

Taiwan Squid & Saury Fisheries Association

Southwest Atlantic Argentine Shortfin Squid

Fishery Improvement Project

Needs Assessment Report

Prepared by

Overseas Fisheries Development Council

October, 2022

Table of Contents

Executive Summary	1
List of Acronyms	2
Methodology	4
Scoring overview	5
Basic Fishery Information	6
Unit of Assessment (UoA)	8
Status of Target Stock- Principle 1	10
Stock status outcome (1.1.1)	10
Stock rebuilding (1.1.2)	13
Harvest control strategy (1.2.1).....	13
Harvest control rules (1.2.2)	14
Harvest strategy information and monitoring (1.2.3).....	15
Assessment of stock status (1.2.4).....	15
Ecosystem Impacts- Principle 2	16
Primary/secondary species outcomes (2.1.1 & 2.2.1)	16
Primary/secondary species management (2.1.2 & 2.2.2).....	17
Primary/secondary species information (2.1.3 & 2.2.3).....	17
ETP species outcome (2.3.1)	17
ETP species management (2.3.2)	18
ETP species information (2.3.3).....	19
Habitats outcome (2.4.1).....	19
Habitats management (2.4.2).....	20
Habitats information (2.4.3).....	20
Ecosystem outcome (2.5.1).....	21
Ecosystem management (2.5.2).....	22
Ecosystem information (2.5.3)	22

Management System- Principle 3	24
Legal and/or customary framework (3.1.1).....	24
Consultation, roles, and responsibilities (3.1.2)	26
Long-term objectives (3.1.3)	27
Fisheries-specific objectives (3.2.1)	29
Decision-making processes (3.2.2).....	30
Compliance and enforcement (3.2.3)	31
Monitoring and management performance evaluation (3.2.4)	33
References	35

Executive Summary

This Needs Assessment Report is prepared by the Overseas Fisheries Development Council (OFDC) using the Environmental Rapid Assessment Tool (version 2.0) released on *FisheryProgress.com* in November, 2021. This report assesses the squid-jigging fishery conducted by 82 fishing vessels registered under Taiwan Squid and Saury Fisheries Association, which targets *Illex argentinus* in the southwestern Atlantic. Those 82 squid-jigging fishing vessels are flying Taiwanese flag and engage in fishing activities on the high seas of the southwestern Atlantic and within the exclusive economic zone (EEZ) of the Falkland Islands. This Report aims to assess the gap between the current fishery and well-recognized sustainable fisheries standards and seek improvements in the fishery based on relevant criteria.

The information and data contained in this Report are based on desk research, including public available studies and information on the websites of the Falkland Islands Fisheries Department and Taiwan Fisheries Agency, and onsite information collected from interviewees. The fishery assessments from Marine Stewardship Council (MSC) are also a source of information.

The conclusion drew by the assessment team is that the southwestern Atlantic squid fishery which the Taiwan Squid and Saury Fisheries Association engage in does not meet the sustainable fisheries standards as specified in the Environment Rapid Assessment tool at the current stage. As a result, it is necessary to take corresponding actions, to ensure the sustainability of the fishery.

According to this Report, the main problems of the southwestern Atlantic squid fishery conducted by the Taiwan Squid and Saury Fisheries Association are lack of the harvest control strategy (PI 1.2.1) and harvest control rules (PI 1.2.2), as each indicator is scored with less than 60. Other problems include: lack of regular review on endangered, threatened, and protected (ETP) species (PI 2.3.2), more information is needed on ETP species information (PI 2.3.3) to support management strategies and lack of external management performance evaluation (PI 3.2.4).

List of Acronyms

Acronyms	Definition
CPUE	Catch per Unit Effort
BNPS	Bonaerensis-north Patagonian stock
EEZ	Exclusive Economic Zone
ETP	Endangered, Threatened or Protected Species
FIP	Fishery Improvement Project
HCR	Harvest Control Rule
INIDEP	Instituto Nacional de Investigación y Desarrollo Pesquero
IUCN	International Union for the Conservation of Nature
IUU	Illegal, Unreported and Unregulated (fishing)
MBA	Monterey Bay Aquarium
MCS	Monitoring, Control and Surveillance
MSC FS	Marine Stewardship Council Fisheries Standard
MSY	Maximum Sustainable Yield
NPCI	National Plan of Control and Inspection for Fisheries
OFDC	Overseas Fisheries Development Council
PI	Performance indicator
PSA	Productivity Susceptibility Analysis
RFMO	Regional Fisheries Management Organization
SAFC	South Atlantic Fisheries Commission
SB	Spawning Biomass
SBR	Spawning Biomass Ratio
SFW	Seafood Watch
SPS	south Patagonian stock
SpSG	spring spawning group
SSB	Spawning Stock Biomass

SSG	summer spawning group
TAC	Total Allowable Catch
TRP	Target Reference Point

Methodology

The Environmental Rapid Assessment tool is co-developed by Ocean Outcomes, World Wildlife Fund US, and Sustainable Fisheries Partnership. The tool is built around the Performance Indicators (PIs) of the Marine Stewardship Council (MSC) standard and draws concepts/definitions from both the MSC and Monterey Bay Aquarium Seafood Watch (MBA SFW) standards, specifically the MSC Fisheries Standard Version 2.01 and the MBA SFW Standard for Fisheries Version 3.2. Despite this methodology largely relies on concepts developed and tested by MSC and MBA SFW, it does not replicate or replace either a MSC pre-assessment or a SFW assessment. This assessment is designed to present key information about the fishery and identify major deficiencies towards ecological sustainability, with an aim to defining the scope or to facilitating movements of the fishery into an improvement project.

To maintain consistency with MSC pre-assessment protocols and scoring ranges used on FisheryProgress.org, assessors assign a scoring range to each PI using a red-yellow-green traffic light system (Table 1). 'Default priority' refers to the general importance of addressing the identified deficiency; priority levels may be adjusted depending on the specific circumstances of the fishery under assessment.

Table 1. Environmental Rapid Assessment scoring category

Scoring category	Default priority	General definition of management performance
<60	High	<ul style="list-style-type: none"> Key aspects of management remain insufficient or ineffective due to a lack of resources, will, and/or framework. There is limited information on stock status, or available information suggests that stocks are overfished. There is limited information on fishery's impact on ecosystem, or available information suggests that fishing activity causes some significant impacts to the habitat and ecosystem. <p>Relation to MSC assessment: this PI is likely to fail</p>
60~79	Medium	<ul style="list-style-type: none"> Some important management aspects may be lacking, but none are sufficient to prevent a passing rating by themselves. Monitoring and enforcement are in place and believed effective. Information is available to estimate fishing mortality and the fishery's impact on non-target and ETP species, and the fishery is unlikely to hinder ETP recovery. Habitat and ecosystem impacts are possible, though the fishery is unlikely to cause serious or irreversible harm. <p>Relation to MSC assessment: a condition may be needed for this PI</p>

≥80	Low	<ul style="list-style-type: none"> • Management measures in place are expected to be effective, and precaution is accounted for. • Stock-specific reference points are available and show that biomass is highly likely above a limit and is fluctuating around a target (normally MSY). Information is available to assess fishing mortality and impacts on non-target and ETP species. There is strong evidence that the fishery is not causing serious harm to habitats or ecosystems. <p>Relation to MSC assessment: an unconditional pass for this PI appears likely</p>
-----	-----	---

Scoring summary

Principle	Component	PI#	Performance Indicator	Scoring category
1	Outcome	1.1.1	Stock status outcome	
		1.1.2	Stock rebuilding outcome	Not applicable
	Management	1.2.1	Harvest Strategy	
		1.2.2	Harvest control rules	
		1.2.3	Information and monitoring	
		1.2.4	Assessment of stock status	
2	Other species	2.2.3	Other species information	
		2.2.1	Other species outcome	
		2.2.2	Other species management	
	ETP species	2.3.3	ETP species information	
		2.3.1	ETP species outcome	
		2.3.2	ETP species management	
	Habitat	2.4.3	Habitats information	
		2.4.1	Habitats outcome	
		2.4.2	Habitats management	
	Ecosystem	2.5.3	Ecosystem information	
2.5.1		Ecosystem outcome		
2.5.2		Ecosystem management		
3	Governance & policy	3.1.1	Legal and customary framework	
		3.1.2	Consultation, roles and responsibilities	
		3.1.3	Long term objectives	
	Fishery-specific management system	3.2.1	Fishery-specific objectives	
		3.2.2	Decision-making processes	
		3.2.3	Compliance and enforcement	
		3.2.4	Management performance evaluation	

Basic Fishery Information

Table 2. Description of Southwest Atlantic Argentine shortfin squid fishery

Target species	Argentine shortfin squid (<i>Illex argentinus</i>)
Stock	Atlantic squid
Fishery location	Southwest Atlantic Oceans and the Falkland Islands' valid fishing zone: licence category B for <i>illex</i>
Gear type(s)	Jigging
Catch quantity (weight)	2020: 28,337 tons; 2021: 70,459 tons
Vessel types and sizes	Large distant water squid-jigging vessels
Number of UoA vessels	82
Management authority	Taiwan Fisheries Agency; Falkland Islands Fisheries Department

The main fishing ground of the Southwest Atlantic Argentine shortfin squid fishery is located in waters between Brazil Current and Falkland Current. While the fishery targets Argentine shortfin squid (*Illex argentinus*), it often bycatches few Sevenstar flying squid (*Martialia hyadesi*). In general, from early December to mid-August is the fishing season. Argentine shortfin squid can be found gather in waters between 45~46 degrees south in January and February and the stock will gradually move southeast to the Falkland Islands' Exclusive Economic Zone (EEZ). In May and June, the stock will slowly move northwest to waters outside the Falkland Islands' EEZ. The operation model of the UoA vessels follows the migration of this target species; that is, the UoA vessels depart Taiwan around December/January to the fishing ground in the Southwest Atlantic Ocean and conduct fishing activities in the allowed areas (Figure 1) promulgated by the Falkland Islands from February to June, and is subject to adjust considering vessel operation and fishing condition. Normally, vessels participating in the fishery will leave the fishing ground in May or June and arrive at Taiwan in June or July.

