crab stock introducing changes to the fishing gear usually applied in its harvest.

Other general regulations applicable to the king crab fishery:

- Exempt Decree N° 528, dated 2016, that sets the landing percentage of bycatch species of the artisanal fisheries for 2016. It sets 1% as the maximum landing percentage of king crab per fishing trip for the target resources: stone crab (X Region), golden kingclip (X-XII Region) and others (XIV – XII Region).
- Exempt Decree N° 110, dated 2021, that established the value of the fine in the case of hydrobiological species for the period 2020-2021. In the specific case of king crab, the calculation of the fine corresponding to that period applies the 84.4 UTM/ton factor.
- Exempt Resolution N° 31115, dated 2013, that establishes the National Register of Artisanal Fisheries in accordance with Article 50 of the General Fisheries and Aquaculture Law.
- Exempt Decree N° 129, dated 2013, that approved the regulation for providing fisheries and aquaculture information and the accreditation of origin.

e) Other considerations

According to the General Fisheries and Aquaculture Law, the administration and management of fisheries whose access is closed, as well as the fisheries declared in state of recovery and early development, require a management plan to be established by SUBPESCA, tacking issues such as:

- General background: area of application, stocks involved, fishing grounds of the fleets that harvest that stock and identification of stakeholders (either artisanal, industrial, market, etc.)
- Objectives, goals and timeframes to maintain or take the fishery to the maximum sustainable yield of the stock involved in the plan.

- Strategies to reach the established objectives and goals (conservation and management measures that should meet what it is established in the law); as well as agreements to handle the interaction between the different stakeholders involved in the fishery.
- Assessment criteria to measure the accomplishment of the objectives and strategies that have been set.
- Contingency strategies to approach the variables that could affect the fishery.
- Research and monitoring requirements.
- Any other matter that is considered as of interest for meeting the plan objective.

The management plan is defined by the LGPA as a "compendium of rules and an ensemble of actions that allow for the fishery management based on the updated knowledge of its biofishery, economic and social aspects".

According to the law previously mentioned, for drafting a management plan proposal and its corresponding implementation and assessment, a Management Committee will be established by the Subsecretariat. The management plan proposal should be reviewed by the corresponding Technical Scientific Committee, whose advice is binding. Once the proposal has been approved by both authorities, SUBPESCA should approve the plan by means of a resolution. The plan provisions will be binding for all the stakeholders and vessels operating in the activity and regulated by the law.

In the case of the king crab fishery for the XII Region, SUBPESCA has created a Management Committee, the King Crab and Snow Crab Management Committee for the Magallanes and Chilean Antarctica Region. At the close of this report, no management plan has been approved for this fishery by SUBPESCA.

3. Pre-Assessment against the MSC standard

3.1. Summary of likely scoring levels

Table 8. Key to likely scoring levels.

The information available to the assessment team suggests that the fishery would not meet the scoring guideposts to achieve 60 points in the relevant performance indicator.	< 60
The information available to the assessment team suggests that the fishery would meet the scoring guideposts to achieve 60 points in the relevant performance indicator, but not all scoring guideposts to achieve 80 points. Therefore, a condition would be raised during a full assessment in order to improve the score.	60 – 79
The information available to the assessment team suggests that the fishery would meet or exceed the scoring guideposts to achieve 80 points in the relevant performance indicator. Therefore, an unconditional pass for the relevant performance indicator might be achieved.	≥ 80

Table 9. Summary of pre-assessment scoring

Principle	Component	PI	Performance Indicator	Likely Scoring
1	Outcome	1.1.1	Stock status	**70**
		1.1.2	Stock rebuilding	**< 60**
	Management	1.2.1	Harvest Strategy	**60**
		1.2.2	Harvest control rules and tools	**65**
		1.2.3	Information and monitoring	**65**
		1.2.4	Assessment of stock status	**65**
1002	Primary Species	2.1.1	Outcome	**60**
		2.1.2	Management	**65**
		2.1.3	Information	**< 60**
	Secondary species	2.2.1	Outcome	**RBF**
		2.2.2	Management	**60**
		2.2.3	Information	**65**
	ETP species	2.3.1	Outcome	**100**
		2.3.2	Management	**70**
		2.3.3	Information	**80**
	Habitats	2.4.1	Outcome	**RBF**
		2.4.2	Management	**< 60**
		2.4.3	Information	**60**
	Ecosystem	2.5.1	Outcome	**RBF**
		2.5.2	Management	**< 60**
		2.5.3	Information	**< 60**
3	Governance & policy	3.1.1	Legal and customary framework	**100**
		3.1.2	Consultation, roles and responsibilities	**85**
		3.1.3	Long term objectives	**100**
	Fishery specific management system	3.2.1	Fishery specific objectives	**60**
		3.2.2	Decision making processes	**75**
		3.2.3	Compliance and enforcement	**70**
		3.2.4	Management performance evaluation	**60**

3.2. Full Scoring Tables

Table 10. Color code used in Section 4.2.

The information available to the assessment team **suggests** that the scoring guidepost **would not be met** for a particular scoring issue.	
The information available to the assessment team **suggests** that the scoring guidepost **would be met** for a particular scoring issue.	
The information available to the assessment team **strongly suggests** that the scoring guidepost **would be met** for a particular scoring issue.	
The Scoring Issue on a performance indicator **does not apply** or the relevant Component has not been detected in the fishery.	
The risk-based framework is required to evaluate a particular scoring issue.	

PI 1.1.1 Stock Status

Component	**Outcome**		
PI 1.1.1 – Stock Status	**The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing.**		
Scoring Issue	**SG60**	**SG80**	**SG100**
a.) Stock status relative to recruitment impairment.	It is **likely** that the stock is above the point where recruitment would be impaired (PRI).	It is **highly likely** that the stock is above the PRI.	There is a **high degree of certainty** that the stock is above the PRI.
b.) Stock status regarding Maximum Sustainable Yield (MSY).		The stock is at or fluctuating around its MSY.	There is a **high degree of certainty** that the stock has been fluctuating around its MSY, or has been above it over recent years.

Justification/Rationale

a.) <u>Stock status relative to recruitment impairment</u>.

The most recent assessment of *Lithodes santolla* in the XII Region of Chile by IFOP (Yáñez e Ibarra, 2021) was carried out in three main areas: North Area, Center Area and South Area, using the Length Based-Spawning Potential Ratio (LB-SPR) model (Hordyk *et al*., 2015), during period 2014 to 2019. The following results were obtained:

LB-SPR North Magallanes Area: the SPR for the last year is 35%.
LB-SPR Center Magallanes Area: the SPR for the last year is 34%.
LB-SPR South Magallanes Area: the SPR for the last year is 34%.

Based on the results, in terms of the SPR, the Magallanes Region is between 34% and 35% of its spawning potential ratio, clearly above the limit reference point $SPR_{20\%}$. Therefore, **it is highly likely that the stock is above the PRI** (>$SPR_{20\%}$) and the fishery would score **SG80**.

b.) <u>Stock status regarding Maximum Sustainable Yield (MSY).</u>

According to the stock assessment, the reproductive biomass shows a decreasing trend, with no signs of turn around. Last year, the spawning potential ratio for the three areas ranged between 34-35%, below the reference point associated to MSY. Therefore, the fishery would not score SG80.

Likely Scoring Level	**a.) SG80**	**b.) SG60**	**70**
RBF required?			**NO**

References:

Yáñez, A. y M. Ibarra. 2021. Informe Consolidado. Crustáceos Bentónicos: jaiba y centolla. Convenio de Desempeño 2020. Estatus y posibilidades de explotación biológicamente sustentables 2020: Centolla y Jaiba X-XII Regiones. Doc. Tec. IFOP, 153 pp.

Yáñez A. 2019. Estatus y posibilidades de explotación biológicamente sustentables de los principales recursos pesqueros nacionales 2019. Jaiba y Centolla, 2019. Informe 1 de estatus y CBA. Instituto de Fomento Pesquero. 181 pp.

Yáñez, A. y M. Ibarra. Convenio de Desempeño 2018. Estatus y posibilidades de explotación biológicamente sustentables 2017: Centolla y Jaiba X-XII Regiones. Doc. Tec. IFOP, 154 pp.

PI 1.1.2 Stock Rebuilding

Component	Outcome		
PI 1.1.2 – Stock Rebuilding	**Where the stock is reduced, there is evidence of stock rebuilding within a specified timeframe.**		
Scoring Issue	**SG60**	**SG80**	**SG100**
a.) Rebuilding timeframes	A rebuilding timeframe is specified for the stock that is **the shorter of 20 years or 2 times its generation time**. For cases where 2 generations is less than 5 years, the rebuilding timeframe is up to 5 years.		The shortest practicable rebuilding timeframe is specified which does not exceed **one generation time** for the stock.
b.) Rebuilding evaluation	Monitoring is in place to determine whether the rebuilding strategies are effective in rebuilding the stock within the specified timeframe.	There is **evidence** that the rebuilding strategies are rebuilding stocks, **or it is highly likely** based on simulation modelling, exploitation rates or previous performance that they will be able to rebuild the stock within the **specified timeframe**.	There is **high degree of certainty** are rebuilding stocks, or it is highly likely based on simulation modelling, exploitation rates or previous performance that they will be able to rebuild the stock within the specified timeframe.
Justification/Rationale			
a.) <u>Rebuilding timeframes</u>. There is no evidence of a stock rebuilding strategy or measures within a specified timeframe for *Lithodes santolla* in the XII Region. Moreover, the stock does not show an upward trend. Therefore, the fishery would not score **SG60**.			
b.) <u>Rebuilding evaluation</u>. Monitoring is in place to determine whether the rebuilding strategies are effective in rebuilding the stock within the specified timeframe. Therefore, the fishery would score **SG60**. However, there is no evidence of recovery and the fishery would not score SG80.			
Likely Scoring Level	**a.) FAILS**	**b.) SG60**	**<60**
References:			

PI 1.2.1 Harvest Strategy

Component	Harvest-Management Strategy		
PI 1.2.1 Management Strategy	**There is a robust and precautionary harvest strategy in place.**		
Scoring issues	**SG60**	**SG80**	**SG100**
a.) Harvest strategy design	The harvest strategy is **expected** to achieve stock management objectives reflected in PI 1.1.1 SG80.	The harvest strategy is responsive to the state of the stock and the elements of the harvest strategy **work together** towards achieving management objectives reflected in PI 1.1.1 SG80	The harvest strategy is responsive to the state of the stock and is **designed** to achieve stock management objectives reflected in PI 1.1.1 SG80.
b.) Harvest strategy evaluation	The harvest strategy is **likely** to work based on prior experience or plausible argument.	The harvest strategy may **not have been fully tested** but evidence exists that it is achieving its objectives.	The performance of the harvest strategy has been **fully evaluated** and evidence exists to show that it is achieving its objectives including being clearly able to maintain stocks at target levels.
c.) Harvest strategy monitoring	Monitoring is in place that is expected to determine whether the harvest strategy is working.		
d.) Harvest strategy review			The harvest strategy is periodically reviewed and improved as necessary.
***e.) Shark finning**	*It is **likely** that shark finning is not taking place.	* It is **very likely** that shark finning is not taking place.	* There is a **high degree of certainty** that shark finning is not taking place
***f.) Review of alternative measures**	There has been a review of the potential efficacy and feasibility of alternative measures to reduce to a minimum the mortality related with unwanted catches of the target stock.	There is a **regular** review of the potential efficacy and feasibility of alternative measures to reduce to a minimum the mortality related with unwanted catches of the target stock. Those measures are applied as adequate.	There is a **biennial** review of the potential efficacy and feasibility of alternative measures to reduce to a minimum the mortality related with unwanted catches of the target stock. Those measures are applied as adequate.
Justification/Rationale			

a.) <u>Harvest strategy design</u>.

In the case of the UoA, a stock assessment was performed using the Length Based-Spawning Potential Ratio (LB-SPR) model. This model assumes that the stock is in equilibrium, which means that the stock size composition is assessed against the expected size composition if the stock has experienced a constant level of fishing pressure and constant recruitment. It defines the limit and target reference points at 20 and 40% of SPR, respectively (Spawning Potential Ratio - defined as the proportion of reproductive potential that remains unfished at any given level of fishing pressure).

The regulations imposed on the king crab fishery have focused on preserving the reproductive potential. Currently, it is managed through: the SSS strategy (Size, Sex & Season), size regulation (Ex. Res. Nº 375/1987) at 120 millimeters south of parallel 46° 30^{I} 00^{II} LS, permanent fishing ban on females (Ex. Res. Nº 39/1983), biological rest from December 1th each year to June 30th of the following year (parallel 46°30^{I} 00^{II} LS and Magallanes Region (Ex. Res. Nº 509/1991). Moreover, the regulation considers the use of traps as the only acceptable fishing gear (Ex. Res.

N° 442/1981), prohibition of female landing and commercialization and the access of live male specimens to processing plants. Moreover, new registers to the king crab fishery are forbidden (Ex. Res. Nº 3963/2019).

As in other similar fisheries in the world, the harvest strategy **is expected** to achieve stock management objectives reflected in PI 1.1.1. Therefore, this scoring issue would meet **SG60**. However, it cannot be claimed that the overall harvest strategy is responsive to the state of the stock, as there has been no turn-around in the declining trend. Thus, the fishery would not meet SG80.

b.) Harvest strategy evaluation.

When designing the harvest strategy, it was considered it was likely to work based on prior experience or plausible argument. Therefore, this scoring issue would meet **SG60**. However, the fishery would not score SG80 as there has been no turn-around in the declining trend.

c.) Harvest strategy monitoring.

The fishery is regularly monitored by means of landing statistics, onboard observers programs, landing samplings and stock assessment. The current fishery follow-up level allows to determine if the harvest strategy is working. Therefore, it meets **SG60.**

d.) Harvest strategy review.

The harvest strategy, the current population status and the stock status forecasts are regularly reviewed by IFOP and by the King Crab and Stone Crab Management Committee of the Magallanes and Chilean Antarctica Region. This committee includes private and public stakeholders. Its mandate is to draft a management plan for the species, in addition to offer advice regarding the fishery development and propose new regulations or amend the existing ones. Its aim is to increase the efficiency of the fishery management scheme.

The IFOP follow-up program (Guzmán *et al*., 2004), The IFOP follow-up program (Guzmán *et al*., 2004, and Olguín y Mora, 2020) suggests to impose a limit to the number of traps set in the water for this fishery (fishing effort) and to modify their design as regards the mesh opening size in the net or the obligation to add escape vents to the traps. Along the same lines, IFOP (Daza *et al*., 2020), encourage the implementation of a system that would monitor the number of traps currently used by each vessel in the region. The idea would be to include their life history. Indeed, it has been observed that year after year there is an increase in the number of traps manufactured or modified (height, diameter). Moreover, a non-quantified number of them are lost in fishing grounds. This could cause ghost fishing due to their catch retention mechanism.

As a result, IFOP (Valdebenito *et al*., 2021) performed a fishing gear evaluation study and improvement proposal for the ecosystem exploitation and sustainable use of the king crab fishery in the Magallanes region, funded by the Wildlife Conservation Society, with the support of the Walton Foundation and the advice of the National Institute of Fisheries Research and Development (INIDEP) from Argentina. It analyzed the lateral addition of escape circular rings. According to the results obtained, the rings reduced the catch of non-commercial specimens, thus recommending their general use in the short-term. According to the Minutes of the Meeting N° 4/2021 of the Fishery Management Committee, conversations are held regarding the regulation of traps (number, type, etc.). Hence, this scoring issue will meet **SG100** if the remaining items of this PI would satisfy the requirements to meet SG80.

e.) Shark finning.

This scoring element is not applicable because the target species is not a shark.

f.) Review of alternative measures.

In the case of this fishery, there is almost no bycatch as the undersized specimens and the females are returned alive to the sea. The assessment team contentds that this scoring issue is not applicable.

Likely Scoring Level	**a.) SG60**	**b.) SG60**	**c.) SG60**	**d.) SG60**	**e.) N/A**	**f.) N/A**	**60**

References:

ACTA SINTÉTICA SESIÓN N° 4/2021 COMITÉ DE MANEJO DE CENTOLLA Y CENTOLLÓN DE LA REGIÓN DE MAGALLANES Y ANTÁRTICA CHILENA. https://www.subpesca.cl/portal/616/articles-112050_documento.pdf

Daza, E, E. Almonacid, R. Hernández. 2020. Informe Final Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón. Doc. Tec. IFOP 2019. 228 pp + Tablas + Figuras + Fotografías + Anexos.

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Guzmán, L. Daza E. Canales, C. Cornejo, S. Quiroz, J. González M.2004.Estudio biológico pesquero de centolla y centollón en la XII Región. Informe Final. FIP 2002-15. IFOP. 366 pp.

Res. Ex. N° 3963 - 26.12.2019. Suspende transitoriamente la inscripción en el registro artesanal en las pesquerías de los recursos Centolla y centollón en área y período que indica.

Res. Ex. Nº 375 - 1987. Regulación de talla de 120 milímetros en el área comprendida entre el paralelo correspondiente al sur del paralelo 46° 30l 00ll LS.

Res. Ex. Nº 39 – 1983. Veda permanente de hembras de centolla.

Res. Ex. Nº 442 - 1981. Establece medida de Administración, Veda, actividad extractiva exclusivamente con trampas y Tamaño Mínimo X-XII.

Valdebenito, E. Ríoseco, E. y Álvarez, A. 2021. Evaluación del arte de pesca y propuesta de mejoras para la explotación ecosistémica y usos sustentable de la pesca de centolla en la Región de Magallanes. WILDLIFE CONSERVATION SOCIETY CHILE. Doc. Tec. IFOP, 143 pp.

Yáñez, A. y M. Ibarra. Informe Consolidado. 2021. Crustáceos Bentónicos: jaiba y centolla. Convenio de Desempeño 2021. Estatus y posibilidades de explotación biológicamente sustentables 2020: Centolla y Jaiba X-XII Regiones. Doc. Tec. IFOP, 153 pp.

PI 1.2.2 Harvest control rules and tools

Component	Harvest-management strategy		
PI 1.2.2 Harvest control rules and tools	**There are well defined and effective harvest control rules (HCR) in place.**		
Scoring issues	**SG60**	**SG80**	**SG100**
a.) HCR design and application	**Generally understood** HCR are in place, already implemented or **available. It is expected** that they will act to reduce the exploitation rate as the recruitment impairement point is approached.	**Well defined** HCR **are in place**, that **ensure** that the exploitation rate is reduced as the recruitment impairement point is approached. It is expected they maintain stock **oscillating around** an objective point consistent with (or above) MSY or, in the case of key species of low trophic level (LTL), at a level consistent with the ecosystem needs.	It is expected that the HCR will maintain **most of the time** the stock **oscillating around or above** an objective point consistent with MSY, or any other adequate level, bearing in mind the stock ecologic role.
b.) Harvest control rules account for uncertainty		It is likely that the HCR account for the main uncertainties.	The HCR take into account a **wide** range of uncertainties, including the stock ecologic role. There is **evidence** that the HCR account for the main uncertainties.
c.) HCR evaluation	There is **some evidence** that tools **used to** implement HCR are appropriate and effective in controlling exploitation.	**Available evidence indicates** that the tools in use are appropriate and effective in achieving the exploitation levels required under the HCR.	**Evidence clearly shows** that the tools in use are effective in achieving the exploitation levels required under the HCR.

