Chinese Japanese Flying Squid (JFS) Fisheries Improvement Scoping Report

December 2018

Ocean Outcomes (O2) Contacts:

Songlin Wang, China Program Director
Qing Fang, Consultant
Dr. Jocelyn Drugan, Analytics Team Director and Fishery Scientist
Rich Lincoln, Founder and Senior Advisor
TABLE OF CONTENTS

1. BACKGROUND ................................................................................................................................. 4
   1.1 OVERVIEW OF FISHERY PRE-ASSESSMENT ........................................................................... 4
   1.2 OVERVIEW OF FIP SCOPING ....................................................................................................... 5

2. STOCK AND FISHERY DESCRIPTION .............................................................................................. 6
   2.1 SPECIES AND STOCK ................................................................................................................... 6
   2.2 FISHERY OVERVIEW .................................................................................................................... 9
      2.2.1 Location .................................................................................................................................. 9
      2.2.2 Gear, seasons and other characteristics .................................................................................. 11
      2.2.3 Seasonal characteristics of the domestic JFS fishery .............................................................. 12
      2.2.4 Catch information .................................................................................................................. 12

3. SQUID SECTOR SUPPLY CHAIN OVERVIEW ................................................................................... 14
   3.1 GLOBAL ........................................................................................................................................ 14
   3.2 CHINA .......................................................................................................................................... 14
      3.2.1 China’s national squid export overview ............................................................................... 15
   3.3 CHINA’S LIKELY JFS SQUID IMPORT TRADE ........................................................................... 21

4. ANALYSIS OF PARTNER JFS SUPPLY CHAINS ........................................................................... 22
   4.1 TRAWL FISHERY SUPPLY SECTOR ............................................................................................... 22
      4.1.1 Landing - first purchase ......................................................................................................... 22
      4.1.2 Post landing materials storage ............................................................................................. 23
      4.1.3 Processing and export ......................................................................................................... 23
   4.2 JFS PURSE SEINE SUPPLY CHAIN (ZHEJIANG) ........................................................................ 24
   4.3 JFS GILLNET SUPPLY CHAIN (SHANDONG) ........................................................................... 24
   4.4 FURTHER ANALYSIS OF CHINESE JFS TRAWL FISHERY BASED IN SHANDONG ............... 25
      4.4.1 South Korea .......................................................................................................................... 26
      4.4.2 Japan ...................................................................................................................................... 27
      4.4.3 North Korea .......................................................................................................................... 27
      4.4.4 Role of transshipment vessels and transshipment at sea ......................................................... 28
      4.4.5 Potential challenges for meeting area fished purchase specifications ................................... 29
      4.4.6 Possible management approach to address domestic JFS fishery interests ......................... 30
   4.5 VESSEL FISHING AREA VERIFICATION .................................................................................... 30
      4.5.1 AIS evaluation ....................................................................................................................... 31
      4.5.2 Future verification efforts ....................................................................................................... 32

5. FISHERY SUSTAINABILITY PERFORMANCE .................................................................................. 32
   5.1 PRE-ASSESSMENT AND FISHERY IMPROVEMENT NEED BY MSC PERFORMANCE INDICATOR .... 33
   5.2 FURTHER SCOPING CONSIDERATIONS ....................................................................................... 37
      5.2.1 Non-trawl gear ...................................................................................................................... 37
      5.2.2 Trawl fishery insights from scoping investigations ................................................................. 38
      5.2.3 Issues and recommendations from 2017 monitoring ............................................................ 39

6. STAKEHOLDER MAPPING AND ENGAGEMENT ............................................................................. 40
   6.1 KEY GOVERNMENT MANAGEMENT AUTHORITIES ................................................................... 40
      6.1.1 Oceanic and Fishery Bureau of Shandong Province ............................................................... 41

www.oceanoutcomes.org
6.1.2 Zhejiang Province Ocean and Fisheries Bureau .................................................................43
6.2 SCIENCE INSTITUTES ........................................................................................................43
   6.2.1 Shandong Marine Resource and Environment Research Institute (SMRERI) ................44
   6.2.2 Marine Fishery Institute of Zhejiang Province ............................................................44
6.3 KEY CHINESE SEAFOOD INDUSTRY ASSOCIATIONS ......................................................45
   6.3.1 Chinese Aquatic Products Processing and Marketing Alliance (CAPPMA) ..................45
6.4 CHINESE JFS SUPPLY SECTOR ........................................................................................45
   6.4.1 Processors ....................................................................................................................45
   6.4.2 Catching sector ............................................................................................................46
6.5 INTERNATIONAL BUYERS AND RETAIL PARTNERS .........................................................46
6.6 OCEAN OUTCOMES (O2) ..................................................................................................46
6.7 OTHER NGOS ....................................................................................................................47