Falkland Conservation Zones
 Valid Fishing Areas: Licence Category B (Illex)
 15-Feb to 15-June

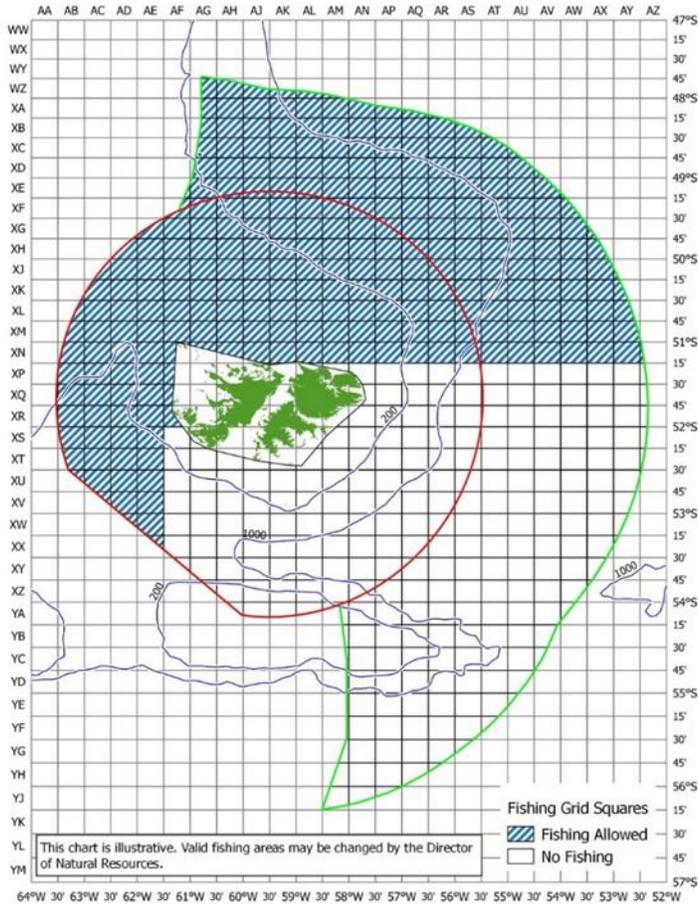


Figure 1. Fishing area allowed by the Falkland Islands

While there are various fishing methods to capture squids or cephalopods, including handline fishing, trolling, trawling and drift gillnets, these UoA vessels use automatic squid-jigging machines to harvest squid, which utilizes the diel vertical migration of squids and their phototaxis-positive characteristic. Such fishing gear is mainly used by large vessels. In general, a sea anchor is installed at the stern of the vessel, a spanker at the bow, and a row of fishing lights and automatic squid-jigging machines at the starboard and port side. The squid-jigging operation takes place after sun set, where the vessel master will have the vessel's main engine stalled. The sea anchor will then be tossed into sea, the spanker will be set to stabilize the hull, and the fishing lights will be turned on to gather squids. When a great number of squids is attracted by the lights and comes close to the vessel at night, the squid-jigging machines will start operating till early morning next day. The automatic squid-jigging machine is composed of a pair of jigging reels, jigging lines, and a control board. The length of the jigging lines is around 75 meters, and a barbless lure is attached to the line at 0.75-meter interval. That is, approximately 12~40 barbless lures are on one fishing line. The fishing lines are tossed along the rollers that are fixed on the bulwark into seas, attracting squids to

the lures. Squids that are attracted to the lures and get hooked will then fall off the barbless lures onto a steel frame covered with wire mesh netting as the fishing lines are hulled.

The Argentine shortfin squid Fishery in Southwest Atlantic Oceans was once managed by the South Atlantic Fisheries Commission (SAFC), which is a bilateral commission established by the United Kingdom and Argentina. The Commission used to conduct scientific researches based on the information provided by its members, and set a catch limit of the squid based on the assessment result. However, relevant joint scientific research projects came to a halt after Argentina’s withdrawal from the Commission, making it no longer possible to obtain basic scientific information of the species to form a management decision. This fishery therefore is not managed by any organization.

Unit of Assessment (UoA)

For the purpose of this assessment, the Units of Assessments (UoAs) are identified based on main target species harvested by distant water squid-jigging vessels.

UoA	Description
Target species (common and scientific name)	Argentine shortfin squid (<i>Illex argentinus</i>)
Stock	Atlantic squids
Geographical area	Southwest Atlantic Oceans and the Falkland Islands’ EEZ
Fishing method or gear type	Jigging
Fishing fleet, group of vessels, or individuals fishing operators harvesting the stock	Taiwanese-flagged distant water squid-jigging vessels

Illex argentinus, commonly known as the Argentine shortfin squid, is a species of squid in the class of *Cephalopoda*, the order of *Teuthida*, the suborder of *Oegopina*, the family *Ommastrephidae*, and the Genus *Illex*. The mantle of Argentine shortfin squid is elongate and rhomboidal (Graph 2), and the fin muscular at their tail end are broad and short. The length of the fins is around one thirds of mantle length and the width of the fins is about half of the mantle length. Argentine shortfin squid have 10 tentacles, two among of which are tentacular clubs. In the center of tentacular clubs there are four rows of suckers, and two rows of them are extra-large. Argentine shortfin squid has a short lifespan of around one year, and is semelparous (Hatanaka, 1986; Rodhouse and Hatfield, 1990). Argentine shortfin squids are benthos, dwelling on the ocean floor once they reach maturity. They show the diel vertical migration pattern, rising to water of 25 to 40 meters depth at night to ingest, and migrate to the bottom of the sea during the day (Jerb and Roper., 2010). Argentine shortfin squids feed on amphipoda, krill and other large zooplankton, and also ingest myctophidae and squid of the same kind, but itself is also one of the main bait for cod.



Figure 2. Argentine shortfin squid (*Illex argentinus*), from <http://www.fifca.co.fk/products/illex-squid>

Argentine shortfin squid distributes along the coast of the Southwest Atlantic from 23°S to 55°S, including southern Brazil, Uruguay, Argentina, Falkland Islands, the continental shelf and the upper slope of the margin at the southern tip of South America (Figure 3). The complex of Argentine shortfin squid is categorized into four separate units according to their spawning period and location, feeding ground, and body type when reaching maturity: the summer spawning group (SSG), the spring spawning group (SpSG) (Crespi-Abril et al., 2008), the winter spawning continental slope group that is comprised of the south Patagonian stock (SPS) (Laptikhovsky et al., 2001; Middleton and Arkhipkin, 2001), and the winter spawning shelf group, composed of the Bonaerensis-north Patagonian stock (BNPS). Considering the fishing period and location of the UoA, juvenile and subadult squid of the BNPS are presumably be targeted (Chen et al., 2007; Sacau et al., 2005).



Figure 3. Distribution of Argentine shortfin squid

Status of Target Stock- Principle 1

Principle 1 considers the status of the target stock(s) and whether harvest is being conducted in a manner that does not lead to overfishing or depletion of the exploited populations.

Stock status outcome (1.1.1)

Scoring category	80+
------------------	-----

Rationale:

Given that Argentine shortfin squid lives for one year and usually die soon after spawning, the yearly biomass is basically recruitment, which is unlike ray-finned fishes that would have overlapped age groups. As a result, nowadays depletion estimates are often used to conduct stock assessment for squids.

Since Argentine shortfin squid is one of crucial resources of the Falkland Islands, the Falkland Islands Fisheries Department conducts researches on this species regularly and the most recent stock assessment report was published in October, 2019. In such assessment catch/effort data of commercial jigging and trawling fisheries licensed by Argentina and the Falkland Islands, and a recruitment survey biomass estimate taken in February, 2019 were used. Therefore, this stock assessment is occupied predominantly by the winter-spawning stock.