Justification/Rationale

a.) <u>HCR design and application</u>.

There are no explicit or implicit Harvest Control Rules for the king crab in the Magallanes Region that aim at reducing the exploitation rate when the stock is outside its biological reference points. Therefore, the fishery would not score SG60.

b.) <u>Harvest control rules account for uncertainty</u>.

There are no harvest control rules according to the MSC standard definition. This scoring issue would meet **SG60** by default if the rest of the scoring issues also met it but it does not meet SG80.

c.) <u>HCR Evaluation</u>.

As there is no way to adapt to the stock exploitation status that could work as an implicit harvest control rule, it is impossible to assess if the available management tools are adequate or not. Therefore, the fishery does not meet **SG60**.

Likely Scoring Level	**a.) FAILS**	**b.)**	**c.) FAILS**	**<60**

References:

Yáñez, A. y M. Ibarra. Informe Consolidado. 2021. Crustáceos Bentónicos: jaiba y centolla. Convenio de Desempeño 2021. Estatus y posibilidades de explotación biológicamente sustentables 2020: Centolla y Jaiba X-XII Regiones. Doc. Tec. IFOP, 153 pp.

PI 1.2.3 Information/Monitoring

Component	Harvest strategy - management		
PI 1.2.3 Information / Monitoring	**Relevant information is collected to support the harvest strategy.**		
Scoring Issues	**SG60**	**SG80**	**SG100**
a.) Range of information	**Some** relevant information related to stock structure, stock productivity and fleet composition is available to support the harvest strategy.	**Sufficient** relevant information related to stock structure, stock productivity, fleet composition and other data is available to support the harvest strategy.	A **comprehensive range** of information (on stock structure, stock productivity, fleet composition, stock abundance, fishery removals and other information such as environmental information), including some that may not be directly relevant to the current harvest strategy, is available.
b.) Monitoring	Stock abundance and fishery removals are monitored and **at least one indicator** is available and monitored with sufficient frequency to support the harvest control rule.	Stock abundance and fishery removals are **regularly monitored at a level of accuracy and coverage consistent with the harvest control rule**, and **one or more indicators** are available and monitored with sufficient frequency to support the harvest control rule.	**All information** required by the harvest control rule is monitored with high frequency and a high degree of certainty, and there is a good understanding of the inherent **uncertainties** in the information [data] and the robustness of assessment and management to this uncertainty.
c.) Comprehensiveness of information		There is good information on all other fishery removals from the stock.	

Justification/Rationale

a.) <u>Range of information</u>.

There is information about the king crab fishery in the Magallanes Region, obtained from different sources: IFOP, Fishing Research Fund projects, and SERNAPESCA. The information is available online and on papers published in scientific magazines. The type of data available are landings per type of fleet, per harbor, per month or per year, descriptions of the biological features (size, sex, growth, molt and distribution), type of fishing fleet, fleet characteristics, harvest method, bait and CPUE, etc. All these data are used for the fishery follow-up in the annual assessment of the stock (IFOP (Daza *et al*., 2020)).

There is **enough** information related to the stock structure and productivity, fleet composition and other data to support the harvest strategy. Therefore, this scoring issue would reach **SG80**.

The current Follow-Up Program (IFOP (Daza *et al*., 2020)) has information gaps regarding the ecology of the stock under study, the behavior of the fleet (such as the participation of informal agents), estimates of the real fishing effort and the quantification of the use of illegal fishing gear. Indeed, the current follow-up program monitors vessels using “traps”. However, in the last months of the fishing season (September to November), the use of nets and diving becomes frequent. There is no objective information to establish the magnitude of the illegal activities as a percentage of the annual volumes landed. Therefore, monitoring to identify harvesting with fishing gear other than traps would be advisable. However, so far this consideration has not been taken into account.

According to Nahuelhual *et. al*., (2019), the main illegal fishing practices are the following: i) over-reporting of catch in a vessel, when, in fact, the catch comes from non-authorized vessels (without Authorized Fishing Register (RPA)) or is removed before the opening of the fishing season, thus entering into the export chain; the fisher that is presenting the false report is so-called a super fisher, as the reported volume landed is above the vessel capacity; ii) cooked on board, processing and packaging female king crab or specimens below the legal

size, selling it locally; and iii) black fishing that involves the landing of king crabs alive in non-authorized ports. These specimens are processed inland and sold locally. Any of these illegal practices also violate the regulations regarding size, sex, closed periods and fishing gear (nets instead of traps) (Nahuelhual *et al*., 2018). A recent study (Bozzeda, Marín, & Nahuelhual, 2019) show a threshold of 2,000 kg per vessel and per fishing trip, in which the reported catch does not conform to the estimated ratio between biomass and habitat features (for instance, temperature, turbidity). This implies that those vessels reporting landings above this thresholds would be fishing above the King crab population sustainable level, given the environmental conditions in the area. This situation would be occurring is areas such as Nassau Bay, O'Higgins Channel, Long Channel, Wilson Channel, Carlos III Island and Monsón Bay.

It is necessary a larger space time coverage and to determine control points in order to have adequate knowledge of the stock behavior in different areas. Therefore, it cannot be claimed that a **comprehensive range** of information is available, thus the fishery would not score SG100.

b.) <u>Monitoring</u>.

The data were obtained from the annual program of the projects "Follow-Up of Benthic Fisheries" (2000-2010) and "Follow-Up of Benthic Crustacean Fisheries" and FIP projects developed by IFOP in 1996 and 2004. It should be noted that the information available for King crab in Chile is limited to studies performed mainly in the 70s and 80s (Geagham, 1973; González y Perugi, 1974; Sanhueza, 1976; Campodónico, 1980; Hernández, 1980; Hernández, 1981; Campodónico y Hernández, 1981; Inostroza, *et al*., 1982; Hernández *et al*., 1984; Campodónico *et al*., 1983; Campodónico, 1986; Campodónico *et al*., 1988) (IFOP (Daza *et al*., 2020)).

Data gathering in landing point depended entirely of the goodwill of the artisanal sector (skippers or shipowners), of the stock volumes landed and the weather conditions. The people in charge of the vessels are not always willing to allow the sampling of the landings they are in charge of. Sometimes they authorize the sampling but it has to be performed onboard with all the complexities attached (limited space and precautions not to interfere with the landing operations). The access to the fishing areas depends entirely on the goodwill of the artisanal fishing sector. It they are willing to grant access onboard to the scientific observers or not. This is a limiting factor for the development of these studies as there is no way to ensure continuity in the field operations and consistency in the sampling sites (IFOP (Daza, *et al*., 2020)).

In this sense, the Benthic Crustaceans Fishery Follow-Up Program could be considered a poor data study, lacking larger space time coverage and the setting of permanent control points that would ensure adequate knowledge of the stock behavior in different areas.

Consequently, there are **available indicators** but they are not monitored with sufficient frequency to support the harvest control rule as defined by the MSC. Thus, the fishery would score **SG60**. Even if stock abundance and fishery removals are regularly monitored, the lack of information previously mentioned does not allow to claim that the monitoring is performed at a level of accuracy and coverage consistent with the harvest control rule. Thus, the fishery would not score SG80.

c.) <u>Comprehensiveness of information</u>.

According to the Follow-Up Benthic Crustacean Fisheries program (IFOP (Daza *et al*., 2020)), in the Magallanes Region, in all the monitored historical series, only one specimen of king crab was reported as bycatch by the fishing fleet targeting stone crab. There might be non reported king crab removals, as mentioned in item a), as IFOP can only carry out research in those vessels that use traps (legal fishing gear). Therefore, this prevents real knowledge of what is going on in the fishery. Therefore, it cannot be claimed that there is good information about stock removals performed by other fisheries. As a result, the fishery would not score **SG80**.

Likely Scoring Level	**a.) SG80**	**b.) SG60**	**c.) SG60**	**65**

References:

Daza, E, E. Almonacid, R. Hernández. 2020. Informe Final Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón. Doc. Tec. IFOP 2019. 228 pp + Tablas + Figuras + Fotografías + Anexos.

Nahuelhual, L., Gómez, I., Campos, G., Saavedra, G. 2019. La Región de Magallanes y Antártica Chilena frente al cambio global. Reporte regional Centro de Investigación: Dinámica de Ecosistemas Marinos de Altas Latitudes de la Universidad Austral de Chile. 67 pág. ISBN: 978-956-390-103-0.

Nahuelhual, L., Saavedra, G., Blanco, G., Wesselink, E., Campos, G., & Vergara, X. (2018). On super fishers and black capture: Images of illegal fishing in artisanal fisheries of southern Chile. Marine Policy, 95(May), 36–45. https://doi.org/10.1016/j.marpol.2018.06.020.

PI 1.2.4 Assessment of stock status

Component	Harvest strategy - management		
PI 1.2.4 Assessment of stock status	**There is an adequate assessment of the stock status**		
Scoring issues	**SG60**	**SG80**	**SG100**
a.) Appropriateness of assessment to stock under consideration		The assessment is appropriate for the stock and for the harvest control rule.	The assessment takes into account the major features relevant to the biology of the species and the nature of the fishery.
b.) Assessment approach	The assessment estimates stock status relative to reference points, adequate to the species category.	The assessment estimates stock status relative to reference points, adequate to the stock and they can be estimated.	
c.) Uncertainty in the assessment	The assessment **identifies major sources** of uncertainty.	The assessment **takes uncertainty into account**.	The assessment takes into account uncertainty and is evaluating stock status relative to reference points in a **probabilistic** way.
d.) Evaluation of assessment			The assessment has been tested and shown to be robust. Alternative hypotheses and assessment approaches have been rigorously explored.
e.) Peer review of assessment		The assessment of stock status is subject to peer review.	The assessment has been **internally and externally** peer reviewed**.**

Justification

a.) <u>Appropriateness of assessment to stock under consideration</u>.

The assessment performed by IFOP (Yáñez e Ibarra, 2021), the LB-SPR model developed by Hordyk *et al*. (2015), is a technique that uses life history rates (M/K and Lm/L∞) and the population size structure, together with the forecasts of size at maturity, to estimate the fishing and the natural mortality rates (F/M) and the spawning potential ratio (SPR). It is very useful when assessing poor data due to its relative simplicity (Brooks *et al*., 2010; Walters & Martell, 2004). Moreover, theoretical biological reference points have been developed which have been recognized by international fishing laws, such as $SPR_{40\%}$, which is considered as a conservative proxy for RMS. The assessment is appropriate for the stock and for the harvest control rule. Therefore, the fishery would score **SG80**.

b.) <u>Assessment approach</u>.

The results of the king crab stock assessment performed in previous years did not account for local depletion. Instead, it interpreted what was happening in the Magallanes Region as a whole. In the assessment provided by IFOP (Yáñez e Ibarra, 2021), there was a change in the stock assessment methodology, moving on from a size structured model for all the Magallanes Region to a data-poor model focused in three areas for the same region. This assessment gave the priority to smaller space scales against larger scales with more general premises. This is considered as an improvement within this assessment. Indeed, working with aggregate data for a whole region as previously done introduces a high degree of uncertainty given the inter annual variations (even intra annual) in the origin of the data used. In such case, it would be impossible to perform a continuous follow-up of a specific area. Hence, taking into account the size and geography of this particular region, such approach would result in a high degree of bias in the final results. The IFOP (Yáñez e Ibarra, 2021) assessment constitutes a first estimate of the stock status in the XII Region against generic reference points (SPRtarget = 40% and SPRlimit = 20%), considered as adequate for the species category (Lithodoidea family). Therefore, the fishery would score **SG60**

but not SG80, as the reference points have not been determined according to the specific modeling of the stock in its fishery.

c.) Uncertainty in the assessment.

The stock assessment performed by IFOP (Yáñez e Ibarra, 2021) requires to work with the exploited population. Therefore, in this case the only information used is that of the individuals that could be fished (males), where the estimated maturity is generally higher than in females. Those SPR values are first estimates and they would require specific parameters for each area. Indeed, due to the lack of specific growth parameters for each area (center and north) and of maturity estimates performed by means of microscopic analyses, values from other areas had to be included (south), maybe causing a bias in the results. As this is a data-poor model, no projection analysis was performed; nevertheless, IFOP expects to develop for the next technical report a methodology that would allow for the projection of the results obtained through those models or by means of the simulation of other harvest scenarios, thus projecting the population within a specified timeframe. A sensitivity analysis was performed for king crab in the area of Dalcahue-Tenaún Los Lagos Region, considering the estimate maturity ogive for the southern area of the Magallanes Region. The aim was to observe if a change in the ogive, in this case a lower average maturity size, will produce significantly different results to that obtained with the maturity estimate performed in the Dalcahue-Tenaún area. Therefore, the assessment **identifies major sources** of uncertainty and would meet **SG60**, but not SG80 as the assessment still does not take uncertainty into account.

d.) Evaluation of assessment.

The assessment has not been tested and shown to be robust. Moreover, no other alternative assessment approaches have been explored. Therefore it does not meet SG100.

e.) Peer review of assessment.

The assessment is peer reviewed **internally** at IFOP, reporting on the progress made during the development of the study, according to the Scientific Advice Continuous Quality Improvement Program (PMCCAC), prepared by stock and/or fishery. This PMCCAC on the data, information and knowledge gaps was developed, regarding the general fishery status according to the advice requirements of the fishery administration. Based on this, the performance achieved is assessed, proposing the actions, activities and goals, time frames and conditions that are considered as necessary to reduce the gaps identified and the meet the advice requirements previously established.

During the methodological development process, a fulfillment checklist was carried out, encompassing all the recommendations of the expert advisers, in order to verify the fulfillment of each one of the observations, corrections and recommendations highlighted by the reviewers.

The main activities are the following:

i. Drafting a PMCCAC update, for each fishery and reported in the progress update.
ii. Implementation of the work program.
iii. Drafting a report including all the progress and results during each year of the project, the updated PMCCAC and a checklist (start/end) of its achievements.

The assessment is peer reviewed **internally**. As a result, this issue would meet **SG80**, but, as it has not been peer reviewed externally, so it would not meet SG100.

Likely scoring level	**a.) SG80**	**b.) SG60**	**c.) SG60**	**d.) SG60**	**e.) SG80**	**65**

References:

Daza, E, E. Almonacid, R. Hernández. 2020. Informe Final Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón. Doc. Tec. IFOP 2019. 228 pp + Tablas + Figuras + Fotografías + Anexos.

Hordyk, A. R., Ono, K., Valencia, S. R., Loneragan, N. R. & Prince, J. D. 2015. A novel length-based empirical estimation method of spawning potential ratio (SPR), and tests of its performance, for small-scale, data-poor fisheries. ICES Journal of Marine Science 72, 217-231. doi: 10.1093/icesjms/fsu004.

Yáñez, A. y M. Ibarra. Informe Consolidado. 2021. Crustáceos Bentónicos: jaiba y centolla. Convenio de Desempeño 2021. Estatus y posibilidades de explotación biológicamente sustentables 2020: Centolla y Jaiba X-XII Regiones. Doc. Tec. IFOP, 153 pp.

PI 2.1.1. Primary species status

Component	Primary species		
PI 2.1.1 Outcome status	**The UoA does not pose a risk of serious or irreversible harm to the primary species and does not hinder recovery of depleted primary species**		
Scoring issues	**SG60**	**SG80**	**SG100**
a.) Main primary species stock status	Main primary species are **likely** to be above the PRI. Or If the species is below the PRI, there are established measures in the UoA that **are expected** to ensure that the UoA does not hinder recovery and rebuilding.	Main primary species are **very likely** to be above the PRI. Or If the species is below the PRI, there is **recovery evidence** or an effective established strategy **within all the MSC UoA in which it is catalogued as main species**, to ensure that collectively they do not hinder recovery and rebuilding.	There is a **high degree of certainty** that main primary species are above the PRI **and are** fluctuating around a MSY level.
b.) Minor primary species stock status			Minor primary species are **very likely** to be above the PRI. Or If the species is below the PRI, there is **evidence** that the UoA does not hinder minor primary species recovery and rebuilding.
Justification/Rationale			
a.) <u>Main primary species stock status:</u> As there is no clear evidence about the significance of self-caught bait and adopting a precautionary approach, we will consider the three species considered as primary (yellownose skate, golden kingclip and Chilean Southern hake) as main primary species. As mentioned in the introduction, the three species are above the PRI, therefore **SG60** is met. However, for the yellownose skate there is some uncertainty, so we cannot claim that the three main primary species are **very likely** to be above the PRI. We cannot ensure either that the impact of this fishery, together with the impact of other fisheries certified by the MSC in the area do not hinder the recovery of the yellownose skate. Consequently, this scoring issue would not meet SG80.			
b.) <u>Minor primary species stock status:</u> If confirmed that all the catch levels of these species do not exceed the threshold of main species, and all of them were minor, SG80 would be met by default, but not SG100 (See a).			
Adopting a precautionary approach, it would score 60 until evidence is found supporting that bait species can be classified as minor.			
Likely scoring level	**a.) SG60**	**b.)**	**60**
Risk-Based Framework (RBF) required?			**No**

References:

Daza, E, E. Almonacid, R. Hernández. 2020. Informe Final IFOP. Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón 2019. XII Región. 228 pp + Tablas + Figuras + Fotografías + Anexos.

Daza, E, E. Almonacid, R. Hernández. 2019. Informe Final IFOP. Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón 2018. XII Región. 240 pp + Tablas + Figuras + Fotografías + Anexos.

Daza, E, E. Almonacid, R. Hernández. 2018. Informe Final IFOP. Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón 2017. XII Región. 298 pp + Tablas + Figuras + Fotografías + Anexos.

Daza, E, E. Almonacid, R. Hernández y Canales, A. 2017. Informe Final IFOP. Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón 2016. XII Región. 256 pp + Tablas + Figuras + Fotografías + Anexos.

Daza, E, E. Almonacid, R. Hernández y Canales, A. 2016. Informe Final IFOP. Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón 2015. XII Región. 233 pp + Tablas + Figuras + Fotografías + Anexos.

PI 2.1.2. Primary species management strategy

Component	Primary species		
PI 2.1.2 Management strategy	**There is a strategy in place designed to ensure the fishery does not pose a risk of serious or irreversible harm to primary species; the UoA reviews regularly and implements adequate measures to reduce unwanted fishing mortality.**		
Scoring issues	**SG60**	**SG80**	**SG100**
a.) Management strategy in place	There are **measures** in place, if necessary, that are expected to maintain the main primary species at levels which are highly likely to be within biologically based limits, or to ensure the UoA does not hinder their recovery and rebuilding.	There is a **partial strategy** in place, if necessary, that is expected to maintain the main primary species at levels which are highly likely to be within biologically based limits, or to ensure the fishery does not hinder their recovery and rebuilding.	There is a strategy in place for managing main and minor primary species.
b.) Management strategy evaluation	The measures are considered **likely** to work, based on plausible argument (e.g., general experience, theory or comparison with similar UoA/species).	There is some **objective basis for confidence** that the partial strategy or measures will work, based on some information directly about the UoA and/or species involved.	**Testing** supports **high confidence** that the partial strategy or strategy will work, based on information directly about the UoA and/or species involved.
c.) Management strategy implementation		There is **some evidence** that the partial strategy/measures are being **implemented successfully**.	There is **clear evidence** that the partial strategy/strategy is being **implemented successfully and is achieving the global objective in (a)**.
d.) Shark finning	It is **likely** that shark finning is not taking place.	It is **very likely** that shark finning is not taking place.	There is **high degree of certainty** that shark finning is not taking place.
e.) Review of alternative measures	The potential efficacy and the feasibility of the alternative measures are reviewed to minimize unwanted fishing mortality of the UoA in the main primary species.	The potential efficacy and the feasibility of the alternative measures are reviewed **regularly** to minimize unwanted fishing mortality of the UoA in the main primary species; and they are implemented adequately.	The potential efficacy and the feasibility of the alternative measures are reviewed **biannually** to minimize unwanted fishing mortality of the UoA in the **main primary species**; and they are implemented adequately.
Justification/Rationale			

a.) <u>Management strategy in place</u>.