7. FIP IMPLEMENTATION ........................................................................................................48
   7.1 YEAR 1 (2018) FIP ACTIVITIES – PATHWAY TO LAUNCH ............................................48
   7.2 FIP STRUCTURAL CONSIDERATIONS ............................................................................48
       7.2.1 O2’s role ...................................................................................................................48
       7.2.2 FIP Industry Commission .........................................................................................48
       7.2.3 FIP Secretariat ........................................................................................................48
       7.2.4 FIP Scientific Advisory Group ................................................................................49

8. REFERENCES ........................................................................................................................51

APPENDIX A. SUPPLEMENTAL 2017 JFS FISHERY RESEARCH REPORT ...............................53
   A.1. SMRERI INSIGHTS ........................................................................................................53
       A.1.1 JFS fishery overview ...............................................................................................53
       A.1.2 Suggestion for improved fishing efficiency ............................................................53
       A.1.3 Specific JFS fishing permit regulation ....................................................................54
   A.2 STOCK AND FISHERY DESCRIPTION ........................................................................54
       A.2.1. Biological and stock characteristics .......................................................................54

APPENDIX B. PHOTOGRAPHIC EXAMPLES OF 2017 MONITORING ..................................60

APPENDIX C. 2018 SCOPE OF WORK ....................................................................................66
1. Background

Japanese flying squid (JFS) (*Todarodes pacificus*) is an important commercial species caught by Japanese, Chinese and Korean fishermen in the Northwest Pacific Ocean, Sea of Japan, Yellow Sea, and East China Sea (FAO 61; major fishing area 61). In China, the species is primarily caught by trawl gear, with purse seine and gillnet harvest being of lesser importance. JFS abundance in Chinese fishing areas in relation to its wide distribution across the northern and western Pacific Ocean is believed to be modest: JFS biomass in the East China Sea area was previously estimated to be ~30 kilotons (kt) compared to annual global harvest estimates of roughly 300-700 kt.

This report documents pre-assessment and scoping analyses completed for the Chinese East China and Yellow Seas JFS fisheries as a basis for developing and launching a fishery improvement project (FIP). Two seafood industry leaders; Sea Farms Limited and PanaPesca USA LLC have been responsible for championing and funding these efforts, with strong support from their partners, as part of their longstanding commitments to sourcing sustainable seafood.

Since the project’s inception we have discussed the challenges of enlisting various levels of Chinese government to become engaged in and actively supporting JFS fishery improvement. A growing industry partnership in the developing FIP is essential to motivate this government engagement. The 2018 decisions by Aqua Star and Quirch Foods to join Sea Farms and PanaPesca as international seafood buyer partners in this pre-competitive collaboration has the potential to exert greater influence to address the fishery’s sustainability challenges from both a biological and traceability standpoint. Additional partners who want access to a supply of JFS that is undergoing improvement on a path toward meeting international standards hopefully will find information within this scoping report that will assist in their decision to join this growing partnership effort.

1.1 Overview of fishery pre-assessment

In 2015 Sea Farms and its partners commissioned Ocean Outcomes (O2) to conduct a pre-assessment of the Chinese JFS trawl fishery in the north continental shelf of the East China Sea and the Yellow Sea, two areas where commercially important stock aggregate. The pre-assessment is not included in its entirety in this report, but key elements have been incorporated as the foundation for developing a FIP work plan. In particular, the performance of the fishery against the Marine Stewardship Council’s (MSC’s) standard by individual performance indicator is summarized herein.

O2 completed the pre-assessment in 2016, which indicated that although JFS is short lived and highly productive, the fishery management system needs a stronger scientific foundation for implementing precautionary management, ecosystem-based planning, and regulations to improve the following factors:

● Stock abundance is not regularly assessed and no catch accounting exists for individual squid species.

● Non-selective gears (primarily trawl and to a lesser degree, purse seine) result in potential issues with bottom contact and secondary catch of other species; however, little information is available to assess these impacts.

● No harvest strategy is utilized beyond the summer fishing moratorium.