According to the research report, data collected by trawlers showed the biomass estimate of Argentine shortfin squid was 159,361.9 tons while that of the winter-spawning stock was 145,369 tons. The 95% confidence intervals from the bootstrap algorithm were: 62,309.2 tons to 279,733.4 tons for the Argentine shortfin squid, and 62,621.0 tons to 278,535.9 tons for winter-spawning biomass. The total biomass estimate (159,361.9 tons) was not significant different from the biomass estimate (132,876 tons) presented by the Instituto Nacional de Investigación y Desarrollo Pesquero, INIDEP (SSC 2019). According to the commercial effort data, the CPUE of jigging fisheries started high at the beginning of the year, averaging 34.4 tons / vessel-day through the first 6 weeks, then decreasing rapidly (Figure 4). The resulting maximum likelihood estimate biomass of Argentine shortfin squid in the survey area decreased from 263,440 tons in week 1 to 57,022 tons in week 22 (Figure 5).

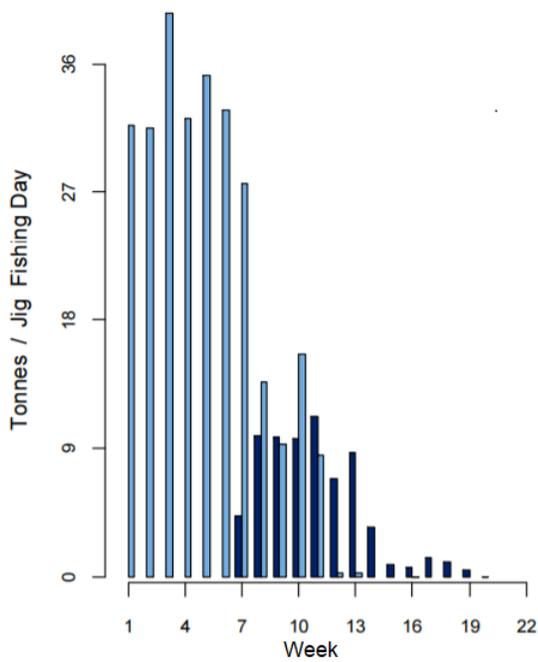


Figure 4. Total catches per day in the jig fisheries (light blue: Argentina, dark blue: the Falkland Islands)

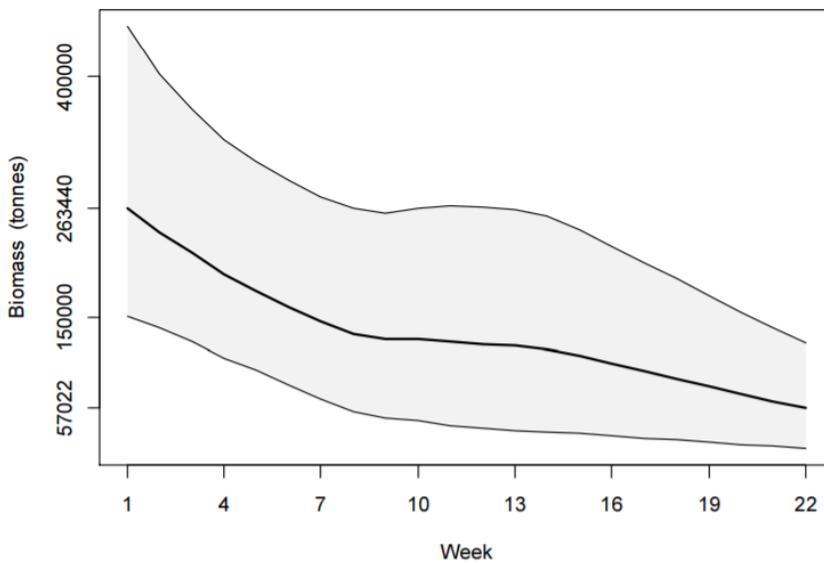


Figure 5. Estimated Argentina shortfin squid time series in the survey area in 2019.

Beddington et al. (1990) proposed a management target of 40% proportional escapement Argentine shortfin squid, following convention in other squid fisheries. The management target was subsequently set to an escapement threshold of 40,000 tons (Barton et al. 2004). The initial biomass estimate in previous research result was 263,440 tons while the catch in Argentina and the Falkland

Islands in 2019 was 134, 468 tons. The percentage of escapement was roughly 49%, suggesting potential stock is in good condition. However, it is worth noted that such research only examined data in the surveyed area while the species spans from Brazil, Uruguay, Argentina, the Falkland Islands to high seas. As a result, there is still an uncertainty.

Given the short life history and high productivity of Argentine shortfin squid, it is categorized as species of least concern. Having said that, such characteristics also make Argentine shortfin squid vulnerable to environment and harvest pressure. The following is the analysis of Argentine shortfin squid and fisheries characteristics using Productivity-Susceptibility Analysis (PSA) method. The PSA score for the species is 2.68 (detailed scoring is shown below, Table 1). According to the scoring guidelines, species scored 2.64~3.18 is deemed as having a “Medium Vulnerability.”

Table 1. PSA detailed scoring of Argentine shortfin squid

Productivity	Relevant Information	Score (1=low risk, 2=medium risk, 3=high risk)
Average age at maturity	<1 year (Barratt and Allcock 2014)	1
Average max age	1 year (Haimovici et al. 1998)	1
Fecundity	750,000 eggs (Laptikhovsky and Nigmatullin 1993)	1
Average max size		N/A
Average size at maturity		N/A
Reproductive strategy	Pelagic spawner (Leta 1992)	1
Trophic level	3.8 (Belleggia et al. 2014)	2
Density dependence (invertebrates only)	None	2
Susceptibility Attribute	Relevant Information	Score (1=low risk, 2=medium risk, 3=high risk)
Areal overlap (Considers all fisheries)	High overlap	3
Vertical overlap (Considers all fisheries)	High overlap	3
Selectivity of the fishery (Specific to fishery under assessment)	Given the fishing period and the location of the UoA, where the majority of the squids reach their maturity after March, and that the UoA uses squid-jigging as fishing gear and barbless lures as fishing method, 95% of their catch is squids with mental length above 23 cm, and few juvenile	2

	squids will be caught in February (Sacau et al.,2005; Haimovici et al, 1998; statistics from the Falkland Islands Fisheries Department, 2020).	
Post capture mortality	Retained	3
Scoring Guidelines		
Productivity score (P)= average of the productivity attribute scores (p1, p2, p3, p4 (finfish only), p5 (finfish only), p6, p7, and p8 (invertebrates only));		
Susceptibility score (S) = $[(S1*S2*S3*S4)-1/40]+1$;		
Vulnerability score (V)= $\sqrt{(P^2 + S^2)}$.		

To sum up, since Argentine shortfin squids are considered having a medium vulnerability and some data showed the stock status in in good health and no conflicted information is found, this PI is scored above 80.

Stock rebuilding (1.1.2)

Scoring category	N/A
------------------	-----

Rationale:

Since the stock status of the Southwest Atlantic Argentine shortfin squid (1.1.1) is scored above 80, this PI can be skipped.

Harvest control strategy (1.2.1)

Scoring category	40-59
------------------	-------

Rationale:

Since the Southwest Atlantic Argentine shortfin squid currently is not managed by any regional fisheries management organizations, there is a lack of relevant stock assessment and management measures at the regional level. In terms of country-level management, the Falkland Islands has a certain degree of management of Argentine shortfin squid, including issuing fishing licenses annually, restricting fishing areas and restricting fishing periods. It also stipulates that licensed fishing vessels must daily report their catch during the authorization fishing period to monitor their

catch. In addition, the Falkland Islands Fisheries Department will conduct research and assessment on the stock of Argentine shortfin squid. Given that Argentine shortfin squid is in good condition as derived from its latest stock assessment, the Falkland Islands has not yet established any harvest control rules for this fishery.

In general, harvest control strategy shall include monitoring, stock assessment, harvest control rules or a scientific-based harvest control mechanism, and etc. While there is evidence showing that stock of Argentine shortfin squid seems not be seriously impacted by the fishery in the Falkland Islands currently, considering neither a biological reference point, limit reference point nor further control rules for the resources is established, this PI is scored as Red Level (40~59).