There are several measures in place to maintain and recover the yellownose skate, golden kingclip and Southern hake stocks.

<u>As regards the yellownose skate</u>, the latest stock assessment points at a reduction in the Reproductive Potential Ratio (RPR), illustrating a spawning biomass stock reduction, reaching 24% of the virgin spawning biomass (BD0), above its limit reference point. Recently, there has been a slight increase in the spawning biomass, probably as a result of the specific management measures for this stock, including limited access to new entries in the fishery (Art. N| 24 LGPA), global catch quotas, bycatch quotas (Dec. Ex. Folio DEXE202100051) and national season

closures between December and February (D.Ex. N° 14/2016), reducing the catches since the end of the 90s, thus showing the low fishing mortality values over the last few years (Pérez et. al., 2018). Therefore, this scoring issue would meet **SG80**. There is a **partial strategy** in place, if necessary, that is expected to maintain the main primary species at levels which are highly likely to be within biologically based limits.

As regards the golden kingclip, the results of the stock assessment from IFOP would indicate a 36% reduction in the spawning biomass in comparison with the virgin spawning biomass, clearly above the Biological Limit Reference Point. In the last 5 years, due to the low level of catches recorded, the stock would have shown signs of recovery; approaching the target level represented by 40% of the ratio between current spawning biomass and virgin spawning biomass. The specific management measures for this stock include limited access to new entries in the fishery (Art. N 24 Titulo III LGPA), global and individual catch quotas for the industrial and artisanal fleets, bycatch quotas (Dec. Ex. N° 202100242) and regulation of the fishing gear, with a minimum mesh size of 13 cm (D.S. N° 144/1980 and D.S.N° 245/1990) for the industrial trawling fleet (Contreras y Quiroz, 2018). Therefore, this scoring issue would meet **SG80**.

As regards Southern hake, for the year 2016, IFOP estimates (Pérez y Espinosa, 2018) indicate a spawning biomass approximately at a 30% reduction, clearly above the limit reference point. The depletion trends in the spawning and total biomass (Figure 42) show a progressive reduction during the whole series, with a slight stabilization over the last four years in the spawning biomass and a significant improvement in the total biomass, reaching a 56% reduction. The Southern hake fishery imposed limited access to new entries (Art. N 24 Titulo III LGPA), global and individual catch quotas (Dec. Ex. N° 202100242), season closures (D. Ex. N° 200/2019) and fishing gear restrictions; hook size N° 6 (D.S.N° 245/1990) and minimum mesh size 13 cm (D.S. N° 144/1980). These measures have contributed to the catch of mainly adult specimens by the industrial fleet. Therefore, this scoring issue would meet **SG80**.

b.) Management strategy evaluation.

As mentioned in the introduction and item a), all species are managed through annual catch quotas, set according to IFOP stock assessments. These assessments show increases in the reproductive biomass over the last few years in comparison with previous years of all the main primary species. Therefore, the evaluation team considers that, in the case of yellownose skate and golden kingclip, there is **objective basis for confidence that the** partial strategy or measures will work, based on some information directly about the UoA and/or species involved. Therefore, this scoring issue would meet **SG60** and **SG80** for these stocks. However, in the case of the Southern hake, evidence does not support the expectations, probably due to the unreported fishing. Thus, it would meet **SG60**, but not SG80.

Consequently, this scoring issue would not meet SG80 for the three species.

c.) Management strategy implementation.

Similary to what is mentioned in item b), due to the situation with the Southern hake, so far the fishery does not meet **SG80**.

d.) Shark finning.

Even though it is necessary to document it, shark finning is not linked to a fishery that hardly catches yellownose skate at all. The fishery scores **SG60** and, once there is high degree of certainty, SG100 would be met.

e.) Review of alternative measures.

The Management Committee is debating the regulation of number and type of traps according to IFOP recommendations (Guzmán *et. al*., 2004 and Daza *et. al*., 2020) that suggests for this fishery a limitation of the number of traps set on the water (fishing effort) and a trap design with different mesh sizes, or the addition of escape vents, or putting in practice some biodegradable mesh sewings (for instance, cotton). Therefore, this scoring issue would meet **SG60**. However, it does not meet SG80 because there is no evidence of regular review of alternative measures yet.

Likely scoring level	**a.) SG80**	**b.) SG60**	**c.) SG60**	**d.) SG60**	**e.) SG60**	**65**

References:

Subsecretaria de pesca y acuicultura. 2021. Estado de la situación de las principales pesquerías de chilenas año 2020. Departamento de Pesquerias, Division de Administracion Pesquera. 120 pag.

Daza, E, E. Almonacid, R. Hernández. 2020. Informe Final IFOP. Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón 2019. XII Región. 228 pp + Tablas + Figuras + Fotografías + Anexos.

Dec. Ex. Folio DEXE202100051 Establece Cuotas Anuales de Captura para los Recursos Raya Volantín y Raya Espinosa Año 2021.

Dec. Ex. 202100242 EXENTO. ESTABLECE CUOTAS ANUALES DE CAPTURA PARA UNIDADES DE PESQUERÍA DE RECURSOS DEMERSALES QUE SE INDICA SOMETIDAS A LICENCIAS TRANSABLES DE PESCA, AÑO 2022

Guzmán, L. Daza E. Canales, C. Cornejo, S. Quiroz, J. González M.2004.Estudio biológico pesquero de centolla y centollón en la XII Región. Informe Final. FIP 2002-15. IFOP. 366 pp.

María Cristina Pérez Cuesta. 2018. Raya volantín. Convenio Estatus y posibilidades de explotación biológicamente sustentables de los principales recursos pesqueros nacionales año: 2017. Informe Final IFOP. 157 pp.

Mejías, F. y Espinoza, J. 2018. Congrio dorado. Convenio Estatus y posibilidades de explotación biológicamente sustentables de los principales recursos pesqueros nacionales año: 2017. Informe Final IFOP. 156 pp.

Pérez, M. y Espinoza, J. 2018. Merluza del sur. Convenio Estatus y posibilidades de explotación biológicamente sustentables de los principales recursos pesqueros nacionales año: 2017. Informe Final IFOP. 175 pp.

PI 2.1.3. Primary species information/monitoring

Component	Primary species		
PI 2.1.3 Information	**Information on the nature and extent of primary species is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage primary species.**		
Socring issues	**SG60**	**SG80**	**SG100**
a.) Information quality to assess impact on main species	Qualitative information is **adequate to estimate** the UoA impact on the status of the main primary species. Or **If the RBF is used to score PI 2.1.1 for the UoA:** Qualitative information is adequate to estimate productivity and susceptibility for main primary species.	Some quantitative information is available and is **adequate to assess** the UoA impact on the status of the main primary species Or **If the RBF is used to score PI 2.1.1 for the UoA:** Some quantitative information is adequate to assess productivity and susceptibility for main primary species.	Quantitative information is available and is adequate to assess **with a high dregree of certainty** the UoA impact on the status of the main primary species.
b.) Information adequacy for impact assessment on minor species			**Some** quantitative information is adequate to estimate the UoA impact on the status of the **minor** primary species.
c.) Information adequacy for management strategy	Information is adequate to support **measures** to manage **main** primary species	Information is adequate to support a **partial strategy** to manage **main** primary species	Information is adequate to support a comprehensive **strategy** to manage primary species, and **evaluate with a high degree of certainty** whether the strategy is **achieving its objective**.

Justification/Rationale

a.) <u>Information quality to assess impact on main species</u>.

Information on the primary species mentioned in PI 2.1.1 is not available, preventing an estimate of the UoA impact on the status of any main primary species. Therefore, this scoring issue would not meet **SG60**.

b.) <u>Information adequacy for impact assessment on minor species</u>.

Information on the primary species mentioned in PI 2.1.1 is not available, preventing an estimate of the UoA impact on the status of any minor primary species. If any of the primary species were to be considered as minor, this scoring issue would achieve **SG60** and SG80 by default. If quantitative information becomes available to estimate the UoA impact on their status, the fishery would be able to meet SG100.

c.) <u>Information adequacy for management strategy</u>.

The information gathered by the monitoring program seems not to be adequate to understand the impact of the UoA on the primary species and, hence, to determine if a particular strategy is necessary to reduce those impacts. Therefore, **SG60** would not be met.

Likely scoring level	**a.) FAILS**	**b.) SG60**	**c.) FAILS**	**<60**

References:

Daza, E, E. Almonacid, R. Hernández. 2020. Informe Final IFOP. Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón 2019. XII Región. 228 pp + Tablas + Figuras + Fotografías + Anexos.

Daza, E, E. Almonacid, R. Hernández. 2019. Informe Final IFOP. Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón 2018. XII Región. 240 pp + Tablas + Figuras + Fotografías + Anexos.

Daza, E, E. Almonacid, R. Hernández. 2018. Informe Final IFOP. Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón 2017. XII Región. 298 pp + Tablas + Figuras + Fotografías + Anexos.

Daza, E, E. Almonacid, R. Hernández y Canales, A. 2017. Informe Final IFOP. Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón 2016. XII Región. 256 pp + Tablas + Figuras + Fotografías + Anexos.

Daza, E, E. Almonacid, R. Hernández y Canales, A. 2016. Informe Final IFOP. Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón 2015. XII Región. 233 pp + Tablas + Figuras + Fotografías + Anexos.

PI 2.2.1. Secondary species status

Component	Secondary species		
PI 2.2.1 Status	**The UoA has as an objective to keep secondary species above a biologically based limit and does not hinder recovery of those secondary species that are below a biologically based limit**		
Scoring issues	**SG60**	**SG80**	**SG100**
a.) Stock status of main secondary species	Main secondary species are **likely** to be within biologically based limits. Or If they are below biologically based limits, there are measures established that are expected to ensure that the UoA does not hinder recovery and rebuilding.	Main secondary species are **very likely** to be within biologically based limits. Or If they are below biologically based limits, or there is **evidence of recovery** or **evidence of an effective partial strategy** established that ensures that the UoA does not hinder recovery and rebuilding. And When the catches of main secondary species that are beyond the biologically based limits are significant, or there is evidence of a recovery or a proven effective strategy among the MSC UoAs that have considerable catches of the species, to ensure that, collectively, they do not endanger the recovery and rebuilding.	There is a **high degree of certainty** that the main secondary species are within the biologically based limits.
b.) Stock status of minor secondary species			Minor secondary species are **very likely** to be above biologically based limits. Or If they are below biologically based limits, there is evidence that the UoA does not hinder recovery and rebuilding of minor secondary species.

Justificación/Rationale

a.) <u>Stock status of main secondary species</u>.

The MSC standard defines *secondary species* as those non-target species that are within the scope of the Standard but are not managed based on reference points; or those that are beyond the scope of the Standard (birds, reptiles, marine mammals) and that are not considered as Endangered, Threatened or Protected species (ETP). The secondary species within the scope of the Standard that represent 5% or more of the catches of the fleet under assessment, or vulnerable secondary species that represent 2% or more of the catches of the fleet under assessment, are considered *main secondary species*. Those species that are outside the scope of the standard but are not included in the category of ETP species are also automatically considered as main secondary species (see indicators of component 2.3).

According to the information presented by the Onboard Observers Program of IFOP, the Chilean snow crab is considered as a main secondary species, representing more than 92% of the total bycatch and between 11 to 14% of the total catch. At the close of this report, there is no recent stock assessment that could determine the current status of the stock. According to IFOP (2020), with the current harvest levels, there is risk of exceeding the volumes of male specimens necessary to ensure a successful copulation. Indeed, males must be bigger than females to ensure success.

The imperial shag (*Phalacrocorax atriceps*) is a species identified by IFOP (2020) as having interaction with the fishery between 2014 and 2018, with one register of three birds. As it does not meet the criteria of Endangered, Threatened and Protected Species, it should be analyzed as a main secondary species. According to Cursach *et al*. (2010), the available information does not ensure a reliable population estimate for Chile.

Considering that there is no knowledge of the stock status of those species, a risk-based framework (RBF) would be necessary for the assessment.

b.) <u>Stock status of minor secondary species</u>.

The species identified in the king crab artisanal fishery, according to IFOP's Benthic Crustaceans Fishery General Monitoring Program: Stone Crab and King Crab Magallanes Region, present low harvest volumes for some of the minor species reported (**Table 5**), allowing the assessment team to conclude that the UoA could not hinder recovery and rebuilding of any of the minor secondary species due to their very low ratio of the catch, despite their unknown status regarding biological limits. However, there are species such as Patagonian redfish, cod, snook or dogfish used as bait that are caught by the fleet under assessment. Nevertheless, the data available regarding self-caught bait is not enough to project the incidence rate of each species in the total catch. As a result, there is no certainty that this scoring issue would meet SG100.

Likely scoring level	**a.) RBF**	**b.) SG60**	**RBF**
Risk Based Assessment (RBF) required?			**YES**

References:

Daza, E, E. Almonacid, R. Hernández. 2020. Informe Final IFOP. Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón 2019. XII Región. 228 pp + Tablas + Figuras + Fotografías + Anexos.

Daza, E, E. Almonacid, R. Hernández. 2019. Informe Final IFOP. Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón 2018. XII Región. 240 pp + Tablas + Figuras + Fotografías + Anexos.

Daza, E, E. Almonacid, R. Hernández. 2018. Informe Final IFOP. Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón 2017. XII Región. 298 pp + Tablas + Figuras + Fotografías + Anexos.

Daza, E, E. Almonacid, R. Hernández y Canales, A. 2017. Informe Final IFOP. Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón 2016. XII Región. 256 pp + Tablas + Figuras + Fotografías + Anexos.

Daza, E, E. Almonacid, R. Hernández y Canales, A. 2016. Informe Final IFOP. Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón 2015. XII Región. 233 pp + Tablas + Figuras + Fotografías + Anexos.

PI 2.2.2. Secondary species management strategy

Component	Secondary species		
PI 2.2.2 Management strategy	**There is a strategy in place for managing secondary species that is designed to ensure the UoA does not pose a risk of serious or irreversible harm to secondary populations; the UoA reviews and implements it regularly**		
Scoring issues	**SG60**	**SG80**	**SG100**
a.) Management strategy in place	There are **measures** in place, if necessary, which are expected to maintain main secondary species at levels which are highly likely to be within biologically based limits or to ensure that the UoA does not hinder their recovery.	There is a **partial strategy** in place, if necessary, that is expected to maintain main secondary species at levels which are highly likely to be within biologically based limits or to ensure that the UoA does not hinder their recovery and rebuilding.	There is a **strategy** in place for managing main and minor secondary species.
b.) Management strategy evaluation	The measures are considered **likely** to work, based on plausible argument (e.g. general experience, theory or comparison with similar UoA/species).	There is **some objective basis for confidence** that the measures/partial strategy will work, based on some information directly about the UoA and/or the species involved.	**Testing** supports **high confidence** that the strategy will work, based on information directly about the UoA and/or species involved.
c.) Management strategy implementation		There is **some evidence** that the measures/partial strategy is being **implemented successfully**.	There is **clear evidence** that the strategy/partial strategy is being **implemented successfully and it is achieving its global objective** according to (a).
(d) Shark finning	It is **likely** that shark finning is not taking place.	It is **highly likely** that shark finning is not taking place.	There is a **high degree of certainty** that shark finning is not taking place.
(e) Review of alternative measures to minimize bycatch mortality	The potential efficacy and the feasibility of the alternative measures are reviewed to minimize unwanted **bycatch** mortality of the UoA in the main secondary species.	The potential efficacy and the feasibility of the alternative measures are reviewed regularly to minimize unwanted **bycatch** mortality of the UoA in the main secondary species; and they are implemented adequately.	The potential efficacy and the feasibility of the alternative measures are reviewed **biannually** to minimize unwanted **bycatch** mortality of the UoA in the main secondary species; and they are implemented adequately.

Justification/Rationale

a.) <u>Management strategy in place</u>.

There are several elements of the <u>Chilean snow crab fishery</u> that conform the current harvest strategy, similar to those of the king crab fishery. The measures, that aim at optimizing the reproductive potential of the stocks under commercial fishing, include: use of traps as fishing gear, ban on female landings and commercialization, minimum legal male catch size of 80 mm of shell length SL, fishing season between February 1st and November 30th each year, ban on the entry of male specimens alive inside processing plants and closed access to new entries in the Artisanal Fishing Register of the XII Region (IFOP, 2020). Moreover, there is the "Follow-Up Program of the Main National Fisheries" that includes the Benthic Crustaceans Fishery Follow-Up Program in the Los Lagos Region and Aysén and Magallanes Regions, whose main objective is to study the stock status, offer basic information for the stock assessment and ensure time continuity in the gathering of the biological and fishing information. All these measures put together a strategy that aims at the preservation of the reproductive stock. Thus, in the case of the Chilean snow crab, this scoring issue would meet **SG60** and SG80.

As regards the imperial shag, the Chilean legislation, Law Nº 19.473 and its Regulation (D. N° 65/2015) of the Ministry of Agriculture and Livestock, in its Article 4th, forbids the hunting and catch of the imperial shag in all the national territory. Therefore, for the imperial shag, this scoring issue would meet **SG60**, considering that there are measures in place which are expected to maintain main secondary species at levels which are highly likely to be within biologically based limits. However, there is no partial strategy in place to preserve this species. Therefore, this scoring issue would not meet SG80.

b.) Management strategy evaluation.

Even if there are measures in place which are expected to maintain main secondary species at levels which are highly likely to be within biologically based limits, there is no objective basis for confidence to ensure it. Therefore, this scoring issue would meet **SG60** but not SG80.

c.) Management strategy implementation.

There is no evidence that the measures are being implemented successfully. Therefore, this scoring issue would not meet SG80.

d.) Shark finning.

Among the minor species included in the self-caught bait is the dogfish. Even though it is necessary to document it, shark finning is not linked to this fishery. The fishery scores **SG60** and, once there is high degree of certainty, SG100 would be met.

e.) Review of alternative measures to minimize bycatch mortality.

IFOP (Guzmán *et. al*., 2004 and Daza *et. al*., 2020), suggests for this fishery a limitation of the number of traps set on the water (fishing effort) and a trap design with different mesh sizes, or the addition of escape vents, or putting in practice some biodegradable mesh sewings (for instance, cotton). At the date of this report, all this is being discussed by the King crab stock Management Committee for the Magallanes region. However, so far these measures have not been implemented. Therefore, this scoring issue would meet **SG60** but not SG80.