In addition, the assessment found that the existing traceability system failed to produce conclusive records and reliable evidence of domestic vs. non-Chinese waters being fished with respect to Chinese vessel landings being reported as domestic catch. Furthermore, after 2015, the distribution and catch of JFS in Chinese waters, which had been a key element of supply to certain UK markets, had reportedly shifted from the northern East China Sea to the Yellow Sea. As a result, further scoping was deemed necessary to determine the appropriate spatial scale and shape of specific fishery and supply chain improvement actions that would be needed for a Chinese JFS FIP.

1.2 Overview of FIP scoping

After completing the 2016 pre-assessment, Sea Farms and PanaPesca supported further scoping analyses of the Chinese domestic JFS fishery and supply chain to support the fishery’s ability to reach FIP Stage 1 in a timely yet comprehensive manner. Specifically, the goal of this scoping was a work plan and implementation strategy that would guide the fishery in achieving a level of performance consistent with the Marine Stewardship Council (MSC) standard and the Conservation Alliance for Sustainable Seafoods ‘Guidelines for Supporting Fishery Improvement Projects’ definition of a comprehensive FIP. Further, efforts have been made to coordinate these FIP planning activities with the Sustainable Fisheries Partnership (SFP) led Asia Squid Roundtable so as to achieve complementary alignment between the two initiatives.

The scoping exercise was partially intended to address data deficiencies noted during the pre-assessment. Specifically, additional information on species catch composition in the fishery was of interest to better understand the nature of MSC Principle 2 performance issues. This was of particular interest from the standpoint that the pre-assessment had less information available for the Yellow Sea area compared to the East China Sea, so there was natural interest to explore whether any additional or different issues might need to be addressed. In addition, a potential interest in considering both purse seine and trawl fisheries within the emerging FIP was identified.

Overall, scoping was intended to provide a clearer determination of the types of information and improvements likely to be necessary in the fishery and what enabling conditions and next steps would be needed with respect to key stakeholders (e.g. fishery participants, seafood buyersprocessors, government, science representatives and NGOs) to assure that launch and implementation of a FIP would have a reasonable likelihood of success. Furthermore, while the primary interest by FIP partners is focused on the Chinese domestic fisheries, scoping also considered the migratory nature of JFS with respect to the longer-term value that could be derived from coordinated fisheries improvement across national boundaries where squid are harvested. Finally, analysis sought to explore potential uncertainties of the catch origin of JFS.
landed in Chinese waters in terms of the extent to which catch attributed to Chinese domestic harvest could be originating from Korean or Japanese waters through fisheries authorized via bilateral agreements.

2. Stock and fishery description

The analysis of sustainability performance of Chinese fisheries is generally limited due to the lack of species-specific catch and biological data from fishery landings and a poorly formed fishery management system compared to countries such as the United States (US), Canada, European Union (EU), Iceland, Australia and New Zealand. A basic background summary of relevant fishery information is presented in this section to provide context for the supply chain, stakeholders and potential FIP.

2.1 Species and stock

Japanese flying squid (JFS) (*Todarodes pacificus*), also known as Japanese common squid スルメイカ (Japanese), 太平洋褶柔鱼 (Chinese) are the predominant target squid species in the northern East China Sea and Yellow Sea. This species is called “dark-skin squid” in Zhoushan. *Loligo* squid species (specifically a complex of three species commonly marketed as Chinese common or mitre squid, but comprised of *Uroteuthis* [*Loligo*] *chinensis*, *U. edulis* and *U. duvauceli*) also support significant domestic Chinese fisheries. However, these *Loligo* species are distributed more southerly, primarily off Fujian and Guangdong Provinces and more inshore compared to JFS, which is fished from Zhejiang, Liaoning and Shandong Provinces. Therefore, fisheries for *Loligo* and JFS are significantly segregated in Chinese waters, involving different fleets, processors and supply chains.

At the same time, it is worth noting that JFS is not the only squid species caught off these northern three provinces, as beka squid (*Loliolus beka*), common Japanese squid (*Loligo japonica*) and swordtip squid (*U. edulis*) also occur in these areas. Swordtip squid are mainly harvested in the East China Sea by vessels from Zhejiang province. JFS have a broad geographic distribution within the Northern and Western Pacific Ocean. They are native to waters off Japan, mainland China, Taiwan, South Korea, North Korea, and Russia, and are found in both the open ocean and coastal regions (Roper et al., 2010). Near China, JFS can be found in the South China Sea, East China Sea, and Yellow Sea. They are rarely captured in the Bohai Sea.