Harvest control rules (1.2.2)

Scoring category	20-39
------------------	-------

Rationale:

Pursuant to the Fisheries (Conservation and Management) Ordinance 2005 of the Falkland Islands, the Director of Fisheries may establish Individual Transferable Quota (ITQ) in the Argentine shortfin squid fishery. Currently, no ITQ system is introduced in the fishery according to the website of the Falkland Islands Fisheries Department. Having said that, the Falkland Islands manages the Argentine shortfin squid through the issuance of fishing license (License Type B, applicable to the Argentine shortfin squid fishery and the Sevenstar flying squid fishery). Every year only licensed fishing vessels are permitted to operate in the permitted area within the permitted period. Fishing vessels with License Type B shall comply with relevant provisions specified on the license, including operating in the permitted area within the permitted period (from February 15 to June 15 every year), ensuring fishers wearing appropriate safety equipment, prohibiting the use of baited lures, and not capturing, harming or cause death of seabirds. Moreover, in order to monitor the fishery, licensed fishing vessels shall daily report their catch. However, as mentioned before, since the SAFC is not operating now, no further scientific research on this stock is conducted as a basis of scientific management.

In conclusion, despite there is effort control (issuance of fishing license) in place, the fishery lacks regulations to limit the mortality of the target species; given that no HCR is established for Argentine shortfin squid, this PI is scored as Red Level (20~39).

Harvest strategy information and monitoring (1.2.3)

Scoring category	80
------------------	----

Rationale:

The Taiwan Fisheries Agency and the Falkland Islands Fisheries Department collect information on this species respectively. The Taiwan Fisheries Agency requires distant water fishing vessels engaging in squid fisheries to obtain fishing license and daily report their catch data through the electronic logbook system designated by the competent authority. Other information required to be reported includes vessel name, CT number, skipper name, fishing start date and position (latitude and longitude), fishing end date and position (latitude and longitude), sea surface temperature, gear type used, number of jigs per line; total operating fishing light power, total catch by different specifications (different sizes, carcass and head), bycatch information (whether there is bycatch and the handling of such), and discard quantity. In the Falkland Islands, licensed fishing vessels are obliged to daily report their catch during the permitted fishing period. The Falkland Islands Fisheries Department will compile information on catch and vessel composition regularly publish the fishery report on its website. In addition, the Fisheries Department also has a research team established to collect information and conduct research on the stock structure and productivity of Argentine shortfin squid. Considering there is sufficient information and monitor system for the fishery, this PI is thus scored as Green Level (80+).

Assessment of stock status (1.2.4)

Scoring category	80
------------------	----

Rationale:

According to the MSC Fisheries Standard version 2.0 published by the Marine Stewardship Council, if PI 1.1.1 is assessed using the Risk Based Framework, the default score of this PI is 80. Additionally, since the stock is in good health according to the stock assessment result in 2019 conducted by the Falkland Islands Fisheries Department, this PI is scored as Green Level (80+).

Ecosystem Impacts- Principle 2

Principle 2 considers the impacts of the UoAs on the ecosystem, including the impacts on other species, habitats, and key ecosystem components.

Background

Considering the fishing gears used in this fishery are automatic squid-jigging machines, a highly selective gear type, and only fishing lights instead of baited lures are used to attract the target species, the possibility to bycatch other species is rather low. Logbooks provided by fishers were also examined, where bycatch record was not found. In order to understand the actual situation, onsite interviews with fishers were held. Interviewed fisheries suggested that bycatch rarely occurred during their operation, reconfirming the hypothesis about the high selectivity of the gear. Therefore, it is deduced that there is neither primary nor secondary species in the fishery. Furthermore, according to the Environmental Rapid Assessment Tool (version 2.0) provided by the FisheryProgress, gear types including harpoons, jig fishing are proved to have little or no bycatch associated with them and could be considered as exempt gears, suggesting such gears is not likely to have bycatch or have impacts on the ecosystem.

Table 2. Principle 2 species classification

Common name and scientific name of the species	Annual catch caught by UoA	UoA catch %	Classification
Argentine shortfin squid (<i>Illex argentinus</i>)	Around 70,459 tons (2021)	100%	Target species

Primary/secondary species outcome (2.1.1 & 2.2.1)

Scoring category	80
------------------	----

Rationale:

As stated in the background paragraph under Principle 2, there is unlikely to have primary or secondary species in this fishery. Under such circumstances, this PI is scored as Green Level (80+) by default.

Primary/secondary species management (2.1.2 & 2.2.2)

Scoring category	80
------------------	----

Rationale:

As stated in the background paragraph under Principle 2, under the circumstances where there is neither primary nor secondary species in this fishery, no measures or strategies are needed to reduce bycatch; moreover, as no bycatch on shark occurred in the fishery, there will be no shark finning. Consequently, this PI is scored as Green Level (80+) by default.

Primary/secondary species information (2.1.3 & 2.2.3)

Scoring category	80
------------------	----

Rationale:

While this fishery is unlikely to bycatch other species and no management strategy is implemented for other species, fishing vessels engaging in the fishery are obliged to report their catch and bycatch (if any) via logbooks, from which the Taiwan Fisheries Agency and the Falkland Islands Fisheries Department will be notified. As a result, it can be said that there is appropriate information supporting strategies to be formulated. This PI is scored as Green Level (80+) by default consequently.

ETP species outcome (2.3.1)

Scoring category	80
------------------	----

Rationale:

No record on direct interaction with any ETP species were found while examining the logbooks provided by the UoAs; however, during the interviews with fishers, fishers noted the possibility of bycatching seabirds and fur seals in their fishing activities. Such incidents occurred when groups of squid are attracted by the fishing lights and those animals came close to eat squids. Sometimes when the visibility was poor, sea birds or fur seals were consequently caught as they ate squids that were hooked. However, such incidents were very rare and whenever bycatch on seabirds or fur seals were discovered, fishers would release those animals to the sea in a timely manner. In addition, according to the 2018 observer report on the interaction between seabirds and squid-jigging vessels published by the Falkland Islands, some fishers would feed seabirds with squid guts, and

such behavior sometimes led to seabirds being accidentally entangled with fishing lines while scrambling for food. Observations of a few observers also suggest that seabirds may collide with each other or collide with the vessel due to the influence of fishing lights used in the operation. In general, there is few interactions between seabirds and fishing vessels. Therefore, it can be deduced that this fishery does not create irreversible impacts on such animals. However, the report also mentioned that considering the monitoring of seabirds in the past decade was not systematic, more strategic data collection methods may be required to reach a more reliable conclusion.

Regarding the indirect impact this UoA may cause, as the species targeted by this UoA is considered in good status, it is deduced that this fishery is unlikely to impact other competing species. Moreover, on one hand, as stipulated in Article 46 of the Regulations for Fishing Vessels Conducting Squid Jigging Fishery, Taiwanese fishing vessels are prohibited to dispose any type of plastic trash or discharge any oil on the sea; on the other hand, the Falkland Islands complies with the International Maritime Organization (IMO) concerning marine pollution. Give from the above, it is deduced that this UoA does not cause much marine pollution that would lead to habitat destruction. Therefore, this PI is scored as Green Level (80+).

ETP species management (2.3.2)

Scoring category	60~79
------------------	-------

Rationale:

The fishing gear (automatic jigging machine) and the fishing method (using unbaited lures and operating at night) used by the UoA can be considered a management strategy in a broader sense. In addition to the Marine Mammals Ordinance 1992 promulgated by the Falkland Islands, where harvesting or killing marine mammals in the Falkland Islands’ territorial waters and fishing areas is prohibited; the fishing license issued by the Falkland Islands also specifies that any capture, harm or killing of seabirds or marine mammals is banned in the Falkland Islands. The Wildlife Conservation Act enacted by Taiwan prohibits, in Article 16, the protected wildlife from being disturbed, abused, hunted, killed, traded, exhibited, displayed, owned, imported, exported, raised, bred, and processed; Article 20 of the Regulations for Fishing Vessels Conducting Squid Jigging Fishery also stipulate that any salmon, trout, sea turtle, seabird, whale shark, cetacean, penguin or other prohibited species promulgated by the competent authority incidentally caught by any squid jigging fishing vessel shall be released when caught alive or discarded dead. Moreover, according to the research report released by the Falkland Islands Fisheries Department, there is no frequent interaction between the fishery the UoA engages in ETP species. Therefore, objectively speaking, such strategy can be considered effective. Considering the measures in place currently are not under regular review to examine their effectiveness or enforcement, this PI is scored as Yellow Level (60~79).

ETP species information (2.3.3)

Scoring category	60~79
------------------	-------

Rationale:

As stated in the rationale paragraph of the ETP species outcome (2.3.1) section, the UoA vessels only report via logbook system. No observer is sent onboard squid-jigging vessels from Taiwan's side currently. However, the Falkland Islands will send observers onboard licensed fishing vessels to collect information if considered necessary. Therefore, while a logbook system is currently in place to collect information, considering that Taiwan has not yet deployed observers onboard this UoA vessels, and that the observer data of the Falkland Islands is not collected in a systematic manner, it is deducted that such information may not be sufficient to evaluate the effectiveness of management strategies. This PI is scored as Yellow Level (60-79).