Likely scoring level	**a.) SG60**	**b.) SG60**	**c.) SG60**	**d.) SG60**	**e.) SG60**	**60**

References:

ACTA SINTÉTICA SESIÓN N° 4/2021 COMITÉ DE MANEJO DE CENTOLLA Y CENTOLLÓN DE LA REGIÓN DE MAGALLANES Y ANTÁRTICA CHILENA. https://www.subpesca.cl/portal/616/articles-112050_documento.pdf

Daza, E, E. Almonacid, R. Hernández. 2020. Informe Final IFOP. Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón 2019. XII Región. 228 pp + Tablas + Figuras + Fotografías + Anexos.

Guzmán, L. Daza E. Canales, C. Cornejo, S. Quiroz, J. González M.2004.Estudio biológico pesquero de centolla y centollón en la XII Región. Informe Final. FIP 2002-15. IFOP. 366 pp.

PI 2.2.3. Secondary species information/monitoring

Component	Secondary species		
ID 2.2.3 Information/ monitoring	**Information on the nature and extent of secondary species is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage secondary species**		
Scoring issues	**SG60**	**SG80**	**SG100**
a.) Information quality to assess impact on main secondary species	Qualitative information is **adequate to estimate** the UoA impact on the status of the main secondary species. Or **If the RBF is used to score PI 2.2.1 for the UoA:** Qualitative information is adequate to estimate productivity and susceptibility for main secondary species.	Some quantitative information is available and is **adequate to assess** the UoA impact on the status of the main secondary species Or **If the RBF is used to score PI 2.2.1 for the UoA:** Some quantitative information is adequate to assess productivity and susceptibility for main secondary species.	Quantitative information is available and is adequate to assess **with a high degree of certainty** the UoA impact on the status of the main secondary species.
b.) Information adequacy for impact assessment on minor secondary species			Some quantitative information is adequate to estimate the UoA impact on the status of the minor secondary species.
c.) Information adequacy for management strategy	Information is adequate to support **measures** to manage **main** secondary species.	Information is adequate to support a **partial strategy** to manage **main** secondary species	Information is adequate to support a comprehensive **strategy** to manage **all** secondary species, and **evaluate with a high degree of certainty** whether the strategy is **achieving its objective**

Justification/Rationale

a.) <u>Information quality to assess impact on main secondary species</u>.

<u>Regarding stone crab</u>, there is good quali-quantitative information available from the "Benthic Crustaceans Fishery General Monitoring Program". This program started gathering data of the area under study since 2011 and it was developed by IFOP (Daza, *et. al*., 2016, 2017, 2018, 2019 and 2020). Thus, applying RBF, this scoring issue would meet **SG80** for this species, but not SG100.

<u>Regarding the Imperial shag</u>, there is qualitative information that allows to apply the RBF. Therefore, this scoring issue would meet **SG60**, but not SG80.

b.) <u>Information adequacy for impact assessment on minor secondary species</u>.

There is mainly qualitative information obtained from "Benthic Crustaceans Fishery General Monitoring Program" since 2011. Nevertheless, there is no quantitative information available regarding minor secondary species caught as bait. Thus, it would not meet SG100.

c.) <u>Information adequacy for management strategy</u>.

The data available for this assessment was provided by the "Benthic Crustaceans Fishery General Monitoring Program" from 2016 to 2020 (Daza *et. al*., 2016, 2017, 2018, 2019 and 2020). So the effect of potential measures to be adopted could be measured, or even of a partial strategy to mitigate the impact on main secondary species. The information may be adequate to support measures to manage main secondary species. Consequently, this scoring issue meets **SG80.** Nevertheless, the weak spatial or temporal coverage of the data gathering process and the lack of quantitative data regarding the species caught as bait, prevent the fishery scoring SG100.

Likely scoring level	**a.) SG60**	**b.) SG60**	**c.) SG80**	**65**

References:

Daza, E, E. Almonacid, R. Hernández. 2020. Informe Final IFOP. Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón 2019. XII Región. 228 pp + Tablas + Figuras + Fotografías + Anexos.

Daza, E, E. Almonacid, R. Hernández. 2019. Informe Final IFOP. Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón 2018. XII Región. 240 pp + Tablas + Figuras + Fotografías + Anexos.

Daza, E, E. Almonacid, R. Hernández. 2018. Informe Final IFOP. Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón 2017. XII Región. 298 pp + Tablas + Figuras + Fotografías + Anexos.

Daza, E, E. Almonacid, R. Hernández y Canales, A. 2017. Informe Final IFOP. Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón 2016. XII Región. 256 pp + Tablas + Figuras + Fotografías + Anexos.

Daza, E, E. Almonacid, R. Hernández y Canales, A. 2016. Informe Final IFOP. Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón 2015. XII Región. 233 pp + Tablas + Figuras + Fotografías + Anexos.

PI 2.3.1. ETP species status

Component	ETP species		
PI 2.3.1 Outcome status	**The fishery meets national and international requirements for protection of ETP species.** **The UoA does not pose a risk of serious or irreversible harm to ETP species and does not hinder recovery.**		
Scoring issues	**SG60**	**Scoring issues**	**SG60**
a.) UoA effects on ETP stocks within national or international limits, as applicable	Known effects of the UoA are **likely** to be within limits of national and international requirements for protection of ETP species.	The combined **effects of the MSC UoA** are known and are **highly likely** to be within limits of national and international requirements for protection of ETP species.	The combined **effects of the MSC UoA** are known and there is a **high degree of certainty** to be within limits of national and international requirements for protection of ETP species.
b.) Direct effects	Known direct UoA effects are **unlikely** to create **unacceptable impacts** to ETP species	Direct UoA effects are **highly unlikely** to create **unacceptable impacts** to ETP specie.	There is a **high degree of confidence** that there are **no significant detrimental direct UoA effects** on ETP species.
c.) Indirect effects		Indirect effects have been considered for the UoA and are thought to be **unlikely** to create unacceptable impacts.	There is a **high degree of confidence** that there are **no significant detrimental indirect effects** of the UoA on ETP species.

Justification/Rationale

a.) <u>UoA effects on ETP stocks within national or international limits, as applicable.</u>

According to the Benthic Crustaceans Fishery General Monitoring Program, Magallanes Region (Daza *et. al*., 2016, 2017, 2018, 2019 and 2020) the register of the bycatch of marine mammals, birds and reptiles is performed onboard of vessels by the Scientific Observers of IFOP during the trap turning process. They document the bycatch data regarding the interaction between type of animal (mammals, birds and reptiles) and type of fishing operation (presence inside the fishing gears (traps) or entanglement with them). Moreover, they register the details of the animal caught or trapped: common name and the state in which they were found (live, wounded or dead and the number of individuals).

At the time of this report, the fishery does not report any interaction with any marine mammal, bird or reptile. These reports do not mention any interaction with cold water corals. Therefore, this scoring issue does not apply..

b.) <u>Direct effects.</u>

There was an isolated report of a whale entanglement in a king crab trap line in the Magallanes Region several years ago. Indeed, a migration route of this species overlaps with the fishery area during part of the year. After a recommendation from IFOP, the Subsecretariat of Fisheries issued a regulation in October 2021 to mitigate this potential impact.

Indeed, this was an isolated event with a single whale specimen. Measures were adopted to avoid repetition. There is a **high degree of confidence** that there are **no significant detrimental direct UoA effects** on ETP species. Therefore, it meets **SG100**.

c.) <u>Indirect effects.</u>

None of the species caught by the king crab fishery represent an indirect risk for the ETP species as neither are they key ecosystem species, nor do they represent the essential food of any other species. Therefore, the fishery scores **SG100**.

Likely scoring level	**a.) NA**	**b.) SG100**	**c.) SG100**	**100**
Risk based framework (RBF) required?				**NO**

References:

Cursach, J., A. Simeone, R. Matus, O. Soto, R. Schlatter, C. Tobar y J. Ojeda. 2010. Distribución reproductiva del cormorán imperial (Phalacrocorax atriceps) en Chile. Boletín Chileno de Ornitología. 16(1): 9-16.

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Daza, E, E. Almonacid, R. Hernández. 2018. Informe Final IFOP. Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón 2017. XII Región. 298 pp + Tablas + Figuras + Fotografías + Anexos.

Daza, E, E. Almonacid, R. Hernández y Canales, A. 2017. Informe Final IFOP. Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón 2016. XII Región. 256 pp + Tablas + Figuras + Fotografías + Anexos.

Daza, E, E. Almonacid, R. Hernández y Canales, A. 2016. Informe Final IFOP. Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón 2015. XII Región. 233 pp + Tablas + Figuras + Fotografías + Anexos.

PI 2.3.2. ETP Species Management Strategy

Component	ETP Species		
PI 2.3.2 Management strategy	**The UoA has in place precautory management strategies designed to:** • **meet national and international requirements for protection of ETP species** • **ensure the UoA does not hinder the recovery of ETP species** **Moreover, the UoA reviews and implements regular measures, as appropriate, to minimize mortality of ETP species.**		
Scoring issues	**SG60**	**SG80**	**SG100**
a.) Management strategy in place (national and international requirements)	There are **measures** in place that minimize mortality of ETP species caused by the UoA, and are expected to be **highly likely to achieve** national and international requirements for the protection of ETP species.	There is a **strategy** in place for managing the UoA impact on ETP species, including measures to minimize mortality, which is designed to be **highly likely to achieve** national and international requirements for the protection of ETP species.	There is a **comprehensive strategy** in place for managing the UoA impact on ETP species, including measures to minimize mortality, which is designed to **achieve above** national and international requirements for the protection of ETP species.
b.) Management strategy in place (alternative)	There are **measures** in place expected to guarantee that the UoA does not prevent the recovery of ETP species.	There is a **strategy** in place expected to guarantee that the UoA does not prevent the recovery of ETP species.	There is a **comprehensive strategy** in place for managing the UoA impact on ETP species, to guarantee that the UoA does not prevent the recovery of ETP species.
c.) Management strategy evaluation	The measures are **considered likely** to work, based on **plausible arguments** (e.g. general experience, theory or comparison with similar UoA/species).	There is an **objective basis for confidence** that the strategy / partial strategy will work based on direct **information** about the UoA and / or the species involved.	**The strategy/comprehensive strategy is mainly based** on direct information about the UoA and/or species involved, and a **quantitative analysis** supports **high confidence** que that the strategy will work.
d.) Management strategy implementation		There is **some evidence** that the measures/strategy are being implemented successfully.	There is **clear evidence** that the strategy/comprehensive strategy is being implemented successfully and is achieving its objective according to scoring issues (a) or (b).
e.) Review of alternative measures to minimize mortality of ETP species	The potential efficacy and the feasibility of the alternative measures are reviewed to minimize ETP species mortality related to the UoA.	The potential efficacy and the feasibility of the alternative measures are reviewed **regularly** to minimize ETP species mortality related to the UoA and they are implemented adequately.	The potential efficacy and the feasibility of the alternative measures are reviewed **biannually** to minimize ETP species mortality related to the UoA and they are implemented adequately.
Justification/Rationale			
b.) <u>Management strategy in place (alternative)</u>. As regards the information provided by the Benthic Crustaceans Fishery General Monitoring Program, Magallanes Region (Daza *et. al*., 2016, 2017, 2018, 2019 and 2020), the register of the bycatch of marine mammals, birds and reptiles is performed onboard of vessels by the Scientific Observers of IFOP. The information is adequate for measuring trends and support a strategy for managing the UoA impact on ETP species. In the case of the king crab artisanal fishery, given the fact that there are no systematic impacts on ETP species, the main strategy is to continue with the permanent monitoring. Moreover, to avoid possible entanglements of big cetaceans in the trap lines, of which there has been only one register in the Magallanes Region, Technical Report (RPESQ) N°198-2021 recommends the introduction of changes when building the trap lines with non-buoyant material, or anchoring them so that the trap lines remain in the seabed. Moreover, they recommend not to set trap lines in areas where there is evidence of the presence of whales. The presence of whales should be reported,			

as well as entanglements in the fishing logbook, to SERNAPESCA. In October 2021, Exempt Resolution 2827 enforced these recommendations.

In the coasts of Chile, the cetaceans were declared national monuments by means of Decree N° 230/2008 of the Ministry of Economy, Development and Reconstruction. In addition, Law N°20.293 is approved, protecting any cetacean species that inhabits or sails the maritime waters under national jurisdiction. This Law prohibits to kill, hunt, catch, harass, hold, possess, transport, land, process or perform any transformation process, commercialization or storage of any of this cetacean species. In order to promote the protection and the non-lethal use of the cetaceans, the Law aims at protecting key areas for the development of their life cycle, putting in place additional protective measures in the areas of breeding, mating, parental care, feeding and migrating routes. Moreover, all the fishing vessels should have a contingency plan in case of collision, damage or accidental extraction of a cetacean, in accordance with the corresponding legislation.

Chile is signatory of CITES, the International Convention for the Regulation of Whaling and the Convention on Migratory Species. SERNAPESCA (National Fisheries and Aquaculture Service) is in charge of regulating the trade on those species listed in CITES, Appendices I and II. Moreover, there are national strategies to reduce the interaction with chondrichthyans, marine birds and mammals with the Chilean fisheries, for instance, the adoption of the National Action Plan to Reduce the Interaction between Seabirds and Fisheries in Chile (PAN-Aves).

Therefore, this scoring issue would meet **SG80**.

c.) Management strategy evaluation.

Bearing in mind the permanent monitoring and the lack of systematic interactions, there is an objective basis for confidence that the strategy / partial strategy will work based on direct information about the UoA. Thus, this scoring issue would meet at least **SG80**.

d.) Management strategy implementation.

This scoring issue meets **SG60** by defect. It is still too early to know if Exempt Resolution 2827/2021 will fulfill the objective of avoiding impacts on whales. Therefore, SG80 is not met.

e.) Review of alternative measures to minimize mortality of ETP species.

Exempt Resolution 2827/2021 shows that alternative measures are timely discussed to reduce fishery undesirable impacts. Moreover, there have been conversations and public contributions to improve the trap design and reduce bycatch. If the permanent monitoring would flash some signal of undesirable fishery impacts on ETP species, the same procedures would be applied. Consequently, the potential efficacy and the feasibility of the alternative measures are reviewed to minimize ETP species mortality related to the UoA, so the fishery would score **SG60**. However, it cannot be claimed that this practice is **regular.** Therefore, SG80 would not be met.

Likely scoring level	a.) SG80	c.) SG80	d) SG60	e.) SG60	70

References:

Daza, E, E. Almonacid, R. Hernández. 2020. Informe Final IFOP. Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón 2019. XII Región. 228 pp + Tablas + Figuras + Fotografías + Anexos.

Daza, E, E. Almonacid, R. Hernández. 2019. Informe Final IFOP. Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón 2018. XII Región. 240 pp + Tablas + Figuras + Fotografías + Anexos.

Daza, E, E. Almonacid, R. Hernández. 2018. Informe Final IFOP. Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón 2017. XII Región. 298 pp + Tablas + Figuras + Fotografías + Anexos.

Daza, E, E. Almonacid, R. Hernández y Canales, A. 2017. Informe Final IFOP. Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón 2016. XII Región. 256 pp + Tablas + Figuras + Fotografías + Anexos.

Daza, E, E. Almonacid, R. Hernández y Canales, A. 2016. Informe Final IFOP. Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón 2015. XII Región. 233 pp + Tablas + Figuras + Fotografías + Anexos.

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Res. Ex N° 2827, de 2021, que establece características de construcción para líneas de trampas empleadas en la captura de crustáceos bentónicos.

Subsecretaría de Pesca y Acuicultura. Gobierno de Chile. 2021. Informe Técnico (R. PEsq.) Nº 198. Establecimiento de características de construcción para líneas de trampas empleadas en la captura de crustáceos bentónicos. 17 p.

Subsecretaría de Pesca y Acuicultura. Gobierno de Chile, 2021. Informe de Chile sobre implementación de Resolución C-11-02, para mitigar el impacto sobre las aves marinas de la pesca de especies abarcadas por CIAT. 17 pp. https://www.iattc.org/PDFFiles/CatchReports/Seabirds/_English/CHL-C-11-02_Seabirds-SPO.pdf

PI 2.3.3. ETP species information

Component	ETP Species		
PI 2.3.3 Information / Monitoring	**Relevant information is collected to support the management of UoA impacts on ETP species, including:** • **information for the development of the management strategy;** • **information to assess the effectiveness of the management strategy; and** • **information to determine the outcome status of ETP species**		
Scoring issues	**SG60**	**SG80**	**SG100**
a.) Information adequacy to evaluate impact	Qualitative information is **adequate** to **estimate** UoA related mortality in ETP species. Or If the RBF is used to score PI 2.3.1 for the UoA: Qualitative information is **adequate to estimate productivity and susceptibility** for ETP species.	Some quantitative information is available and is **adequate to assess** mortality and the related impact and to determine if the UoA might be a threat for the protection and recovery of ETP species. Or If the RBF is used to score PI 2.3.1 for the UoA: Some quantitative information is adequate to assess productivity and susceptibility for ETP species.	Quantitative information is available to assess with a high degree of certainty **the magnitude of all impacts, mortality and injuries and the consequences for the status** of ETP species.
b.) Information adequacy for management strategy	Information is adequate to support **measures** to manage impacts on ETP species.	Information is adequate to measure trends and support a **strategy** to manage impacts on ETP species.	Information is adequate to support a **comprehensive strategy** to manage impacts, minimize mortality and injuries of ETP species, and evaluate with a **high degree of certainty** whether the strategy is achieving its objective.

Justification/Rationale

a.) <u>Information adequacy to evaluate impact</u>.

At the time of this report the following information was available: (i) quali-quantitative information regarding bycatch species (Daza *et. al*., 2016, 2017, 2018, 2019 and 2020) and (ii) literature regarding ETP species that inhabit or frequently visit the area where the king crab artisanal fishery takes place in the Magallanes Region. The list of species is very extensive. In consequence, information is considered as **adequate** to estimate productivity and susceptibility of ETP species. Therefore, this scoring issue would reach **SG80,** but not SG100 due to the lack of spatial or temporal coverage in data gathering.

b.) <u>Information adequacy for management strategy</u>.

According to the Benthic Crustaceans Fishery General Monitoring Program, Magallanes Region (Daza *et. al*., 2016, 2017, 2018, 2019 and 2020), the information is adequate to measure trends and support a **strategy** to manage impacts on ETP species. Hence, this scoring issue would meet **SG80**, but not SG100 due to the lack of spatial or temporal coverage in data gathering.

Likely scoring level	a.) SG80	b.) SG80	80

References:

Daza, E, E. Almonacid, R. Hernández. 2020. Informe Final IFOP. Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón 2019. XII Región. 228 pp + Tablas + Figuras + Fotografías + Anexos.

Daza, E, E. Almonacid, R. Hernández. 2019. Informe Final IFOP. Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón 2018. XII Región. 240 pp + Tablas + Figuras + Fotografías + Anexos.

Daza, E, E. Almonacid, R. Hernández. 2018. Informe Final IFOP. Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón 2017. XII Región. 298 pp + Tablas + Figuras + Fotografías + Anexos.

Daza, E, E. Almonacid, R. Hernández y Canales, A. 2017. Informe Final IFOP. Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón 2016. XII Región. 256 pp + Tablas + Figuras + Fotografías + Anexos.

Daza, E, E. Almonacid, R. Hernández y Canales, A. 2016. Informe Final IFOP. Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón 2015. XII Región. 233 pp + Tablas + Figuras + Fotografías + Anexos.

PI 2.4.1. Habitat status

Component	Habitats		
PI 2.4.1 Status	**The UoA does not cause serious or irreversible harm to habitat structure, considered on the basis of the area covered the body responsible for the fishery management on the areas/s where the UoA operates.**		
Scoring issues	**SG60**	**SG80**	**SG100**
a.) Habitat status	The UoA is **unlikely** to reduce habitat structure and function to a point where there would be serious or irreversible harm.	The UoA is **highly unlikely** to reduce habitat structure and function to a point where there would be serious or irreversible harm.	There is **evidence** that the UoA is highly unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm.
b.) VME habitats status	The UoA is **unlikely** to reduce VME habitat structure and function to a point where there would be serious or irreversible harm.	The UoA is **highly unlikely** to reduce VME habitat structure and function to a point where there would be serious or irreversible harm.	There is **evidence** that the UoA is highly unlikely to reduce VME habitat structure and function to a point where there would be serious or irreversible harm.
c.) Minor habitats status			There is **evidence** to support that the UoA is highly unlikely to reduce minor habitat structure and function to a point where there would be serious or irreversible harm.

Justification/Rationale

a.) <u>Habitat status</u>.

At the closure of this report, neither is there specific information about the fishery indicating the type of sediments that compose the seabed where the fishery operates, nor about the distribution of the sediment types throughout the Chilean continental shelf. However, with the information gathered by the IFOP observers program regarding the characterization of the benthic fauna, a total of 23 taxa of species with benthic habits are reported. This information might come in handy to perform a Consequence Spatial Analysis (CSA) to assess the risks on the different habitants usually found.

b.) <u>Vulnerable Marine Ecosystem habitats status (VMEs)</u>.

In Chile there are three types of vulnerable marine environments (VME); a) marine park, b) marine reserve and c) multiple use vulnerable marine coastal environment (MU-VMCE). According to the available data, the Francisco Coloane Multiple Use Vulnerable Marine Coastal Environment (MU-VMCE) would overlap with fishing grounds of the king crab fishery. It could be concluded that the UoA is **unlikely** to reduce VME habitat structure and function to a point where there would be serious or irreversible harm. Therefore, the fishery scores **SG60**.

It is advised to gather information regarding the exact king crab harvest points to determine the precise characteristics of the habitats that receive an impact. Then, the fishery could score SG80 or SG100.

c.) <u>Minor habitats status</u>.

This scoring issue meets **SG60** by default. From the available information at the close of this report, no minor habitats have been identified; the fishery would be operating in the continental shelf in depths down to 60 m, with predominant soft seabeds of sandy and muddy sediments. Once more data are gathered by the fleet under assessment and the non-existence of minor habitats is verified (or they are identified and score as low risk in a CSA), this scoring issue could reach SG100.

Likely scoring level	**RBF**	**b.) SG60**	**c.) SG60**	**RBF**
Risk based framework (RBF) required?				**YES**

References:

Daza, E, E. Almonacid, R. Hernández. 2020. Informe Final IFOP. Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón 2019. XII Región. 228 pp + Tablas + Figuras + Fotografías + Anexos.

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Pineda, V. Contardo, X. Alfaro, G. Helle, S. 2002. Caracterización textural, mineralógica y geoquímica de los sedimentos del Canal Beagle y Bahía Nassau, XII Región de Magallanes, Chile Crucero CIMAR-FIORDO 3. Revista Ciencia y Tecnología del Mar, Vol. 25 (1).

PI 2.4.2 Habitat management strategy

Component	Habitats		
PI 2.4.2 Management strategy	**There is a strategy in place that is designed to ensure the UoA does not pose a risk of serious or irreversible harm to habitat types**		
Scoring issues	**SG60**	**SG80**	**SG100**
a.) Management strategy in place	There are **measures** in place, if necessary, that are expected to achieve the Habitat Outcome SG80.	There is a **partial strategy** in place, if necessary, that is expected to achieve the Habitat Outcome SG80 or above.	There is a **strategy** in place for managing the impact of all the MSC UoA and non-MSC fisheries on habitat types.
b.) Management strategy evaluation	The measures are **considered likely** to work, based on plausible argument (e.g. general experience, theory or comparison with similar UoA/habitats).	There is some **objective basis for confidence** that the measures/ partial strategy will work, based on **information directly about the UoA and/or habitats** involved.	**Testing** supports high **confidence** that the strategy/ partial strategy will work, based on **information directly about the UoA and/or habitats** involved.
c.) Management strategy implementation		There is **some quantitative evidence** that the measure/partial strategy is being implemented successfully.	There is **clear quantitative evidence** that the strategy/ partial strategy is being implemented successfully and it is achieving its objective, as described in (a).
d.) Compliance with the management requirements and other measures 'of non- MSC fisheries' and MSC UoA for protecting VME	There is **qualitative evidence** that the UoA meets the management requirements to protect vulnerable marine ecosystems.	There is **some qualitative evidence** that the UoA meets the management requirements and measures to protect vulnerable marine ecosystems for MSC and non-MSC fisheries, respectively.	There is **clear qualitative evidence** that the UoA meets the management requirements and measures to protect vulnerable marine ecosystems for MSC and non-MSC fisheries, respectively.

Justification/Rationale

a.) <u>Management strategy in place</u>.

According to the information gathered by IFOP observers and considering the biology of the target species, it is known that the fishery operates on the continental shelf at depths down to 64 m, in areas in which the seabeds are composed of sandy sediments. The typical benthic fauna associated includes crustaceans, mollusks, echinoderms and some bony fish of benthic or benthic-demersal habits. There is a register of individuals of each species that are caught as bycatch by the UoA, with reports detailing number of individuals and volume harvested for some of the reported species (**Tables 5** and **6**).

At the close of this report, there is information regarding the type of sediments that compose the seabeds in some areas of the XII Region. A study performed by Pineda *et al.*, (2002) in the south of the Magallanes Region, showed that the study of texture determined the predominance of sands in 53% of the stations, widely distributed in the Nassau Bay, sector of the shelf with an average depth of 80 m. The mix sand-mud represents 23%. Regarding the distribution of these sediments on the entire Chilean continental shelf, there is not enough information available However, if a comparison is made between the extension of the area where the fishery operates and the extension of the Chilean continental shelf, the first is significantly smaller; therefore, it could be inferred that the impact of the fishery on those habitats with seabeds composed of sandy and muddy sediments would not represent a risk. Nevertheless, while there is not complete information regarding the seabed composition in the entire Chilean shelf, including specific information about the type of seabeds where the traps are deployed, it is not possible to conclude if the fishery presents a significant level of risk for those habitats.

Even if the information mentioned here above was available, there is no fishery specific information regarding the seabeds where they are deploying the king crab traps. To solve this issue, it is suggested to collect data during a complete fishing season.

However, it does not seem necessary to apply habitat protective measures; consequently, it is important that the fishery scientific follow-up program or a private onboard observers program gather data about the fishing gear footprint and the type of sediment where the fishery is operating to be able to learn by means of a CSA if the fishery poses a risk to those habitats and, hence, to ensure that there is no need for the habitat protective measures. Therefore, it is impossible to claim at the present moment that the fishery meets the requirements of **SG60**.

b.) Management strategy evaluation.

While it is not possible to determine if a management strategy should be implemented, there is no point in assessing its effectiveness. Thus, the fishery does not meet **SG60.**

c.) Management strategy implementation.

This issue meets **SG60** by defect. However, while data are missing regarding the biota associated to the seabeds where the fishery operates in the continental shelf, it would be impossible to determine if it is necessary to put in place management measures and, as a result, if the strategy is being implemented successfully.

d.) Compliance with the management requirements and other measures 'of non- MSC fisheries' and MSC UoA for protecting VME.

According to the categories of VMEs in Chile and the regulations that applies to each one of them, it is understood that measures are being established to protect VMEs. There was an overlap between the Francisco Coloane MU-VMCE present in the XII Region and the areas where the King crab is caught. Nevertheless, in those areas fishing is permitted, if it is performed transitorily and authorized by Resolution. This is indicated by the Subsecretariat of Fisheries in its regulation of marine parks and marine reserves as contemplated in the General Fisheries an Aquaculture Law.

As a result, there is **qualitative evidence** that the UoA meets the management requirements to protect vulnerable marine ecosystems (VME). Therefore, the fishery meets the requirements for **SG60** but not for SG80.

Likely scoring level	**a.) FAILS**	**b.) FAILS**	**c.) SG60**	**d.) SG60**	**<60**

References:

Daza, E, E. Almonacid, R. Hernández. 2020. Informe Final IFOP. Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón 2019. XII Región. 228 pp + Tablas + Figuras + Fotografías + Anexos.

Daza, E, E. Almonacid, R. Hernández. 2019. Informe Final IFOP. Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón 2018. XII Región. 240 pp + Tablas + Figuras + Fotografías + Anexos.

Daza, E, E. Almonacid, R. Hernández. 2018. Informe Final IFOP. Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón 2017. XII Región. 298 pp + Tablas + Figuras + Fotografías + Anexos.

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Daza, E, E. Almonacid, R. Hernández y Canales, A. 2016. Informe Final IFOP. Seguimiento Pesquería Crustáceos Bentónicos, recursos centolla y centollón 2015. XII Región. 233 pp + Tablas + Figuras + Fotografías + Anexos.

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Decreto 276/2003. Área Marina Costera Protegida Francisco Coloane creada por https://www.bcn.cl/leychile/navegar?i=220114&f=2004-01-15

PI 2.4.3. Habitats information

Component	Habitats		
PI 2.4.3 Information	**Information is adequate to determine the risk posed to habitat types by the UoA and the effectiveness of the strategy to manage impacts on habitat types.**		
Scoring issues	**SG60**	**SG80**	**SG100**
a.) Information quality	There is **basic understanding** of the types and distribution of main habitats. Or If CSA is used to score IC 2.4.1 for the UoA: The qualitative information is adequate to estimate the types and distribuition of the main habitats.	The nature, distribution and **vulnerability** of all main habitat types in the UoA area are known at a level of detail relevant to the scale and intensity of the UoA. Or If CSA is used to score IC 2.4.1 for the UoA: Part of the quantitative information available is adequate to estimate the types and distribution of the main habitats.	The distribution of habitat types is known over their range, with particular attention to the occurrence of vulnerable habitat types.
b.) Information adequacy for assessment of impacts	Information is adequate to broadly understand the nature of the main impacts of gear use on the main habitats, including spatial overlap of habitat with fishing gear. Or If CSA is used to score IC 2.4.1 for the UoA: The qualitative information is adequate to estimate the consequence and spatial attributes of the main habitats.	Sufficient data are available to allow the nature of the impacts of the UoA on habitat types to be identified and there is reliable information on the spatial extent of interaction, and the timing and location of use of the fishing gear. Or If CSA is used to score IC 2.4.1 for the UoA: Part of the qualitative information is adequate to estimate the consequence and spatial attributes of the main habitats.	The physical impacts of the gear on the habitat types have been quantified fully.
c.) Monitoring		Sufficient data continue to be collected to detect any increase in risk to main habitats.	Changes in habitat distributions over time are measured.

Justification/Rationale

a.) Information quality.

There is basic understanding of the habitat types that exist in the fishery operating area and their distribution. There are qualitative data regarding fishery extension and interaction at a spatial level, as well as information regarding the benthic fauna associated to the habitats with which the UoA interacts.

Therefore, this scoring issue meets **SG60.** SG80 and SG100 could be met once the suggested information is collected, as mentioned in indicator 2.4.2.

b.) Information adequacy for assessment of impacts.

The information is adequate to broadly understand the nature of the main impact of the fishing gear on the habitat types usually found and there are hints that the spatial overlap between habitat and the fishing gear is low. The qualitative information is adequate to estimate the consequence and spatial attributes of the main habitats when using RBF. Therefore, the scoring issue would meet **SG60**.

c.) Monitoring.

Currently, data gathering regarding habitat types by the onboard observers is not a common practice. Therefore, this scoring issue would meet **SG60**, by defect; but it would not reach SG80.

Likely scoring level	a.) SG60	b.) SG60	c.) SG60	60

References:

Pineda, V. Contardo, X. Alfaro, G. Helle, S. 2002. Caracterización textural, mineralógica y geoquímica de los sedimentos del Canal Beagle y Bahía Nassau, XII Región de Magallanes, Chile Crucero CIMAR-FIORDO 3. Revista Ciencia y Tecnología del Mar, Vol. 25 (1).

SSPA. (2004). D.S. No. 238. Reglamento Sobre Parques Marinos Y Reservas Marinas De La Ley General De Pesca Y Acuicultura. Santiago: Ministerio De Economía Fomento Y Reconstrucción Subsecretaria De Pesca.

PI 2.5.1. Ecosystem status.

Component	**Ecosystem**		
PI 2.5.1 Status	**The UoA does not cause serious or irreversible harm to the key elements of ecosystem structure and function.**		
Scoring issues	**SG60**	**SG80**	**SG100**
a.) Ecosystem status	The UoA is **unlikely** to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.	The UoA is **highly unlikely** to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.	There is **evidence** that the UoA is highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.
Justification/Rationale			
a.) <u>Ecosystem status</u>. Bearing in mind that some of the components require the use of RBF to understand its results, so far and while data are still being gathered, it also seems necessary to use RBF (SICA) for this component.			
Likely scoring level	**a.) RBF**		**RBF**
Risk based framework (RBF) required?			**YES**

PI 2.5.2 Ecosystem management strategy

Component	Ecosystem		
PI 2.5.2 Management strategy	**There are measures in place to ensure the UoA does not pose a risk of serious or irreversible harm to ecosystem structure and function**		
Scoring issues	**SG60**	**SG80**	**SG100**
a.) Management strategy in place	There are **measures** in place that, if necessary, take into account the **potential** impacts of the UoA on key elements of the ecosystem.	There is a **partial strategy** that, if necessary, takes into account **available information and is expected to restrain impacts** of the UoA on the ecosystem so as to **achieve** the Ecosystem Outcome SG80 level of performance.	There is a **strategy** that consists of a **plan** containing measures to **address all the main impacts** of the UoA on the ecosystem and at least some of these measures are in place.
b.) Management strategy evaluation	The **measures** are considered likely to work, based on **plausible argument** (e.g., general experience, theory or comparison with similar UoA/ ecosystems).	There is **objective basis for confidence** that the measures/ partial strategy will work based on direct information about the UoA and/or the ecosystems involved.	**Evidence** supports high confidence that the strategy/ partial strategy will work based on direct information about the UoA and/or the ecosystems involved.
c.) Management strategy implementation		There is **some evidence** that the measures comprising the partial strategy are being **implemented successfully**.	There is **clear evidence** that the strategy/partial strategy is being implemented and is achieving it objective according to issue (a).

Justification/Rationale

a.) <u>Management strategy in place</u>.

There are measures in place, such as the creation of vulnerable marine environments, the declaration of cetaceans as natural monuments by means of Decree N° 230/2008 of the Ministry of Economy, Development and Reconstruction, Law N°20.293, and the National Action Plan to Reduce the Interaction between Seabirds and Fisheries in Chile (PAN-Aves). Moreover, measures have been implemented to protect the whales. However, while the need for applying measures regarding the interaction of the fishery with the habitat and the ecosystem in general remains unclear, it is impossible to determine if this scoring indicator fulfills the requirements of **SG60**.

b.) <u>Management strategy evaluation</u>.

While there is uncertainty about the need for applying measures regarding the interaction of the fishery with the habitat and the ecosystem, it is impossible to determine if the measures are likely to work. As a result, this scoring issue would not meet **SG60**.

c.) <u>Management strategy implementation</u>.

This scoring issue meets **SG60** by defect. However, until the pending issues previously mentioned are not solved, there is no evidence that the measures in place are enough and successful. Hence, **SG80** would not be met.

Likely scoring level	**a.) FAILS**	**b.) FAILS**	**c.) SG60**	**<60**

References:

Decreto N° 230/2008 del Ministerio de Economía, Fomento y Reconstrucción.

Decreto 276/2003. Área Marina Costera Protegida Francisco Coloane creada por https://www.bcn.cl/leychile/navegar?i=220114&f=2004-01-15

Ley N°20.293, Plan de Acción Nacional para Reducir la Interacción de Aves con Pesquerías en la República chilena.

PI 2.5.3 Ecosystem information

Component	Ecosystem		
PI 2.5.3 Information	**There is adequate knowledge about the impact of the fishery on the ecosystem.**		
Scoring issues	**SG60**	**SG80**	**SG100**
a.) Information quality	Information is adequate to **identify** the key elements of the ecosystem.	Information is adequate to **broadly understand** the key elements of the ecosystem.	
b.) Investigation of UoA impacts	Main impacts of the UoA on these key ecosystem elements can be inferred from existing information, but **have not been investigated in detail**.	Main impacts of the UoA on these key ecosystem elements can be inferred from existing information, and **some have been investigated in detail**.	Main **interactions** between the UoA and these ecosystem elements can be inferred from existing information, and **have been investigated in detail**.
c.) Understanding of component functions		The main functions of the components (i.e. target P1, primary, secondary and ETP species and habitats) in the ecosystem are **known**.	The impacts of the UoA on target, primary, secondary and ETP species and habitats are identified and the main functions of these components in the ecosystem are **understood**.
d.) Information relevance		Sufficient information is available on the impacts of the UoA on these components to allow some of the main consequences for the ecosystem to be inferred.	Sufficient information is available on the impacts of the UoA on the components **and elements** to allow some of the main consequences for the ecosystem to be inferred.
e.) Monitoring		Sufficient data continue to be collected to detect any increase in risk level.	Information is sufficient to support the development of strategies to manage ecosystem impacts.

Justification/Rationale

a.) <u>Information quality</u>.

Available information is adequate to **identify** key components of the ecosystem; but not to broadly understand them. Therefore, this scoring issue would meet **SG60**, but not SG80.

b.) <u>Investigation of UoA impacts</u>.

As the fishery information is limited, especially as regards the geographical location of the traps, the number of traps and the level of risk the fishery represents for the habitats on which it operates, it is impossible to deduce which would be the main UoA impacts on key components of the ecosystem. Therefore, this indicator does not meet **SG60**. Once that information is gathered, this indicator would score SG60 and SG80.

c.) <u>Understanding of component functions</u>.

This scoring issue meets **SG60** by defect. However, it does not meet the requirements for SG80 because at the time of this report, the information is not enough to identify the main functions of the different components of the ecosystem (specially interaction with habitats)

d.) <u>Information relevance</u>.

This scoring issue meets **SG60** by defect. Some of the impact on certain components cannot be currently assessed because more information is required. Therefore, SG80 is not met.

e.) <u>Monitoring</u>.

SG60 is met by default. For some of the components, such as species used as bail and habitats, data are not gathered systematically. Therefore, this scoring issue would not meet SG80.