Habitats outcome (2.4.1)

Scoring category	80
------------------	----

Rationale:

The UoA operates in the Falkland Islands' economic waters and the nearby high seas, within the Patagonia continental shelf. Extending from Argentina, Uruguay, and all the way to southeastern Brazil (23°S to 55°S latitude), the Patagonia continental shelf (south of 40°S latitude) is part of the South American continental shelf. A continental shelf is the edge of a continent lying beneath the ocean, where alluvial soil washed off by rivers on land accumulates, and its depth can be 200 meters deep at most, making it sufficient in nutrients and with high level of productivity. And the Patagonia continental shelf is one of the more fertile one in the temperate marine ecosystem.

The fishing gear used by the UoA is automatic squid-jigging machines. According to the information collected through the logbook system, the UoA mostly operates in the Falkland Islands' EEZ waters shallower than 150 meters. The closer the vessel is to the land, the shallower (around 100 meters) the fishing depth is, and vice versa. That being said, the fishing depth never exceed 150 meters. Since the operation takes place in epilimnion, it is not likely to create threat or irreversible harms to the seabed or the ecosystem (see Figure 1 for fishing depth). Arkhipkin et al also mentioned in their thesis published in 2015 that the impact of squid-jigging fishery is limited to pelagic habitats and will not come into contact with bottom or benthic habitats. Therefore, this PI is scored as Green Level (80+).

Habitats management (2.4.2)

Scoring category	80
------------------	----

Rationale:

As stated in the rationale paragraph of the habitats outcome (2.4.1) section, the fishing gear used in this fishery is automatic squid-jigging machine, which operates at mid-depth or to the surface of water. This fishing method itself can be seen as a management strategy. Given that such method will not have direct interaction with the habitats, this strategy can almost ensure the fishery does not create serious or irreversible impact to marine ecosystem or vulnerable marine ecosystem (VME). This PI is scored as Green Level (80+).

Habitats information (2.4.3)

Scoring category	80
------------------	----

Rationale:

As stated in the rationale paragraph of the habitats outcome (2.4.1) section, there is sufficient information to presume that the UoA fishery does not directly impact the habitats. As for issue of ghost fishing gear, according to fishers, under normal circumstances, it is rare for their fishing gear to break; however, when the wave current is too fast, it is likely that adjacent fishing lines will tangle. In that case, it must be cleared by manpower. If it is not cleared in time, the protection device will be triggered to stop the operation of the jigging machine. Therefore, it is unlikely for the fishing gear to fall into the sea, suggesting its little impact on the habitat. Additionally, as required by the flag state (Taiwan), vessel monitoring system (VMS) is installed onboard the UoA vessels, where fishing area and vessel dynamics can be monitored. With the VMS, sufficient and reliable information on the operation duration and the location of the fishing gear and its interaction with the habitats can be obtained. As fishing activities is also under continuous monitoring through the system, habitat risk can be assessed as well. This PI is consequently scored as Green Level (80+).

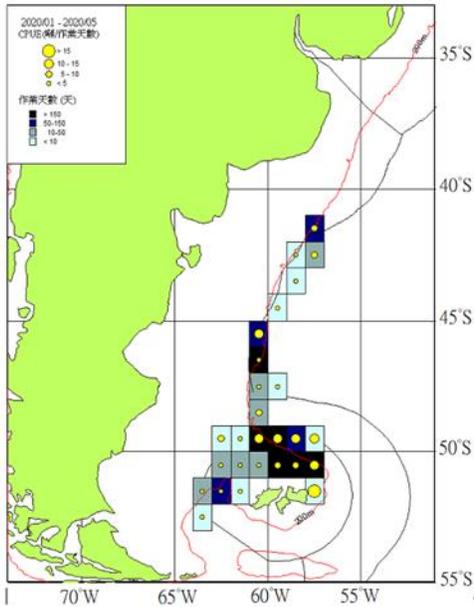


Figure 6. Distribution of fishing days and CPUE (ton/day/vessel) of the Southwest Atlantic Argentine shortfin squid Fishery from January to May, 2020

Ecosystem outcome (2.5.1)

Scoring category	80
------------------	----

Rationale:

In addition to being a major predator on the Patagonia continental shelf harvesting mid-water fish, other squids and crustacean, Argentine shortfin squid is also a prey for marine mammals, fish and seabirds (Rosas-Luis et al., 2014). Argentine shortfin squid is an annual species which reaches sexual maturity within one year. They are pretty prolific-a typical egg count can be up to 750,000-and they spawn year-round (Crespi-Abril and Baron, 2012). Those eggs may be carried by ocean currents to various regions (Haimovici et al., 1998).

It is generally known that the abundance of the Argentine shortfin squid population is easily affected by its spawning group and surrounding environment (such as the Falkland Current and the Brazilian Current, etc.). There is also evidence implicating its recruitment is influenced by the Southern Oscillation Index (SOI) and other main environmental variables (Waluda et al., 2001).

Generally speaking, if a critical component in the ecosystem is severely threatened, it is likely to cause serious or irreversible impact to the structure and function of the ecosystem. As mentioned,

Argentine shortfin squid is both a predator and a prey in the ecosystem, which suggests that the species is an important element in the ecosystem. As a result, if its population is disturbed, it will likely to affect the entire ecosystem. However, at present, according to some assessment reports, Argentine shortfin squid stock is still in good condition, and there is also other evidence that the recruitment of Argentine shortfin squid and the body length of its mature squids have not been affected by the increase in fishery exploitation rate (Arkhipkin et al., 2021). Therefore, according to the available information, the Argentine shortfin squid, which is a key species of this ecosystem, has not been seriously and irreversibly impacted (whether by the fishery or the environment). It can be deduced that the UoA is highly unlikely to disrupt the key ecosystem elements to a point where there would be a serious or irreversible harm. Therefore, this PI score is scored as Green Level (80+).

Ecosystem management (2.5.2)

Scoring category	80
------------------	----

Rationale:

Fisheries interact with the ecosystem. On one hand, the fishery may directly or indirectly impact the ecosystem, such as the damage fishing gears bring to the ecosystem, bycatch of the ETP species, overfishing the target species and its impact on the target species' predators. On the other hands, changes in ecosystem may also be caused by climate change or human factors, which may in turn affect the fishery within.

The Falkland Islands has a certain degree of management over the Argentine shortfin squid, including issuing fishing license annually, restricting fishing areas and fishing period, and requiring licensed fishing vessels to daily report their catches during the permitted fishing period to monitor the fishery. Other management measures encompass prohibiting the use of baited lures and banning the harvest, harm or causing death of seabirds. Taiwan also has relevant management on the squid-jigging fishery, including license permission for fishery operation, restricted fishing area, monitoring of vessel position, and catch reporting. The mentioned measures suggest there are some management strategies in place and are properly implemented. It is consequently deduced that the UoA implemented, so it is speculated that this UoA is highly unlikely to disrupt the key ecosystem elements to a point where there would be a serious or irreversible harm. Therefore, this PI score is scored as Green Level (80+).

Ecosystem information (2.5.3)

Scoring category	80
------------------	----

Rationale:

According to the rationale paragraph of the the ecosystem outcome (2.5.1) section, currently there is sufficient information to identify the key ecosystem elements, and from the available information the main impact the UoA fishery has on the key ecosystem elements can be deduced. In addition, as per the scientific plan of the Falkland Islands Fisheries Department for 2021~2023, relevant research and surveys are proposed to be conducted; as a result, it is deduced that relevant information will continue be collected to examine any increase in risk level. This PI is scored as Green Level (80+).

Management System- Principle 3

Principle 3 focuses on whether there is an institutional and operational framework appropriate to the size and scale of the UoA(s) for implementing Principles 1 and 2, capable of delivering sustainable fisheries.

The UoA is composed of a number of [57] squid-jigging fishing vessels flagged to Taiwan, which is mainly governed by their flag state; however, due to the operation situation of the fishery, in addition to fishing on high seas of the Southwest Atlantic Ocean, the UoA vessels also operate in the Falkland Islands' EEZ. Under such case, when the vessels are granted fishing license from the Falkland Islands and are operating in the Falkland Islands' EEZ, they are obliged to comply with the regulations adopted by the Falkland Islands.

Legal and/or customary framework (3.1.1)

Scoring category	80
------------------	----

Rationale:

Taiwan

Taiwanese flagged fishing vessels are governed by the Fisheries Agency under the Council of Agriculture, Executive Yuan. The Fisheries Act amended and promulgated in 2018 and the Act for Distant Water Fisheries promulgated in 2016 are the two legal instruments for management Taiwanese fishing fleet, which are publicly available. The former is enacted to conserve and rationally utilize aquatic resources , to increase fisheries productivity, to promote sound fisheries development, to guide and assist the recreational fishery, to maintain the orderly operation of the fisheries, and to improve the livelihood of fishermen while the latter requires the competent authority to ensure relevant management taking precautionary principle and ecosystem approach into consideration and are based on best available scientific evidence. Taiwan has an effective legal system and, when necessary, the government will cooperate with other parties in an organized and effective manner to ensure manage the stock and reduce the impacts of fisheries on species, habitats or ecosystems.