Likely scoring level	**a.) SG60**	**FAILS**	**c.) SG60**	**d.) SG60**	**e.) SG60**	**<60**

References:

PI 3.1.1 Legal and/or customary framework

Component	Governance and Policy		
PI 3.1.1 Legal and/or customary framework	**The management system exists within an appropriate and effective legal and/or customary framework which ensures that it:** *** Is capable of delivering sustainability in the UoA** *** Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood** *** Incorporates an appropriate dispute resolution framework**		
Scoring issues	**SG60**	**SG80**	**SG100**
a.) Compatibility of laws and standards with an effective management	There is an effective national legal system and a framework for cooperating with third parties, if necessary, to achieve management outcomes in accordance with MSC Principles 1 and 2.	There is an effective national legal system and an efficient and organized framework for cooperating with third parties, if necessary, to achieve management outcomes in accordance with MSC Principles 1 and 2.	There is an effective national legal system and compulsory procedures that regulate cooperation with third parties, if necessary, to achieve management outcomes accordance with MSC Principles 1 and 2.
b.) Resolution of disputes	The management system incorporates or is subject by law to a **mechanism** for the resolution of legal disputes arising within the system.	The management system incorporates or is subject by law to a **transparent mechanism** for the resolution of legal disputes which is **considered to be effective** in dealing with most issues and that is appropriate to the context of the UoA.	The management system incorporates or is subject by law to a **transparent mechanism** for the resolution of legal disputes that is appropriate to the context of the UoA and has been **tested and proven to be effective**.
c.) Respect for rights	The management system has a mechanism to **generally respect** the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.	The management system has a mechanism to **observe** the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.	The management system has a mechanism to **formally commit** to the legal rights created explicitly or established by custom on people dependent on fishing for food and livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.

Justification/Rationale

a.) <u>Compatibility of laws and standards with an effective management</u>:

The Chilean legislation has a legal framework established in the General Fisheries and Aquaculture Law (LGPA) and its amendments, included in Decree 430 of the Ministry of Economy, Development and Tourism (establishing the consolidated, coordinated and systematized text of Law N° 18.892, dated 1989 and its amendments, General Fisheries and Aquaculture Law). It considers the regulation that would ensure the achievement of results consistent with Principles 1 and 2 of the MSC. This legal framework clearly establishes in its article 1C, the factors to be taken into account by the fisheries authority to achieve the objectives of conservation and sustainable use of hydrobiological resources.

The management rules are applicable to all vessels operating within territorial waters and, in some cases, to those activities performed outside the EEZ by Chilean flagged vessels when the fishery is distributed both inside and outside of the EEZ.

The LGPA establishes binding and clear procedures for the cooperation between the stakeholders involved in the fishery management.

The LGPA considers the procedure for compliance with conservation and management of hydrobiological resources measures, adopted within the framework of international treaties and organizations of which Chile is

party or member. The main international agreements of which Chile is a party are: United Nations Convention on the Law of the Sea (CONVEMAR), signed in 1997; and United Nations Fish Stocks Agreement (UNFSA) –New York Agreement, signed in June 2014.

Moreover, it participates as member state in the following Fisheries Regional Organizations: Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), created in July 1981; and South Pacific Regional Fisheries Management Organization (SPRFMO), in force since August 2012.

It is part of the following aquatic biodiversity conservation fora: Convention on Biological Diversity (CDB), Convention on the Conservation of Migratory Species (CMS), Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES); International Whaling Commission (CBI); Agreement on Conservation of Albatross and Petrels (ACAP) and the Inter-American Commission for the Protection of Turtles (CIT).

It also participates in the following international fora: Decisions taken by the General Assembly of the United Nations on Sustainable Fisheries; Decisions taken by the General Assembly of the United Nations on Sustainable Fisheries: Decisions taken by the General Assembly of the United Nations on Oceans and the Law of the Sea; United Nations Conference on Environment and Development; FAO Fisheries Committee, COFI; FAO Sub-Committee on Fish Trade; Agreement to Promote Compliance with International Conservation and Management Measures by Vessels Fishing in the High Seas, FAO Compliance Agreement, FAO Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing, ratified in 2012.

In order to implement the FAO Code of Conduct for Responsible Fisheries, three National Action Plans were drafted: National Action Plan to Reduce the Bird Bycatch in the Longline Fishery, (approved by Decree 136, 2007); National Action Plan for the Conservation of Sharks (approved by Decree 198, 2007) and National Action Plan to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing, approved by Decree 267, 2005).

It also participates in the Fisheries Committee of the OECD; in the Permanent Commission for the South Pacific (CPPS); and the Asia-Pacific Economic Cooperation (APEC) Fishing Working Group.

Therefore, it can be concluded that there is an effective national legal system and an organized and efficient framework for cooperation that lead to compliance with the outcomes demanded by MSC Principles 1 and 2; hence the fishery would meet SG 60, SG 80 and **SG 100a**.

b.) <u>Resolution of disputes</u>:

The LGPA examines different aspects to minimize the conflicts of interest that could arise between fishery stakeholders, such as:

- Setting a 5 miles strip from the country coastline and inland waters, for the exclusive use of the artisanal fishery, namely, vessels of up to 18 meters of length. (Article 47, LGPA). They are looking to minimize the interaction and possible conflicts in the fishing activity between the industrial and artisanal sectors.
- Establishing a strip of 1 nautical mile (North of the Republic and Degree 43º25'42 South Latitude), measured from the coastline, for the exclusive use of artisanal fishers that use vessels with less than 12 meters in total length. (Article 47 bis, LGPA). They aim at minimizing the conflicts between small scale fishers, that use smaller vessels, with the larger ones.
- Subdivision by law of the harvest quotas of the main hydrobiological resources, shared between the artisanal and the industrial sector for a period of 20 years. (Sixth Temporary Provision, Law 20.657).
- Incorporate within the management plans the faculty to adopt agreements to solve conflicts of interest that might arise (Article 8, LGPA)

Moreover, to solve the conflicts that might arise among the users and the fishing authority, derived from the interventions of the latter, the following options are available:

- All administrative rulings might be contested before the government bodies, according to Law 19.880, Law of Administrative Procedures, in this case before the Ministry of Economy by means of the revision administrative appeal and appeal to a greater administrative authority and risk assessments contemplated in the Law previously mentioned.

- The administrative proceedings can also be presented before government bodies such as the General Accounting Office.
- In those cases, where the administrative rulings of the fishing authority cause an imminent damage against a constitutional right, any citizen can appeal directly to the ordinary justice system, requesting restitution in order to reestablish the violated right, by means of the Courts of Appeal of the Judicial Power, using the Protection Appeals.

The decisions taken in any of the instances, administrative or judicial, are public and binding for the administrative authority.

As an example, the Supreme Court of Justice ruled three sentences in 2020 and 2021 regarding issues presented by the stakeholders:

- Sentence of the Supreme Court in favor of SERNAPESCA in two cases of illegal fishing, October 30th, 2020. http://www.sernapesca.cl/noticias/corte-suprema-fallo-favor-de-sernapesca-en-dos-casos-de-pesca-ilegal
- The Supreme Court confirmed the verdict of the Concepción Court (Biobío Region) and rejected a Protection Appeal presented by Juan Montenegro, President of a fishers trade union (Federación de Trabajadores Pesqueros Ramas Afines Zona Centro Sur de Chile (Fetrapes)), against the Subsecretariat of Fisheries and Aquaculture (Subpesca) and the company Blumar S.A. for the transfer of fishing quotas. https://www.aqua.cl/2020/03/02/corte-suprema-falla-en-caso-de-cuotas-de-pesca/#
- The Supreme Court overturns the SUBPESCA Resolution that authorizes the industrial fishery in a small scale reserve area. https://www.elmostrador.cl/dia/2021/04/06/corte-suprema-deja-sin-efecto-resolucion-que-autoriza-pesca-industrial-en-zona-reservada-para-captura-artesanal/

Consequently, the management system incorporates, or is subject by law to a transparent mechanism for the solution of legal disputes that has been put in practice and has been effective. Therefore, the fishery would meet SG 60, SG 80 and **SG 100 b**.

c.) Respect for rights:

The LGPA establishes clearly the rights of each stakeholder when participating in extractive fishing, depending on the harvest regime applied for managing the fishery. Moreover, the obligations created by these rights are also clearly and officially established and well as the sanctions and reasons for their partial or total termination.

The holder of a right has an administrative ruling approved by the authority that ensures legality. In the case of the industrial fishery, the concession of the right that grants access presents four regimes: general, full exploitation, fishery in recovery and fishery in early development; it considers administrative proceedings such as: (i) Special Fishing Permits, PEP, for the individual quotas regime, granted by SUBPESCA Resolution. They are transferable, divisible and subject to any legal dealing. They are granted by auction for a period of 10 years. (ii) Tradeable Fishing Licenses LPT, granted by SUBPESCA Resolution to full exploitation fisheries with a global catch Quota. According to the law, they have the following specifications: Class A, obtained by historic right of the catch obtained during the previous three years of their application. They are granted for a period of 20 years, they are renewable, depending on the holder´s compliance with the rules; Class B, granted in public tender (15% less than Tradeable Fishing Licenses Class A). They are granted only once and for a fixed period of 20 years; they are totally transferable, divisible and subject to any legal dealing.

The holders of permits and licenses should register the vessels they would use for the fishing activity at SERNAPESCA. In both cases, they receive authorization to catch each year the number of tones obtained multiplying the participation coefficient indicated by the authority by the quota established for the industrial sector. The law considers the lack of compliance or the lack of payment of the rights demanded by the law as causes of partial or total termination according to the dispositions of the law.

In the case of artisanal fishery rights, both vessels and fishers must be registered in an Artisanal Fishery Register, maintained by SERNAPESCA in each region. The register grants permanent right, transmissible and transferable between artisanal fishers. The causes for total termination of these rights are clearly foreseen in the law.

The current fisheries legislation establishes, in agreement with Law 20.249, the granting of an area called Indigenous Peoples' Marine and Coastal Zone to the communities of indigenous peoples that might request it. Its main objective is to protect the customary use of these spaces, in view of maintaining the traditions and the

use of natural resources by the coastal communities. The Indigenous Peoples' Marine and Coastal Zone is offered to the community by means of a use agreement and during its processing, the offering of these areas to the indigenous peoples has priority over any other uses in these areas. According to SUBPESCA website, since 2012 till July 2021, 16 areas have been granted to Indigenous Peoples (https://www.subpesca.cl/portal/616/w3-propertyvalue-50834.html).

Therefore, the Chilean management system has a mechanism to generally respect the legal rights created for the different stakeholders involved in the extractive activity, recognizing the rights of the indigenous peoples dependent on fishing for food or livelihood. Therefore, this scoring issue would meet SG60, SG 80 and **SG 100c**.

Likely scoring level	**a) SG100**	**b) SG100**	**c) SG100**	**100**

References:

Ley 18.892, Ley General de Pesca y Acuicultura texto refundido, coordinado y sistematizado por el D.S. 430 del 28 de Septiembre de 1991. Ministerio de economía Fomento y Reconstrucción.

Ley 20.249, Ley que crea la Zona Marítima y Costera de los Pueblos Indígenas. Ministerio de Planificación.

Ley 19.880, Ley de Procedimientos Administrativos. Ministerio Secretaría General de la Presidencia.

Decreto del Ministerio de Economía 265, 2005, aprueba un Plan de Acción para prevenir, desalentar y eliminar la pesca ilegal, no declarada y no reglamentada.

Decreto del Ministerio de Economía 136, 2007, aprueba un Plan de Acción para reducir las capturas incidentales de aves en las pesquerías de palangre.

Decreto del Ministerio de Economía 198, 2007, aprueba un Plan de acción nacional para la conservación de los tiburones.

Resolución SUBPESCA 2110, 2014, estipula medidas para reducir la captura incidental de aves marinas en las pesquerías de palangre.

Resolución SUBPESCA 2941, 2019, estipula medidas para reducir las capturas incidentales de aves marinas en las pesquerías de arrastre.

PI 3.1.2 Consultation, roles and responsibilities

Component	Governance and Policy		
PI 3.1.2 Consultation, roles and responsibilities	**The management system has effective consultation processes that are open to interested and affected parties.** **The roles and responsibilities of organizations and individuals who are involved in the management process are clear and understood by all relevant parties.**		
Scoring issues	**SG60**	**SG80**	**SG100**
a.) Roles and responsibilities	Organizations and individuals involved in the management process have been identified. Functions, roles and responsibilities are **generally understood**.	Organizations and individuals involved in the management process have been identified. Functions, roles and responsibilities are **explicitly defined and well understood for key areas** of responsibility and interaction.	Organizations and individuals involved in the management process have been identified. Functions, roles and responsibilities are **explicitly defined and well understood for all areas** of responsibility and interaction.
b.) Consultation processes	The management system includes consultation processes that **obtain relevant information** from the main affected parties, including local knowledge, to inform the management system.	The management system includes consultation processes that **regularly seek and accept** relevant information, including local knowledge. The management system demonstrates consideration of the information obtained.	The management system includes consultation processes that **regularly seek and accept** relevant information, including local knowledge. The management system demonstrates consideration of the information and **explains how it is used or not used**
c.) Participation		The consultation process **provides opportunity** for all interested and affected parties to be involved.	The consultation process provides **opportunity and encouragement** for all interested and affected parties to be involved, and **facilitates** their effective engagement

Justification/Rationale

a.) <u>Roles and responsibilities</u>:

The LGPA clearly considers the roles, functions and responsibilities of each one of the institutions involved in fisheries management, either governmental institutions, such as the Ministry of Economy, Development and Tourism, the Subsecretariat of Fisheries and Aquaculture (SUBPESCA), the National Fisheries Service (SERNAPESCA) and the Fisheries Development Institute (IFOP), or advisory bodies of the administration, including the Technical Scientific Committees, the Management Committees, the Zonal Fisheries Councils and the National Fisheries Council.

The functions and responsibilities in fishery matters of the Ministry of Economy, Development and Tourism, SUBPESCA and SERNAPESCA, are established in Decree Law N ° 2.442, dated 1978, in accordance with the LGPA and Law 21.132 (modernizing and strengthening the public role of the National Fisheries Service).

The functions and responsibilities of IFOP are established in article 156 of the LPGA, whereas those of the Fisheries Research Fund are set in paragraph 2, Title VII, LPGA.

As regards the advisory bodies, their roles, number of members and responsibilities are established in the LGPA: Management Committees, (Paragraph 3, Title II, LGPA); Technical Scientific Committees (Paragraph 3, Title XII, LGPA), National Fisheries Council and Zonal Fisheries Councils (Paragraph 1 and 2, Title XII, LGPA). A list of members and minutes of their meetings are available on the SUBPESCA website. The method to appoint their members is established by regulation (Decree 85 – 2003, that approved the procedure to elect the advisors of the National Fisheries Council, and its corresponding amendments: D.S. N° 217, dated 2003 and N° 147, dated 2004; and Decree 453 - 1992, procedure to elect the advisors of the Zonal Fisheries Councils).

For each one of these organizations, it is the law that establishes its functions, the length of the term of service, as well as the origin and participation of their members. This is complemented by the regulations to determine the procedure, requirements and the process for the election of members, which are transparent and public.

Ministry of Economy, Development and Tourism: it is responsible for setting the basic policies to manage and coordinate the activities corresponding to the State regarding the fisheries sector. According to Decree Law 2.442, dated 1978, its actions should promote de development of the national fisheries sector, the protection, conservation and full use of the hydrobiological resources and the aquatic environment of the country. The Ministry provides the regulation of the law, as well as some of the administrative measures, based on a report from the Subsecretariat of Fisheries.

Subsecretariat of Fisheries and Aquaculture (SUBPESCA): regulating body depending from the Ministry of Economy, Development and Tourism. It is in charge of the design and implementation of management policies and measures focused on the conservation and sustainability of the hydrobiological resources, in cooperation with the economic stakeholders in the sector through the participatory bodies established by the Law. The implementation of administrative and management measures should be backed by a technical report and meet, as applicable, the consultation, approval or notification requirements set by the LGPA.

National Fisheries Service (SERNAPESCA): Body depending from the Ministry of Economy, Development and Reconstruction, created by Decree Law 2.442, dated 1978. It is in charge of enforcing the national fisheries policy and monitoring compliance with the fisheries regulations and any other form of exploitation of the hydrobiological resources.

Fisheries Development Institute (IFOP): Created in 1964, IFOP is a technical body specialized in fisheries and aquaculture scientific research. It is permanent partner and advisor of SUBPESCA in decision-making regarding the sustainable use of the fishing resources and the marine environment conservation, according to the last amendment of the LGPA (Ley 20.657, 2013). IFOP performs constant research as part of the annual SUBPESCA research program. It also manages the databases generated during the fisheries research and follow-up activities. These databases are State property and of public access.

Management Committee: Advisory body created by Law number 20.657 in 2013. One of its main functions is to draft the Management Plan proposal for the fisheries under its jurisdiction, as well as defining its period of assessment (this period cannot exceed 5 years since the respective plan was approved). The Committee includes representatives from the artisanal fishery, the industrial sector, processing plants, SERNAPESCA and SUBPESCA.

So far, the king crab fishery has three management committees: i) king crab and snow crab Management Committee of the Magallanes and Chilean Antarctica Region; ii) stone crab and king crab Management Committee of the Aysén del General Carlos Ibáñez del Campo Region; and iii) Benthic Crustacean Fishery Management Committee of the Chiloé Province, Los Lagos Region.

Technical Scientific Committees: Scientific advisory bodies of SUBPESCA for the management of fisheries with closed access. It also offers advice regarding environmental and conservation issues. These committees can offer advice pertaining to one or more fisheries. The name of the members of the Committees are published in the SUBPESCA web page.

Each Committee will have no less than three and no more than members (in the case of the Scientific Committee of Benthic Resources and the Committee of Pelagic Resources, it might be composed by a maximum of 7 members). To participate, the applicants should demonstrate that they have a professional title and experience in marine sciences related to the management and conservation of the fishery resources. The members are appointed by public tender organized by the Minister, that stay in office for four years and may be reelected under the same selection modality. At least one of the members must come from research institutions or universities whose headquarters are located in the regions where the main fishery or target activity of the Committee is distributed. Moreover, two representatives of IFOP and SUBPESCA should also be members. In addition to this number of participants, two additional members might participate for whom some cause of inability has been found but without the right to vote.

According to article 153 of the LGPA, this Committee should determine, among others: (i) the fishery status, (ii) the biological reference points and (iii) the range of the total allowable catch to be established by the authority. Moreover, SUBPESCA might consult with them on other issues such as: design of management and conservations

measures and the formulation of management plans. To draft its reports, the Committee should consider the information provided by the Fishery Promotion Institute, as well as data collected from other sources.

The names of the current members of each committee, appointment rules and minutes of the meetings are available on the SUBPESCA web site.

National Fisheries Council: problem-solving, consultative and advisory body. Its objective is to allow the participation of the fishery stakeholders at a national level in issues related to the fishing activity. It gives advice and recommendations, issues proposals and technical reports based on sound knowledge to the Subsecretariat, in all matters pertaining to the LGPA, as well as in any other of sectorial significance.