In addition, pursuant to Article 154 of the Administrative Procedure Act, when formulating a legal order, the administrative authority shall cause it to be publicly announced in a government gazette or newspaper, and any person may give the designated authority his/her opinions within the specified period. Accordingly, any stakeholder can participate in the formulation of relevant laws

and regulations and resolve concerned disputes in a transparent manner through such mechanism. Chapter 7 of the Fisheries Act and in Chapter 4 the Act for Distant Water Fisheries also specify relevant violations and their corresponding punishments to resolve any disputes arise.

Furthermore, to protect the rights of fishers who are subsisting on fisheries, according to Article 30 of the Act for Distant Water Fisheries, when drawing up the distant water fisheries development plan, the competent authority shall take into account the fisheries production, livelihood of fishermen, and marine ecology.

Falkland Islands

The Falkland Islands is a British overseas territory. Under the 2009 Constitution, the islands have full internal self-government; the UK is responsible for foreign and defense affairs. The islands' chief executive is exercised on the behalf of the monarch of the United Kingdom, who acts on the advice of the islands' Executive Council. The Executive Council of the Falkland Islands is composed of the chief executive, the Director of Finance and three elected members of the Legislative Assembly, with the governor as chairman. The Legislative Assembly of the islands is a unicameral legislature, consisting of the chief executive, the director of finance and eight members elected by universal suffrage. The fisheries around the Falkland Islands are managed by the Falkland Islands Fisheries Department (FIFD), which cover activities within its internal waters, territorial waters, the Falkland Islands Interim Conservation and Management Zone (FICZ) that is established in 1987, the Falkland Islands Outer Conservation Zone (FOCZ) declared in 1991, and other areas in which the Falkland Islands claim it has the exclusive right to fish or manage the fisheries by a declaration, law or convention in force at the time. The Fisheries (Conservation and Management) Ordinance 2005 of the Falkland Islands is the main legal instrument for managing fisheries, whose purpose is to regulate the resources utilization of the Falkland Islands while ensuring sustainability and assist the Falkland Islands in complying with international obligations relating to the management of fishing, fishing vessels and resource conservation applicable to the Falkland Islands. The Act also requests the FIFD to manage fisheries efficiently and effectively based on fisheries research and monitoring. It is understood that in order to strengthen the management of fishery resources and minimize the impact of fisheries on the ecosystem, the FIFD has formulated a comprehensive plan to collect relevant data through its research vessels and observers.

The Fisheries (Conservation and Management) Ordinance 2005 not only specifies the possible punishments for violations of the Ordinance but also establishes a transparent dispute resolution mechanism in Chapter V. Such mechanism has been proved to be able to respond quickly when dealing with the compliance issue of incidental take of seabirds by a fishing vessel targeting toothfish in 2005, so it is deduced that this mechanism can also be applied to other fisheries, including this UoA.

The fisheries management system of the Falkland Islands is established based on the Individually Transferable Quotas system applicable during the permitted fishing period under section 17E of the Fisheries (Conservation Management) Regulations 2005. To better exercise this system, the Fisheries (Action Plan) Regulations 2021 is also enacted, which sets out a commitment to respect the legal and customary rights of local people who depend on fishing for their livelihoods.

In view of the above, this PI is scored as Green Level (80+).

Consultation, roles, and responsibilities (3.1.2)

Scoring category	80
------------------	----

Rationale:

Taiwan

At present, the Fisheries Agency under the Council of Agriculture, Executive Yuan, is the competent authority of fisheries management in Taiwan. The Fisheries Agency is divided into different divisions in charge of different duties, among which, Deep Sea Fisheries Division is responsible for affairs of distant water fisheries, including planning and implementing international fisheries collaboration, participation of international fisheries organizations, promoting and implementing relevant policies and regulations of distant water fisheries, formulating policies on distant water fisheries, participation of international trade/economic organizations, planning and coordinating fisheries observer program, and marine conservation.

In Taiwan, the operation of fisheries management systems and policies depends on the coordination and cooperation among government agencies, stakeholders, and external organizations. Parties that closely cooperated with the fisheries competent authority include the Coast Guard Administration, responsible for providing the security of Taiwan's territorial waters; the Overseas Fisheries Development Council (OFDC), which assists fishers and the government in processing fisheries data and statistics and handling international fishery-related affairs; and fisheries associations that assist vessel operators in fishing operation, such as the Taiwan Tuna Association (TTA), the Taiwan Tuna Purse Seiners Association (TTPAS), and the Taiwan Squid and Saury Fisheries Association. It is understood that prior to attending any meetings of international fisheries organizations, the Fisheries Agency will convene meetings with concerned fishery association, fishery group, scholars and the OFDC to discuss relevant fisheries issues, enabling interested and impacted parties to

express their opinions. In addition, pursuant to Article 154 of the Administrative Procedure Act, when formulating a legal order, the administrative authority shall cause it to be publicly announced in a government gazette or newspaper, and any person may give the designated authority his/her opinions within the specified period. Considering the above assessment on governance, this PI is scored as Green Level (80+).

Falkland Islands

Fisheries of the Falkland Islands are managed by relevant authority/organizations, providing the opportunity for stakeholders to engage, provide scientific advice, and officially review management actions. Such organizations not only consist of those mentioned in the Fisheries (Conservation Management) Regulations 2005, such as the Fisheries Advisory Committee, providing advice to the Director of Fisheries Department; and the Falkland Islands Fishing Companies Association (FIFCA), building connection with all other local agencies and organizations that may collaborate; but also include the Legislative, mentioned in, the Assembly, involving in the process of providing advice on fisheries, the Executive Council, responsible for reviewing fisheries policy; and the Environmental Committee, monitoring and managing environmental affairs of the Falkland Islands. Therefore, the roles, functions and responsibilities of organizations or individuals in the management system have been clearly defined.

In terms of the management system, as stipulated in Article 12 of the Fisheries (Conservation Management) Regulations 2005, the Director shall, except in a case of urgency, so far as is reasonably practicable consult with the Committee and such persons or organizations within the Falkland Islands as the Director considers it desirable to consult who are representative of persons having an interest in the stock or the effects of fishing on the marine environment and environmental interests before setting or varying any sustainability measure. Notification on open to consultation will be made available on communiqué of the Falkland Islands. Additionally, the Ordinance also specify that the Director shall, as soon as practicable, publish the reasons for his decision after setting or varying any sustainability measure. In view of the above, this PI is scored as Green Level (80+).

Long-term objectives (3.1.3)

Scoring category	80
------------------	----

Rationale:

Taiwan

As specified in Article 1 of the Act for Distant Water Fisheries, the long-term objective of fisheries management is to ensure the conservation of marine fisheries resources, strengthen distant water fisheries management, curb illegal, unreported, and unregulated (hereinafter referred to as IUU) fishing, and improve traceability of catches and fisheries products, so as to promote the sustainable operation of distant water fisheries. Article 5 of the Act also stipulated that the competent authority shall, taking reference with international conventions, treaties, agreements and conservation and management measures, draw up and promulgate national plans of actions on the following matters with the pre-cautionary principle, ecosystem-based approach and the best available scientific advice:

- (1) Conservation, management, utilization and maintenance of maximum sustainable yield (MSY) of marine fisheries resources.
- (2) Measures in response to the change of marine fisheries resources and marine ecosystem.
- (3) Goals for sustainable operation, development strategies and implementing steps for distant water fisheries.
- (4) Measures to balance the fishing capacity and the marine fisheries resources.
- (5) Measures to guide, assist and subsidize the distant water fisheries operators, distant water fisheries employees and the industry related to distant water fisheries in response to the structure adjustment of the distant water fisheries.
- (6) Establishment of a system of supervision and management of distant water fisheries and training of human resources.
- (7) Training of human resources for the distant water fisheries and development of relevant technologies and equipment.
- (8) Cooperation with other countries and international fisheries organizations.
- (9) Prevention, deterrence and elimination of IUU fishing.
- (10) Other matters necessary for effective control and management of distant water fisheries.

Accordingly, it is explicit that there are clear long-term aims in the management policy. This PI is therefore scored as Green Level (80+).

Falkland Islands

Article 8, 9, 10, 11 and 13 specify the purposes of the Fisheries (Conservation Management) Regulations 2005, which include providing for the utilization of the fisheries resources of the Falkland Islands while ensuring sustainability, maintaining associated or dependent species at or above a level that ensures their long term viability, maintaining biological diversity of the marine environment, and protecting habitats of particular significance for fisheries management. In addition, decision making should base on the best information available, consider the uncertainty of the available information, and be cautious when information is uncertain, unreliable and inappropriate. Article 6 also requires the Executive Council to review the policy at least once in

every successive period of twelve months to ensure the effective implementation of the management policy. Therefore, there is a clear management purpose specified in management policy. This PI is scored as Green Level (80+).

Fishery-specific objectives (3.2.1)

Scoring category	80
------------------	----

Rationale:

Taiwan

As mentioned previously, it is specified in Article 5 of the Act for Distant Water Fisheries that the Fisheries Agency shall apply pre-cautionary principle, ecosystem based approach and the best available scientific advice to formulate relevant national action plan, such as the Taiwan's National Plan of Action for the Management of Fishing Capacity (NPOA-Capacity). The purpose of the NPOA-Capacity is to ensure that fisheries resources can be utilized in a sustainable manner and reduce Taiwan's overcapacity in fishery to fulfill the purpose of sustainable resource utilization. The NOPA enacts managements of different fishery types. For the management of squid-jigging fishery, in addition to the provisions of the Regulations for Fishing Vessels Conducting Squid Jigging Fishery, monitoring, control and surveillance measures are also implemented in the fishery. As per the Regulations for Fishing Vessels Conducting Squid Jigging Fishery, distant water squid-jigging fishing vessels shall obtain the permit beforehand and in the event when any squid jigging fishing vessel leaves a port, its captain shall daily report catch data through the E-logbook system for verification. Additionally, such vessels are obliged to release or discard species incidentally caught by squid-jigging fishing vessels, including any salmon, trout, sea turtle, seabird, whale shark, cetacean, penguin, any fish species of no economic value or no utilizing value, or other prohibited species promulgated by the competent authority, and the number(s) discarded shall be duly recorded in the logbooks and E-logbook system. **And to prevent harming marine living species, any fishing vessel shall not dispose any type of plastic trash or discharge any oil on the sea.**

~~It can be said that the management system has management objectives that are consistent with the precautionary measures for the target species and the ecosystem. However, since the biomass of the squid is generally considered as not threatened, Taiwan has not set a clear long-term management objective for this species. Therefore, this PI is scored as Yellow Level (60-79). It is cleared that there are both short-term and long-term objectives in the management system of the Taiwan which show consistence with precautionary approach. Therefore, this PI is scored as Green Level (80+).~~

Falkland Islands

As stated in the rationale paragraph of the long-term objectives section (3.1.3), Article 8, 9, 10, 11 and 13 of the Fisheries (Conservation Management) Regulations 2005 specify the long-term objectives. Moreover, the authority of the Falkland Islands has set a management goal for the Argentine shortfin squid, which is an escapement target of 40%. Before the fishing season every year, the authority of the Falkland Islands will conduct survey to track the stock level. The authority manages the Argentine shortfin squid fishery through issuance of the fishing license. Only licensed fishing vessels are permitted to operate in the permitted area during the permitted period, and such vessels are accordingly obliged to comply with the following requirements, including fishing in the permitted area and within the permitted period, using unbaited lures only and not capturing, causing harm or death to seabirds. Also, in order to monitor the catch, licensed fishing vessels shall daily report their catch during the operation period. It is cleared that there are both short-term and long-term objectives in the management system of the Falkland Islands which show consistence with precautionary approach. Therefore, this PI is scored as Green Level (80+).

Decision-making processes (3.2.2)

Scoring category	80
------------------	----

Rationale:

Taiwan

As stated in the rationale paragraph of the long-term objectives section (3.1.3) and the fishery-specific objectives section (3.2.1), it is stipulated in the Act for Distant Water Fisheries that relevant decision making shall apply precautionary principle and ecosystem-based approach and use the best available scientific advice.

Taiwan's fisheries management system has its decision-making procedure in place and is consistent with the general regulations as specified in the Administrative Procedure Act regarding administrative planning, administrative guidance and administrative appeal. For example, when a new law or regulation is proposed, the Fisheries Agency shall notify the public three to four weeks in advance so their opinions about relevant amendments could be taken into consideration by the Fisheries Agency. The Fisheries Agency shall also consult with relevant stakeholders, such as members of fisheries associations, the academia, and environment-focused NGOs, when proposing amendments. The Fisheries Agency, in practice, will convene meetings and invite relevant professionals and stakeholders to engage and discuss, when formulating any fisheries conservation laws and regulations to ensure the decision-making process is transparent and extensive opinions are taken into consideration. It is thus considered there is a transparent and real-time procedure in place that can respond to issues identified.

In addition, according to the Freedom of Government Information Law, which is enacted to establish the institution for the publication of government information, facilitate people to share and fairly utilize government information, protect people's right to know, further people's understanding, trust and overseeing of public affairs, and encourage public participation in democracy, government information should be available to the citizens. If the people have any question or doubt about any policy, they can raise their questions either on the public policy participation platform or directly write to the responsible authority. When any legal challenge arises in the fishery management system, the Fisheries Agency will continue reviewing and amending the concerned regulations according to the challenges faced. Based on the above information, this PI is scored as Green Level (80+).

Falkland Islands

The decision-making procedure is specified in the Fisheries (Conservation Management) Regulations 2005. According to Article 11, in order to reach sustainable fisheries, policy maker shall formulate or amend measures with the best available scientific information, including amending the total allowable catch (TAC), deciding the fishing area, fishing period, and the fishing methods that are allowed to used. Also, prior to drawing up or amending relevant measures, the authority shall to the extent possible consult with the stakeholders and publish its rationale behind its policy after a measure is formulated or amended.

The Ordinance also stipulates a review policy, which requires the progress of the objectives to be reviewed at least once per year, and a decision should be made on whether to amend policies concerning fishery resources, management and conservation. In addition, a Fisheries Advisory Committee has been set up to make relevant suggestions on the rules of procedures exercised by the Director.

There is also a transparent and real-time procedure in the Falkland Islands that can respond to problems identified. Relevant demonstrations include reducing TAC in addressing concerns for stock status in 2017, setting a seasonal fishing ban to protect seabirds and marine mammals, and implementing seabird mitigation measures in 2004 to prevent seabirds from incidental death caused by fisheries. In addition, a specialized observer program for seabirds is established and an electronic logbook system is implemented. Therefore, considering the above, this PI is scored as Green Level (80+).

Compliance and enforcement (3.2.3)

Scoring category	80
------------------	----

Rationale:

Taiwan

At present, there are mechanisms of monitoring, control and surveillance (MCS) for Taiwanese fisheries and relevant regulations to implement conservation measures and resolutions adopted by regional fisheries management organization. According to Chapter 2 of the Act for Distant Water Fisheries, the Fisheries Agency is authorized to implement various MCS measures to ensure Taiwanese distant water fishing fleet complies with relevant regulations. For example, the Regulations for Fishing Vessels Conducting Squid Jigging Fishery specify all kinds of MCS measures and their implementation. Moreover, such Regulations also authorize the fisheries competent authority and the Coast Guard to inspect fishing vessels and their catch, fish product, fishing gears, documents or other objects and inquire vessel operators, fishers or holders of the documents, demonstrating the capability of implementing management measures, strategies and rules of the Taiwanese government.

Taiwan fisheries were once given a Yellow Card warning on IUU fishing in 2015; in order to tackle the issue, the Fisheries Agency enacted and promulgated the Act for Distant Water Fisheries in 2016 to ensure the conservation of marine environment, strengthen management on distant water fisheries, curb illegal, unreported and unregulated fishing activities, and improve the traceability of catches and fisheries products. The Yellow Card was lifted in June 2019, acknowledging the progress made by Taiwan in combating IUU fishing and the upgrade of the fisheries legal and administrative systems. Chapter 4 of the Act for Distant Water Fisheries specifies the handling of relevant violations, and information on penalties imposed will be made publicly available on the official website of the Fisheries Agency (<https://www.fa.gov.tw/cht/PolicyIUU/index.aspx>). According to the information penalties for violations of fishing vessels published by the Fisheries Agency, the number of violation and penalties has been decreasing. Therefore, it can be deduced that the penalties are intimidating and the law-abiding level of Taiwanese fishers has improved. Under the circumstances where there is no evidence concerning whether there is systemic violation in Taiwan's fisheries, this PI is scored as Green Level (80+).

Falkland Islands

There are also mechanisms of monitoring, control and surveillance (MCS) for fisheries under the jurisdiction of the Falkland Islands, including the requirement for fishing vessels to daily report their everyday fishing activities (location of the operation and the weight of the catch) to the FIFD, monitoring if the amount of landings is consistent with that of daily reported catch, the requirement

for fishing vessels to install the VMS system, deploying observers onboard fishing vessels, and sending patrol vessels or aircrafts to monitoring fishing activities at sea.

Schedule 3 of the Fisheries (Conservation Management) Regulations 2005 specifies the manner in which offences under the Ordinance are punishable, suggesting punishments are applied consistently. There are few judgements on fisheries related cases, the one concerning one fisheries corporation fishing without authorization in 2018 is the latest. Since then, no other fishery-related judgment is found, so it can be deduced that the punishments are intimidating. In addition, it is found that the court of the Falkland Islands had made interpretation on the text of fisheries regulations in 2013 and 2016. Considering the above information, this PI is scored as Green Level (80+).