Moreover, it is consulted by the Subsecretariat regarding the National Plan for Fisheries Development; the International Fishing Policy; amendments to the General Fisheries and Aquaculture Law; measures for the promotion of the artisanal fisheries, and the National Plan for Fisheries Research. Moreover, the Council may also give its advice in any other relevant sectorial matter.

Its headquarters are located in the city of Valparaíso, holding its meetings in the SUBPESCA offices. It is composed of 28 members and chaired by the SUBPESCA Secretary. In addition, it includes the General Director of the Maritime Territory and Merchant Navy; the Director of the Fisheries Nacional Service; the Executive Director of the Fisheries Promotion Institute; five representatives of the legally constituted trade unions within the business sector; seven representatives of the legally constituted trade unions within the labor sector (one representative of the skippers of fishing vessels; one representative of the crew members of fishing vessels, and four representatives of the processing plants of hydrobiological resources, and a representative of the encarnadores (those that stick the bait on the fishhook) of the artisanal fishery); five representatives of the trade unions of the artisanal fishing sector; and seven advisers appointed by the President of the Republic with the agreement of three fifths of the Senate.

The National Fisheries Council has been in operation since 1993. The names of its current members, appointment rules and minutes are available on the SUBPESCA web site.

Zonal Fisheries Councils: this body contributes to decentralize the administrative measures taken by the authority and to make effective the participation of the fishery sector stakeholders at the zonal level, in matters related with the fishing and aquaculture activities. They have a consultative and decision-making character, as applicable.

There are 8 Zonal Fisheries Councils in the country, each one of them has 18 members that represent the regional or local public sector, universities related to marine sciences, industrial trade unions, fishing fleet and processing plant workers, the small scale sector and non-profit organizations whose objective is the defense of the environment or the preservation of natural resources or to focus on research. The names of the members of the Regional Fisheries Boards, the appointment rules and minutes of the meetings are published on the SUBPESCA web site.

Nacional Institute for Sustainable Development of Artisanal Fisheries and Small-Scale Aquaculture (INDESPA): Created by Law 21069 as decentralized public service under the supervigilance of the President of the Republic through the Ministry of Finance, Development and Tourism. Its objective is to promote the development of the artisanal fisheries, small-scale aquaculture and their benefits. Hence, it has the following functions and powers:

- Contribute to improve the productive and commercial capacity of the artisanal fisheries and small-scale aquaculture sectors.
- Promote the productive diversification of the artisanal fisheries and small-scale aquaculture sectors.
- Strengthen the integral and harmonious development, as well as the national, cultural and economic heritage of the coves and their neighboring areas.
- Develop infrastructure works for the artisanal fisheries and small-scale aquaculture, to be put in practice through agreements with the responsible bodies of the State Administration.
- Facilitate the access to credit of the artisanal fishers and small-scale aquaculture farmers, to finance productive or product quality improvement projects.
- Offer technical assistance and training to artisanal fishers and small-scale aquaculture farmers, as regards productive and commercialization issues.

Consequently, organizations and individuals involved in the management process have been identified. Functions, roles and responsibilities are explicitly defined and well understood for all areas of responsibility and interaction. Hence, this scoring issue would meet SG60, SG80 and **SG 100a**.

b.) <u>Consultation processes</u>:

The LGPA sets the consultation processes with the different advisory bodies (Technical Scientific Committees and Management Committees), to adopt fishery management measures and plans (for those fisheries with closed access, in recovery, in early development and benthic resources). It also sets consultation process to establish and modify quotas, season closures, minimum catch sizes, fishing gear specifications, percentages of species landed as bycatch, declarations of parks and marine reserves.

The local representatives of the artisanal and industrial fishery sectors are represented in the Management Committees created for certain fisheries.

In the specific case of the management plans, according to the LGPA, the management plan proposal should undergo a process of public consultation through the SUBPESCA website. Any observation can be made within the month of the date of publication on the website. The regulation also considers its dissemination via radio message and publication in a regional newspaper. Once the observations are received, the Subsecretariat will assess the relevance of redrafting the proposal and will give public response to the observations presented.

The management plan proposal will be subjected to public consultation through the Subsecretariat website, radio messages and publication in a regional newspaper.

Moreover, since the enforcement of the Law on Associations and Citizen Participation in Public Administration, there is legal recognition of the participation of the citizens in the decision making of those processes that have an impact on their activities. This law recognizes the right of the people to participate in policies, plans, programs and government actions. This is put in practice through the participation mechanisms implemented by SERNAPESCA: i) Civil Society Councils, ii) Participative Public Accounts, and iii) citizens Consultations. (Exempt Resolution N° 964, dated 2015, of SERNAPESCA, that approves the general citizen participation rules in the public management of the National Fisheries and Aquaculture Service).

Therefore, the management system includes consultation processes that regularly seek and accept relevant information, including local knowledge through the management committees, resulting in the adoption of measures, such as management plans. This is evidence that relevant information is taken into account for the fisheries management, in addition to the citizen participation mechanisms that exist. As a result, this scoring issue would meet SG 60 and **SG 80b**. However, as it does not demonstrate consideration of the information and does not explain how it is used or not used, it does not meet SG100.

c.) Participation:

The LGPA gives the opportunity and encourages the fishery stakeholders (representatives of the industrial and artisanal extraction sectors and of processing plants, etc.) to participate in the management through the Management Committees, Technical Scientific Committees, National Fisheries Council and the 8 Zonal Fisheries Councils. Researchers and scientist from universities offering marine sciences degrees, as well as research centers can participate through the Technical Scientific Committee and the Zonal Fisheries Councils. In addition, the representatives of NGOs can participate through the Zonal Fisheries Councils.

Therefore, bearing in mind that the participation of stakeholders in the management processes is well defined, as the regulation sets their role and responsibilities, the consultation process provides opportunity and encouragement for all interested and affected parties to be involved. Therefore, this scoring issue would meet **SG 80c**.

Likely scoring level	**a.) SG100**	**b.) SG80**	**c.) SG80**	**85**

References:

Ley 18.892, Ley General de Pesca y Acuicultura texto refundido, coordinado y sistematizado por el D.S. 430 del 28 de Septiembre de 1991. Ministerio de economía Fomento y Reconstrucción.

Decreto Ley 2.442 de 1978, que establece los deberes y facultades en materia pesquera del Ministerio de Economía, Fomento y Turismo, SUBPESCA y SERNAPESCA.

Decreto del Ministerio de Economía N° 453 de 1992, que estipula el reglamento para la elección de consejeros de los Consejos Zonales de Pesca

Decreto del Ministerio de Economía N° 77 de 2013, establece el reglamento de funcionamiento, toma de decisión e integración de los Comités Científicos Técnicos.

Ley 21069, que crea el Instituto Nacional de Desarrollo Sustentable de la Pesca Artesanal y de la Acuicultura de Pequeña Escala, INDESPA.

Resolución Exenta N° 964 del 2015 del SERNAPESCA, que aprueba la norma general de participación ciudadana en la gestión pública del Servicio Nacional de Pesca y Acuicultura

PI 3.1.3 Long-term objectives

Component	Management system		
PI 3.1.3 Long-term objectives	**The management policy has clear long-term objectives to guide decision-making that are consistent with MSC Principles and Criteria, and incorporates the precautionary approach.**		
Scoring issues	**SG60**	**SG80**	**SG100**
a.) Objectives	The management policy has long-term objectives to guide decision-making that are consistent with MSC Principles and Criteria, and incorporates the precautionary approach.	The management policy has clear long-term objectives to guide decision-making that are consistent with MSC Principles and Criteria, and incorporates the precautionary approach; explicit in the management policy.	The management policy has clear long-term objectives to guide decision-making that are consistent with MSC Principles and Criteria, and incorporates the precautionary approach; explicit and compulsory in the management policy.

Justification/Rationale

a.) <u>Long-Term Objectives</u>:

Article 1B of the LGPA declares that the objective of the fisheries management is the conservation and the sustainable use of hydrobiological resources, applying a precautory approach, as well as an ecosystem approach in the fisheries regulation and the protection of the marine ecosystems that those resources inhabit.

In addition, article 1C of the LGPA, clearly states that, to achieve the fisheries management objective previously mentioned, the fisheries authority should take into account when adopting conservation and management measures, as well as at the moment of interpreting and applying the LGPA, the following:

a) establish long term objectives for fisheries administration, conservation and protection of the ecosystems, as well as the periodic assessment of the efficacy of the measures put in place.

b) apply the precautory principle in the hydrobiological management and conservation and the protection of the ecosystems, namely:

i) More caution should be applied in the management and conservation of the resources when the scientific information is uncertain, unreliable or incomplete, and

ii) The lack of sufficient scientific information, unreliable or incomplete, cannot be used as motive to delay or not to adopt conservation and management measures.

c) apply an ecosystem approach for the conservation and management of the fishery resources and the protection of the ecosystems, understanding as such an approach that considers the interrelation of the main species within a specific area.

d) manage fisheries resources in a transparent, responsible and inclusive way.

e) gather, verify, inform and share in a systematic, timely, correct and public way, the data regarding the hydrobiological resources and their ecosystems.

f) consider the impact of the fishing activities in the related species and the preservation of the aquatic environment.

g) avoid or eliminate overfishing and excessive fishing capacity.

h) monitor the effective compliance of the conservation and administration measures.

i) minimize the discards, both of the target species as well as of the bycatch.

Moreover, article 3, section c) of the LGPA, indicates that, when setting the annual catch quota, it should maintain or lead the fishery towards the maximum sustainable yield considering the biological characteristics of the exploited resources.

Consequently, the management policy has clear long-term objectives to guide decision-making that are consistent with MSC Principles and Criteria, and incorporates the precautionary approach; explicit and compulsory in the management policy. This scoring issue would meet SG60, SG80 and **SG 100a**.		
Likely scoring level	**a.) SG100**	**100**
References: Ley 18.892, Ley General de Pesca y Acuicultura texto refundido, coordinado y sistematizado por el D.S. 430 del 28 de Septiembre de 1991. Ministerio de economía Fomento y Reconstrucción.		

PI 3.2.1 Fishery-specific objectives

Component	Fishery- specific management system		
PI 3.2.1 Fishery-specific objectives	**The fishery has clear, specific objectives designed to achieve the outcomes expressed by MSC's Principles 1 and 2.**		
Scoring issues	**SG60**	**SG80**	**SG100**
a.) Objectives	**Objectives**, which are broadly consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are **implicit** within the fishery's management system.	**Short and long term objectives**, which are consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are **explicit** within the fishery's management system.	**Well defined and measurable short and long term objectives**, which are demonstrably consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are **explicit** within the fishery's management system.

Justification/Rationale

a.) <u>Fishery specific objectives</u>:

The LGPA indicates that the management plans should establish de objectives, goals and deadlines to maintain or lead the fishery to the maximum sustainable yield, as established by the Management Committees. In the specific case of the king crab fishery (*Lithodes santolla*) in the XII Region, at the time of this report there is a Management Committee for this resource (the King Crab and Snow Crab Management Committee for the Magallanes and Chilean Antarctica Region). However, the corresponding management plan is still under evaluation.

Nevertheless, the administration has established management measures to maintain the full exploitation status of the resource, suspending the entries into the artisanal registry since 2000, as detailed here below:

- Resolution N° 2569, dated 1999, suspending from January 1st, 2000 till December 31st, 2004, the registration in the Artisanal Register of the XII Region, in all its categories, under the section king crab fishery. Moreover, this resolution suspends for the same period the registrations in the Artisanal Register of the XII Region, of all the species that are considered as bycatch of the king crab trap fishery.
- Exempt Resolution N° 3630, dated 2004, suspending from January 1st, 2005 till December 31st, 2009, the registration in the Artisanal Register of the XII Region, in all its categories, under the section king crab fishery. Moreover, this resolution suspends for the same period the registrations in the Artisanal Register of the XII Region, of all the species that are considered as bycatch of the king crab trap fishery.
- Exempt Resolution N° 4415, dated 2009, suspending from January 1st, 20010 till December 31st, 2004, the registration in the Artisanal Register of the XII Region, in all its categories, under the section king crab fishery. Moreover, this resolution suspends for the same period the registrations in the Artisanal Register of the XII Region, of all the species that are considered as bycatch of the king crab trap fishery.
- Exempt Resolution. N° 3556, dated 2014, suspending from January 1st, 2015 till December 31st, 2019, the registration in the Artisanal Registers of the IX Region of the Araucanía, XIV Region of the Los Rios Region, X Region of the Los Lagos Region, XI Region of Aysén and XII Region of Magallanes and Chilean Antarctica, in all its categories, under the section king crab fishery. Moreover, this resolution suspends in the same areas and for the same period the receipt of applications and allocation of industrial permits related to this fishery.
- Exempt Resolution N° 3963, dated 2019, suspending from January 1st, 2020 till December 31st 2024, the registration in the Artisanal Fishery Registers of the regions of the Los Rios Region, the Los Lagos Region, Aysén del General Carlos Ibáñez del Campo, Magallanes and the Chilean Antarctica, under the section king crab and snow crab. This suspension is extended to all the categories, with the exception of the artisanal fishers category (skipper or crew member). The latter will be able to register in the fisheries previously mentioned.

Moreover, this resolution suspends in the same areas and for the same period the receipt of applications and allocation of industrial permits related to this fishery.

In addition, the following regulatory provisions are also available, focusing on a reduction of the fishery impact on the juvenile component, protect the reproductive processes of the target resource and avoid unwanted impacts on species and habitats:

- Decree N° 375, dated 1986, modifying decree 442, dated 1981. It sets the minimum catch size for king crab at 10 centimeters in the area between the parallel corresponding to the north limit of the X Region and parallel 46° 30' 00" L.S.; and at 12 centimeters south of that parallel. The sizes set are measured from the eye orbit to the medium rear end of the carapace.
- Decree N° 39, dated 1983, banning the catch of king crab females and setting the obligation to return to the sea, in the place where they were caught, any female individual caught, even if they are above the minimum catch size.
- Decree N° 443, dated 1990, establishing a season closure for king crab in all the coastline of the XII Region (Parallel 36°30´00" L.S. and the Magallanes y and Chilean Antarctic Region), during the period from December 1st of the calendar year till June 30th of the following calendar year.

Such period was modified due to COVID 19, with December 15th 2020 as the new starting date and July 15th 2021 as finishing date (Exempt Decree Page 202000103, dated 2020).

In the case of the biological rest for the period 2021-2022, according to Exempt Decree 224, dated 2021, of the Subsecretariat of Fisheries and Aquaculture, the period has been modified for the Magallanes and Chilean Antarctica Region, from December 8th, 2021 till June 30th, 2022.

- Decree N° 442, dated 1981, establishing the use of traps as only fishing gear authorized to catch king crab.
- Exempt Resolution N° 2827, dated 2021, sets the construction features for the trap lines used in the catch of benthic crustaceans in order to reduce the buoyancy of the mother line, thus decreasing the risk of interfering with marine mammals. Moreover, this resolution establishes the prohibition to anchor the trap lines in areas where there is presence of whales and dump waste that could cause entanglements. Moreover, it is compulsory to communicate to the nearby fleet in the fishing area the presence and geographical location of the whales.

Along this line, through Exempt Resolution N° E-2021-263 (modified by Exempt Resolution N° 1531 of 2021), the Institute for Fisheries Development was authorized to carry out a fishing research campaign, according to the Reference Technical Terms of the Project "Fishing gear evaluation and improvement proposals for the sustainable exploitation of king crab (*Lithodes santolla*) in the Magallanes Region". The goal is to contribute to the sustainability of the king crab stock introducing changes to the fishing gear usually applied in its harvest.

As a result, objectives, which are broadly consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are implicit within the fishery's management system although they are not strictly stated in a management plan, in accordance to LGPA. Therefore, this scoring issue would only meet **SG60**.

Likely scoring level	**a.) SG60**	**60**

References:

Ley 18.892, Ley General de Pesca y Acuicultura texto refundido, coordinado y sistematizado por el D.S. 430 del 28 de Septiembre de 1991. Ministerio de economía Fomento y Reconstrucción.

Decreto N° 375 de 1986, que fija la talla mínima de extracción para el recurso centolla.

Decreto N° 39 de 1983, que establece la veda de ejemplares hembras de centolla.

Decreto N° 509 de 1991, que establece la veda estacional del recurso centolla en todo el litoral de la X y XI Región.

Decreto N° 443 de 1990, que establece la veda estacional del recurso centolla en todo el litoral de la XII Región.

Decreto N° 442 de 1981, que dispone utilizar exclusivamente en la captura del recurso centolla al arte de pesca denominado trampas.

Dec. Ex. Folio 202000104, de 2020, que modifica la veda de centolla en las Regiones Los Ríos-Los Lagos.

Dec. Ex. Folio 202000103 Modifica D.S. N° 443-1990 Veda Biológica Recurso Centolla, Región de Magallanes y La Antártica Chilena.

Dec. Ex. Folio DEXE202100224, de 2021. Modifica D.S. N.º 443 de 1990 y D.S. N° 509 de 1991, que establece veda biológica para el recurso centolla en áreas y período que indica.

Res. Ex N° 2827, de 2021, que establece características de construcción para líneas de trampas empleadas en la captura de crustáceos bentónicos

Res. Ex. N° E-2021-263, autoriza al Instituto de Fomento Pesquero, a efectuar una pesca de investigación, de conformidad con los Términos Técnicos de Referencia del Proyecto denominado “Evaluación del arte de pesca y propuesta de mejoras para la explotación sustentable de centolla (Lithodes santolla) en la región de magallanes”.

Res. Ex N° 1531 del 2021, que modifica la Res. Ex. N° E-2021-263.

PI 3.2.2 Decision-making processes

Component	Fishery-specific management system		
PI 3.2.2 Decision-making processes	**The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives and has an adequate approach to the UoA conflicts.**		
Scoring issues	**SG60**	**SG80**	**SG100**
a.) Decision-making processes	There are **some** decision-making processes in place that result in measures and strategies to achieve the fishery-specific objectives.	There are **established** decision-making processes that result in measures and strategies to achieve the fishery-specific objectives.	
b.) Responsiveness of decision-making processes	Decision-making processes respond to **serious issues** identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take some account of the wider implications of decisions	Decision-making processes respond to **serious and other important issues** identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions.	Decision-making processes respond to **all issues** identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions
c.) Use of precautionary approach		Decision-making processes use the precautionary approach and are based on best available information.	
d.) Responsibility and transparency of the management systems and decision-making processes	**Some** information about the fishery performance and management measures is generally available on request.	Complete information about the fishery performance and management measures is available on request. **Explanations** are provided for any actions or lack of action associated with findings and relevant recommendations emerging from research, monitoring, evaluation and review activity	**Formal reporting** to all interested stakeholders details complete information about the fishery performance and management measures and describes how the management system responded to findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.
e.) Approach to disputes	Even if the management authority or fishery could be subjected to constant disputes in court, trespassing repeatedly the same law or rule, necessary for the sustainability of the fishery, does not represent contempt or disregard towards the Law.	The management system or fishery are trying to abide in a timely manner with the binding legal rulings derived from any legal dispute.	The management system or fishery are acting proactively to avoid legal disputes or quickly implements the binding legal rulings derived from any legal dispute.

Justification/Rationale

a.) <u>Decision-making processes</u>:

The management decision-making processes are established in the LGPA. The law details the participation of each one of the public institutions (SUBPESCA, SERNAPESCA, IFOP) and auxiliary bodies of the administration, such as the Technical Scientific Committee, the Management Committees, etc.

The implementation or modification of the fishery management measures results from the interaction of those institutions. Their focus is to achieve the conservation and utilization objectives foreseen in the LGPA.

Thus, there are some decision-making processes in place that result in measures and strategies to achieve the fishery-specific objectives. However, there are no established objectives strictly stated in a management plan or similar. The fishery would score **SG 60**.

b.) Responsiveness of decision-making processes

The main management measures applied to the king crab fishery are: effort limitations (suspensions in artisanal fishery registrations), reproductive closure seasons, fishing gear regulations, minimum catch sizes and permanent ban on females.

Considering the king crab stock status, the administration together with the fishery stakeholders has temporarily suspended new registrations for harvesting this stock in the IX – XII Regions, as the stock has reached full exploitation status in those areas.

In the case of reproductive closure seasons, the opening and closing periods are modified due to atypical signs in the reproductive cycle detected during the fishing season (2014 – 2019) or at the request the skippers due to the economic impacts caused by the pandemic (2020-2021). The idea is to help the stakeholders in achieving their economic and social objectives, within the framework of the national health emergency.

Moreover, the Demersal Crustaceans Scientific Committee in its assessment has identified variations in the annual average size reduction patterns in the king crab stock caught, even in the female component despite the fact that it is forbidden to catch females (https://www.subpesca.cl/portal/616/articles-104644_documento.pdf). This could be evidence of impacts of the fishery on the reproductive process. In addition, the King Crab and Snow Crab Management Committee of the Magallanes and Chilean Antarctica Region has considered the development of tests on the traps used in the king crab fishery.

During 2021, IFOP developed a research "Fishing gear evaluation and improvement proposals for the sustainable exploitation of king crab (*Lithodes santolla*) in the Magallanes Region". The aim was to contribute to the sustainability of the king crab resource modifying the fishing gear to minimize the impact on non-commercial male specimens of the species and bycatch and avoid the interaction with large marine mammals.

Consequently. the decision-making processes respond to serious issues identified in relevant research, monitoring and assessments. Therefore, it would meet **SG80**. However, it would not reach SG100, as there are certain issues (for instance, those related with bait or impacts on the habitat) that have not been considered so far.

c.) Use of precautionary approach

The legislation considers the application of the precautionary approach to achieve the conservation and sustainable use of the hydrobiological resources. This approach implies that: i) More caution should be applied in the management and conservation of the resources when the scientific information is uncertain, unreliable or incomplete, and ii) The lack of sufficient scientific information, unreliable or incomplete, cannot be used as motive to delay or not to adopt conservation and management measures (Articles 1B and 1C of the LGPA). As a result, the fishery would score **SG80**.

d.) Responsibility and transparency of the management systems and decision-making processes:

In the king crab fishery, the information related to the decision-making process is public, in accordance with the LGPA, and it is available on the Secretariat of Fisheries website. All the management measures and regulations are published in the Official Journal.

The minutes of the Management Committees (King Crab and Snow Crab Management Committee of the Magallanes and Chilean Antarctica Region - https://www.subpesca.cl/portal/616/w3-propertyvalue-61300.html#collapse03), Technical Scientific Committees (Demersal Crustaceans Technical Scientific Committee - https://www.subpesca.cl/portal/616/w3-propertyvalue-51147.html#), National Fisheries Council (https://www.subpesca.cl/portal/616/w3-propertyvalue-38005.html) and the Zonal Fisheries Councils (https://www.subpesca.cl/portal/616/w3-propertyvalue-38007.html)) are published in the Subsecretariat of Fisheries website.

Moreover, on an annual basis (in March each year) the report on the stock status of the main Chilean fisheries is published on the Subsecretariat web page. It contemplates the king crab fishery assessment as one of the fisheries with general access regime in a estate of full exploitation (https://www.subpesca.cl/portal/618/w3-propertyvalue-792.html)

Moreover, according to Law 20.285 (Law of Transparency within Public Office and of Access to State Administration Information), stakeholders might request to the public institutions information regarding their policy areas. They

should receive a reply within the time periods established by the Law, always respecting due confidentiality, which could justify total or partial denial of access to the information.

Therefore, complete information about the king crab fishery performance and management measures is available on request. Explanations (such as the minutes of the Scientific and Management Committees) are provided for any actions or lack of action associated with findings and relevant recommendations emerging from research, monitoring, evaluation and review activity. Therefore, the fishery would score **SG 80**.

e.) Approach to disputes:

There has been a Supreme Court ruling in favor of SERNAPESCA confirming the sentence against a shipowner in 2018 for using illegal fishing nets to catch king crab (king crab nets). The Supreme Court dismissed the cassation appeal presented by the defendant, arguing that SERNAPESCA provided enough evidence to prove the existence of the violation. It disregarded the version of the defendants, pointing at the "accidental finding of the nets ". As a result, the defendants will have to pay a fine between 50 and 60 TMU for violating the General Fisheries and Aquaculture Law (http://www.sernapesca.cl/noticias/corte-suprema-confirmo-sentencia-por-uso-de-redes-ilegales-para-capturar-centolla).

The management system is trying to abide in a timely manner with the binding legal rulings derived from any legal dispute, presenting, in this specific case, the necessary evidence to prove that an offence has been committed. Therefore, the scoring issue would meet **SG 80**.

Likely scoring level	**a) SG60**	**b) SG80**	**c) SG80**	**d) SG80**	**e) SG 80**	**75**

References:

Ley 18.892, Ley General de Pesca y Acuicultura texto refundido, coordinado y sistematizado por el D.S. 430 del 28 de Septiembre de 1991. Ministerio de economía Fomento y Reconstrucción.

Ley 20.285, Ley de transparencia de la función pública y de acceso a la información de la Administración del Estado.

PI 3.2.3 Compliance and enforcement

Component	Fishery- specific management system		
PI 3.2.3 Compliance and enforcement	**Monitoring, control and surveillance mechanisms ensure the fishery's management measures are enforced and complied with.**		
Scoring issues	**SG60**	**SG80**	**SG100**
a.) Implementation of monitoring, control and surveillance mechanisms	Monitoring, control and surveillance **mechanisms** exist, are implemented in the fishery under assessment and there is a reasonable expectation that they are effective.	A monitoring, control and surveillance **system** has been implemented in the fishery under assessment and has demonstrated an ability to enforce relevant manage-ment measures, strategies and/or rules.	A **comprehensive** monitoring, control and surveillance system has been implemented in the fishery under assessment and has demonstrated a consistent ability to enforce relevant management measures, strategies and/or rules
b.) Sanctions	Sanctions to deal with non-compliance exist and there is some evidence that they are applied.	Sanctions to deal with non-compliance exist, **are consistently applied** and thought to provide effective deterrence.	Sanctions to deal with non-compliance exist, are consistently applied and **demonstrably** provide effective deterrence.
c.) Compliance	Fishers are **generally thought** to comply with the management system for the fishery under assessment, including, when required, providing information of importance to the effective management of the fishery.	**Some evidence exists** to demonstrate fishers comply with the management system under assessment, including, when required, providing information of importance to the effective management of the fishery.	There is a **high degree of confidence** that fishers comply with the management system under assessment, including, providing information of importance to the effective management of the fishery
d.) Systematic non-compliance		There is no evidence of systematic non-compliance.	
Justification/Rationale			

a.) <u>Implementation of monitoring, control and surveillance mechanisms</u>:
SERNAPESCA is in charge of monitoring each subsector (industrial and artisanal). Its activities include physical inspections and document verifications performed in all the stages of the fishing activity: from extraction to export or consumption; satellite monitoring is also included.

The official landing certification program performed entirely by SERNAPESCA according to the provisions of the Law on Modernization of the institution. Those vessels subject to landing certification are transporting motorboats, vessels of 12 meters or more in length and those that operate in the pelagic fishing, independently of their length.

SERNAPESCA carries out a daily follow-up of the location of the artisanal vessels with satellite positioning and, in the landfall, they compare this information with the landing declarations. According to article 64 B, it is compulsory for vessels of 15 meters or more in length to install a satellite device, as well as for artisanal vessels of 12 meters or more and less than 15 meters in length, operating in pelagic fisheries with purse seine and registered in Chile. This information is public: http://www.sernapesca.cl/informacion-utilidad/monitoreo-satelital-de-naves-y-embarcaciones-pesqueras

Moreover, SERNAPESCA develops joint operations through an important strategic alliance it maintains with other monitoring institutions (Chilean Navy, Chilean Police and the Chilean Investigative Police (PDI). They draft joint work programs that strengthen the monitoring procedures.

The LGPA establishes that the holders of any authorization to access the industrial fraction of the global quota or of the fishing authorizations, as well as the shipowners of artisanal vessels of 12 meters or more in length, must provide SERNAPESCA the landing information per fishing trip mentioned in article 63 of the law. They are subjected to the certification process established by the Service.

The information is delivered in a Landing Certificate. Later, SERNAPESCA validates the following landing information provided in the declaration, per fishing trip or transfer: name of vessels, species and volumes landed. Since January 1st, 2020, SERNAPESCA runs the procedure at a national level.

Moreover, article 63 of the RLGPA states that the owners of processing or transformation plants and the people that perform commercialization activities of hydrobiological resources, should inform SERNAPESCA about the provision of hydrobiological resources and the final products obtained from them.

According to article 3 of Decree 129, dated 2013, of the Ministry of Economy, Development and Tourism, the transportation and artisanal fishing vessels must inform individually the following:

- Artisanal extractive fishing vessels:
  a. In the fishing logbook: Identification of the shipowner, the vessel and skipper, date of sail and landfall, sailing and landing port and fishing gear; moreover, per each fishing set: the catch estimated per species or group of species in tons, kilograms or units as applicable, geographical position, date and hour of set and turning of each fishing set and discard quantities per species or group of species and the bycatch, if applicable.
  b. In the shipowner landing declaration: identification of the shipowner, the vessel and skipper, vessel register number on the RPA, date of sail and landfall, sailing and landing port and fishing gear; moreover, the catch estimated per species or group of species in tons, kilograms or units as applicable, fishing grounds, catch destination and, if it is a catch performed within the framework of a research fishing project, the resolution that authorizes it should be identified.

- Transportation vessels:
  In the transportation vessel landing declaration: identification of the shipowner, the vessel and skipper, vessel register number on the Register of Transportation Vessels, date of sail and landfall and sailing and landing port; moreover, quantity of the resource in tons or units, as applicable, fishing grounds where the shipment was obtained, identification of each one of the suppliers of the shipment, tons or units per type of resource corresponding to each supplier and destination of the shipment.

Moreover, according to Law N° 20.625 del 2012 and its Regulation (D.S. Economy N° 76, 2015), industrial and artisanal shipowners of vessels length 15 m or above, must install and operate throughout the fishing trip a Camcorder. This device will allow to record any bycatch that might occur onboard. The aim of this Bycatch Monitoring System is to promote compliance with the bycatch regulations.

Thus, a monitoring, control and surveillance system has been implemented by SERNAPESCA in the fishery under assessment. This system has a general approach. However, it has demonstrated an ability to enforce relevant management measures, strategies and/or rules. Consequently, this scoring issue would meet **SG80**.

b.) Sanctions:

The sanctions due to non-compliance with the LGPA and specific rulings for the UoA management are reflected within the LGPA (Chapter XIII, Title IX, Violations, Penalties and Procedures). This subheading establishes the violations and sanctions regime.

There are penalties applicable to:

- Violations referred to catches and related actions.
- Transfer and related activities concerning hydrobiological species under the minimum size, those prohibited or illegally fished and their subproducts.
- Fishing operations without harvest results.
- Obstructing the tasks of the scientific observers.
- Obstructing taxation.

The penalties imposed can range from:

- Fines.
- Suspension or termination of the license.
- Closure of commercial or industrial facilities.
- Seizure of the fishing gear used for the violation and the means of transportation.
- Seizure of the hydrobiological species or their subproducts.

In the specific case of king crab, the calculation of the value of the penalty (fine) corresponding to period 2020-2021 applies the 84.4 TMU/ton factor (Page DEXE202000110/02-12/2020, that sets the value of the penalty in the case of hydrobiological species for the period 2020-2021).

Consequently, we can say there are sanctions to fight against violations. However, there is not enough evidence to sustain that they are applied or that they act as deterrence. Therefore, **SG60** would be met, but it is impossible to sustain that it meets **SG80**.

c.) Compliance:

There is evidence that the fishers cooperate with the authorities and the scientists in gathering data regarding catch and bycatch data and any other information relevant for the management of the resources and the fishery (fishing grounds, size structure, sex proportion, proportion of mass carrying eggs, carapace consistency, bycatch). The fishery clearly respects the main rules and regulations established and in force.

The fleet is under control and allows onboard scientific observers in all their fishing trips, and provides information necessary for monitoring the landing l resource official certification, as part of the follow-up program of the main national fisheries. Moreover, the fleet reports its activities to the SERNAPESCA according to the regulatory requirements described in PI ID 3.2.3 a).

Therefore, in general terms, fishers are generally thought to comply with the management system for the fishery under assessment, including, when required, providing information of importance to the effective management of the fishery. However, there is no evidence to demonstrate it, so the fishery only scores **SG60**.

d.) Systematic non-compliance:

There is evidence of systematic non-compliance:

- Ruling regarding the use of illegal nets to catch king crab in 2020, in Puerto Natales (http://www.sernapesca.cl/noticias/corte-suprema-confirmo-sentencia-por-uso-de-redes-ilegales-para-capturar-centolla)
- Detection of king crab harvest during the closed season in 2021, thin Lennox Bay area (https://www.aqua.cl/2021/06/29/en-magallanes-detectan-ilicito-de-explotacion-de-centolla/#)
- King crab harvest using king crab nets and during the closed season, catch of females, processing king crab in fishing grounds – creating health hazards -, in 2019 and 2020 (https://www.24horas.cl/regiones/austral/captura-ilegal-de-centollas--5073794)
- Illegal king crab catch and processing in 2021, in Magallanes, Puerto Natales (https://www.mundoacuicola.cl/new/nuevo-hallazgo-de-centolla-ilegal-en-puerto-natales/).
- Detection of new king crab illegal apozamiento[2] in Otway Passage (https://www.pescaconciencia.com/2021/11/01/chile-detectan-nuevo-apozamiento-ilegal-de-centollas-en-seno-otway/).
- Detection of irregularities around the use of forbidden nets in the King crab harvest in the south area of the Magellan Strait (https://www.armada.cl/autoridad-maritima-y-sernapesca-realizaron-fiscalizacion-conjunta-en).

Furthermore, in 2021, the King Crab and Snow Crab Management Committee of the Magallanes and Chilean Antarctica Region identified illegal fishing as one of the 26 problems that have a negative impact on the fishery. Likewise, during the 2nd Regular Meeting of this Committee held in August, 2021, they referred to the bad practices undertaken by some stakeholders that endanger the sustainability of the resource.

Therefore, the scoring issue would meet **SG60**, but not SG80, because there is evidence of systematic non-compliance.

Likely scoring level	**a.) SG80**	**b.) SG80**	**c.) SG60**	**d.) SG60**	**70**

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[2] Apozamiento: accumulation of benthic hydrobiological resources that have been removed or transferred from the places they naturally inhabit (Article 2 of RLGPA)

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PI 3.2.4 Monitoring and management performance evaluation

Component	Fishery- specific management system		
PI 3.2.4 Monitoring and management performance evaluation	**There is a system for monitoring and evaluating the performance of the fishery-specific management system against its objectives. There is effective and timely review of the fishery-specific management system.**		
Scoring issue	**SG60**	**SG80**	**SG100**
a.) Evaluation coverage	The fishery has in place mechanisms to evaluate **some** parts of the management system.	The fishery has in place mechanisms to evaluate **key** parts of the management system.	The fishery has in place mechanisms to evaluate **all** parts of the management system.
b.) Internal and/or external review	The fishery-specific management system is subject to **occasional internal** review.	The fishery-specific management system is subject to **regular internal** and **occasional external** review.	The fishery-specific management system is subject to **regular internal** and **external** review

Justification/Rationale

a.) <u>Evaluation coverage</u>

Article 4°A of the LGPA, declares that "in March each year, the Subsecretariat should present a report regarding the stock status of each fishery that has closed access, has been declared in full exploitation status, recovery or early development. The report should be drafted in accordance with the definition of the stock status of the fisheries contemplated in this law, the management measures and the research developed during the period. This report should be published on its website".

The Fisheries and Aquaculture Subsecretariat publishes each year the "Stock Status of the Main Chilean Fisheries" report, including the king crab fishery assessment (Regions of the Los Lagos Region to Magallanes and Chilean Antarctica). The reports published assess and classify the stock in a state of full exploitation. In 2017, the value of 3,770 tons (+ 1,495.3 tons) was proposed as reference point, taking as a reference the average value of landings since the fishery closure from 1996 till 2017.

Moreover, there is the Follow-Up of Benthic Crustacean Fisheries Program that includes the king crab assessment in the Magallanes and Chilean Antarctica Region among others. The main objective of the program is to learn about the status of the main resources, provide basic information for the stock assessments and achieve time continuity in biological-fishery data gathering. For the stock assessment in this region, 3 big areas are identified for the estimate and analysis of the biological-fishery indicators: North, Center and South.

Therefore, the fishery has in place mechanisms to evaluate only some parts of the management system, such as the stock status, thus scoring **SG60**.

b.) Internal and/or external review

Regarding internal evaluation, in the case of a fishery declared in full exploitation state, SUBPESCA must perform an annual review of the stock status. This implies a regular internal review process that corresponds to the Fisheries Subsecretariat.

Moreover, the Technical Scientific Committee has to make decisions about different aspects of the fishery management system, mainly to determine the stock status of the fisheries and the biological reference points, the catch quotas, the design of the management measures and the drafting of the management plan. As a result, it reviews periodically the management measures. In the case of the King crab fishery, those functions are developed by the Demersal Crustaceans Technical Scientific Committee).

Even if currently the King crab fishery in the XII Region does not have an approved management plan (plan on course of approval), it should be considered that, according to the LGPA, the management committees are responsible for establishing an annual review period for the evaluation of the management plans. In any case, it cannot exceed five years since its implementation (article 8, paragraph III of the LGPA).

Regarding the external review, according to article 156A of the LGPA, the Ministry of Economy, Development and Reconstruction must ensure the quality of the research. Thus, the IFOP reports should be subjected to peer review

by external reviewers to determine if they fulfill the technical terms of reference. Those revisions should verify the technical quality of the research presented, as well as the results obtained. The evaluation reports are public. Moreover, the methodologies, data gathering and procedures applied should be subjected to external peer review in order to ensure quality, according to the procedure previously mentioned. This review can be requested by the Technical Scientific Committees.

Thus, it is considered that the king crab fishery is subject to regular internal review. However, there is no evidence that the system has been subject to external review. As a result, the fishery would only score **SG60**.

Likely scoring	**a.) SG60**	**b.) SG60**	**60**

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