Monitoring and management performance evaluation (3.2.4)

Scoring category	60~79
------------------	-------

Rationale:

Taiwan

The Fisheries Agency published the National Plan of Control and Inspection for Fisheries (NPCI) in November 2016 and made amendments to it in September 2018. This NPCI is adopted to prevent, curb and eliminate IUU fishing activities through improving vessel operators and fishers’ compliance with the Fisheries Act and relevant conservation measures, develop and MCS policy for fisheries, set principles and standards for measures, and strengthen the fisheries controlling capacity of the fisheries competent authority and other relevant government bodies through risk assessment. The Fisheries Agency sets the annual objectives for port inspection, observer coverage, implementation on high seas boarding and inspection and produce annual report every year to review the implementation progress. This can be seen as an internal review mechanism in the fisheries management system that operates regularly. As for external review, since some fisheries, such as tuna fishery, are also under management of relevant regional fisheries management organizations, which Taiwan is its member, the compliance review conducted by such organizations can be regarded as the external review of Taiwan’s fisheries management system. However, as currently there is no specialized international fisheries management organization for the Atlantic Argentine shortfin squid fishery, no similar mechanism can be applied as external review. Therefore, this PI is scored as Green Level (60~79).

Falkland Islands

As stipulated in the Fisheries (Conservation Management) Regulations 2005, any approach or conservation measure that is adopted to ensure the utilization of fisheries resources and other

relevant activities shall be reviewed once every 12 successive months. Therefore, there is a formal review mechanism for a specific fishery management system.

Regarding the internal review of the fishery management system, the FIFD is subject to the review conducted by the government auditor every year, where the financial suitability and the compliance with all statutory duties and obligations will be assessed. The latest formal external review on management system was conducted in 2003 and had provided relevant information for formulation and implementation of the Fisheries (Conservation Management) Regulations 2005. Considering there are regular internal review and irregular external review on fisheries management system, this PI is scored as Green Level (80+).

References

- Crespi-Abril AC, Morsan EM, Barón PJ (2008) Contribution to understanding the population structure and maturation of *Illex argentinus* (Castellanos, 1960) :the case of the inner-shelf spawning groups in San Matias Gulf (Patagonia, Argentina) . J Shellfish Res 27: 1225–1231
- Lapitokhovsky, V. V., Arkhipkin, A. I. and Henderson, A. C. (2001) . Feeding habits and dietary overlap in spiny dogfish *Squalus acanthias* (Squalidae) and narrowmouth catshark *Schroederichthys bivius* (Scyliorhinidae) . J. Mar. Biol. Assoc. U. K. 81, 1015-1018.
- Middleton, D. A. J., and A. I. Arkhipkin. 2001. Environ-mental effects on the distribution and migrations of the squid *Illex argentinus* (Ommastrephidae) in Falkland islands waters. ICES CM 2001/K:01:7-9
- Rodhouse, P.G. & Hatfield, E.M.C., 1990. Dynamics of growth and maturation in the cephalopod *Illex argentinus* de Castellanos, 1960 (Teuthoidea: Ommastrephidae) . Philosophical Transactions of the Royal Society of London (B) , 329, 229-241
- Hatanaka, H., Kawahara, S., Uozumi, Y. & Kasahara, S., 1985. Comparison of life cycles of five ommastrephid squids fished by Japan: *Todarodes pacificas*, *Illex illecebrosus*, *Illex argentinus*, *Nototodarus sloani sloani* and *Nototodarus sloani gouldi*. Scientific Council Studies. Northwest Atlantic Fisheries Organization, 9, 59-68
- Arkhipkin, A. I., and D. A. J. Middleton. 2002. Inverse patterns in abundance of *Illex argentinus* and *Loligo gahi* in Falkland waters: possible in-terspecific competition between squid? Fish. Res. 59:181–196
- Sacau, M., Pierce, G.J., Wang, J., Alexander, I., Arkhipkin, A.I., Portela, J.,Brickle,P.,Santos,M.B.,Zuur,A.F.,Cardoso,X.,2005.The spatio-temporal pattern of Argentine shortfin squid *Illex argentinus* abundance in the south-west Atlantic. Aquat. Living Resour. 18, 361–372.

Chen, C.-S., T.-S., Chiu, and W.-B., Haung, (2007) The Spatial and Temporal Distribution Patterns of the Argentine ShortFinned Squid, *Illex argentinus*, Abundances in the Southwest Atlantic and the Effects of Environmental Influences. *Zoological Studies* 46 (1) : 111-122

Belleggia, M., Figureroa, D.E., Irusta, G., & Bremec, C. (2014) . Spatio-temporal and ontogenetic changes in the diet of the Argentine hake, *Merluccius hubbsi*. *Journal of the Marine Biological Association of the United Kingdom*, 94 (8) :1701-1710.

Barratt, I. & Allcock, L. (2014) . The IUCN Red List of Threatened Species 2014: e.T163246A989453

Haimovici, M., Brunetti, N.E., Rodhouse, P.G., Calrke, J., & Leta, R.H. (1998) . Chapter 3: *Illex argentinus*. 32 pp. In: *FAO Fisheries Technical Paper 376: Squid Recruitment Dynamics*.

Laptikhovsky, V.V., & Nigmatullin, C.M. (1993) . Egg size, fecundity, and spawning in females of the genus *Illex* (Cephalopoda: Ommastrephidae) . *CES Journal of Marine Science*, 50:393-403.

Boyle, P., & Rodhouse, P. (2005) . *Cephalopods: Ecology and Fisheries*. Wiley-Blackwell Publishers. 464 pp.

Haimovici, M., N.E. Brunetti, P.G. Rodhouse, J. Csirke and R.H. Leta. Chapter 3: *Illex argentinus*. Squid recruitment dynamics. The genus *Illex* as a model, the commercial *Illex* species and influence on variability. *FAO Fish. Tech. Pap.* 376:27-58

Queirós, J.P., Phillips, R.A., Baeta, A. et al. Habitat, trophic levels and migration patterns of the short-finned squid *Illex argentinus* from stable isotope analysis of beak regions. *Polar Biol* 42, 2299–2304 (2019) .

Rosas-Luis, R., Sanchez, P., Portela, J.M., & del Rio, J.L. (2014) . Feeding habits and trophic interactions of *Doryteuthis gahi*, *Illex argentinus* and *Onykia ingens* in the marine ecosystem off the Patagonian Shelf. *Fisheries Research*, 152:37-44.

Crespi-Abril, A.C., & Baron, P.J. (2012). Revision of the population structuring of *Illex argentinus* (Castellanos, 1960) and a new interpretation based on modelling the spatio-temporal environmental suitability for spawning and nursery. *Fisheries Oceanography*, 21: 199-214.

Haimovici, M., Brunetti, N.E., Rodhouse, P.G., Calrke, J., & Leta, R.H. (1998). Chapter 3: *Illex argentinus*. 32 pp. In: *FAO Fisheries Technical Paper 376: Squid Recruitment Dynamics*.

Waluda, C.M., Rodhouse, P.G., Podesta, G.P., Trathan, P.N., & Pierce, G.J. (2001). Surface oceanography of the inferred hatching grounds of *Illex argentinus* (Cephalopoda: Ommastrephidae) and influences on recruitment variability. *Marine Biology*, 139:671-679.

A I Arkhipkin, A G Winter, C M Nigmatullin, Heavy fishery exploitation does not affect sizes at recruitment and maturity of squid *Illex argentinus* and *Doryteuthis gahi*, in the Southwest Atlantic, *ICES Journal of Marine Science*, Volume 79, Issue 1, January 2022, Pages 182–192,

Fisheries Agency, 2018, August 31. Response to Greenpeace report on Taiwanese distant water fisheries (2018-08-31) [Text]. Fisheries Agency, Council of Agriculture, Executive Yuan, (Taiwan, ROC); Fisheries Agency, Council of Agriculture, Executive Yuan, (Taiwan, ROC). Available at: <https://www.fa.gov.tw/en/Announcement/content.aspx?id=55&chk=5cbea8fb-fcd7-4e64-8ccbdbf482fb874¶m=>

Laws and Regulations Database of the Republic of China and Taiwan, 2016. [Online] Available at: <https://law.moj.gov.tw/ENG/LawClass/LawAll.aspx?pcode=M0050051>

Laws and Regulations Database of The Republic of China and Taiwan, 2018. [Online] Available at: <https://law.moj.gov.tw/ENG/LawClass/LawAll.aspx?pcode=M0050001#:~:text=This%20Act%20is%20enacted%20to,improve%20the%20livelihood%20of%20fishermen.>

漁業國家管控及檢查計畫, 2019. [Online] Available at: <https://www.fa.gov.tw/cht/PolicyIUU/content.aspx?id=8&chk=9e9625f3-02f4-407b-9d99-945df41840ab¶m=pn%3d1>