JFS populations are highly migratory, moving to forage and reproduce. The squid are found from 0 to 500 meters (m) in depth but typically feed at depths of 0 to 200 m and in waters with temperatures ranging from 5 to 27 degrees Celsius (°C), often forming large aggregations around oceanic fronts, seamounts, and gyres where food is abundant (Roper et al., 2010).
These squid have diel migration patterns, descending to or near the sea bottom during the day to feed on benthic and epibenthic prey. At night the squid ascend to feed in the upper 50 m of the water column and may approach the surface. Trawl fishermen potentially can adjust fishing depths based on this squid behavior to their advantage. Jigging, which catches squid closer to the surface, is typically practiced at night (Roper et al., 2010).

There are two primary JFS stocks defined by their spawning times: fall and winter stocks. Additionally, a summer spawning stock exists but is thought to be relatively small and insufficient for supporting large-scale fisheries. The winter stock is dominant in the East China and Yellow Seas (Table 1).

Genetic analyses of population structure are somewhat limited, but they suggest the existence of two distinct breeding groups: 1) the fall stock and 2) the winter, summer and spring stocks combined (Kang et al., 1996, Katugin, 2002). Fall spawners also show some unique life history characteristics, such as comparatively large body size and low individual fecundity, and hydrographic conditions may keep larvae within the central and southern parts of the Japan Sea (Katugin, 2002). The fall and winter stocks support large-scale fisheries, while the summer spawning stock supports only small-scale fisheries.


<table>
<thead>
<tr>
<th></th>
<th>Spawning period</th>
<th>Main spawning area</th>
<th>Harvest period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter</td>
<td>December to April</td>
<td>East China Sea</td>
<td>October to December</td>
</tr>
<tr>
<td>Fall</td>
<td>April to December</td>
<td>Southern Sea of Japan, Northern East China Sea</td>
<td>May to November</td>
</tr>
<tr>
<td>Summer</td>
<td>April to August</td>
<td>Sea of Japan, Pacific Ocean off Japan</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

JFS have a lifespan of one year, and males have smaller body sizes than females. The maximum reported mantle length is 500 millimeters (mm), and winter and fall spawning stocks mature at 240 to 330 mm mantle length (Roper et al., 2010). Mating and spawning have not been observed in nature but have been studied in the laboratory. Males mature earlier than females and begin mating with immature females about 2 to 3 weeks before the females have matured. Spermatozoa remain viable for several weeks until spawning takes place. Females are thought to spawn above the pycnocline (water layer where the density gradient is greatest) near the continental shelf and upper slope at depths of 100 to 500 m (Puneeta et al., 2015, Roper et al., 2010). Females have a total lifetime fecundity of about 100,000 to 200,000 eggs, which they lay in one or more egg masses that look like gelatinous balls (Puneeta et al., 2015). The balls are almost neutrally buoyant and typically float in the pycnocline interface until the eggs hatch (Bower and Sakurai, 1996). Paralarvae hatch in 4 to 6 days at 18° to 19°C and are believed to actively swim toward the surface. Once hatching is complete, the egg mass deteriorates. Young juveniles are transported north by oceanic currents from their hatching grounds to their feeding grounds. Prey items include finfish (e.g. Japanese anchovy), crustaceans, gastropods, chaetognaths, and cephalopods, including conspecifics. Predators include finfish (e.g.
dolphinfish, chub mackerel, Japanese jack mackerel, skipjack tuna) and marine mammals (e.g. northern fur seals, toothed whales, baleen whales (Roper et al., 2010).

Because spawning and hatching have not been observed in nature, hatching times for the different JFS stocks is not precisely known. However, based on laboratory findings, hatching likely occurs within a few weeks of spawning (Roper et al., 2010).

Growth rates vary depending on the seasonal population and local environmental conditions, particularly the temperature regime. But as a general guideline, from hatching to 15 mm mantle length takes 0.5 months, to 120 mm mantle length requires 3 months, to 190 mm mantle length 6 months, and to 260 mm mantle length, about the maximum size, 12 months (Roper et al., 2010).

Each of the 2 main stocks (spawning groups; Japan Sea and Pacific ocean, off Japan) is located in a separate area and fished at a different season (autumn and winter, respectively). Winter, fall, and summer spawning stocks all occur within the East China and Yellow seas (Li and Yan, 2004). The winter stock is dominant in both seas and accounts for 75 to 80% of annual landings in the Yellow Sea. From June to July, winter stock JFS aggregate offshore in the northern East China Sea. Most of the stock then migrates northward into the Yellow Sea from August through October (Figure 2). In November, the stock returns to the East China Sea to spawn, typically near the edge of the continental shelf (Li and Yan, 2004). After hatching, some of the larvae are carried to the Yellow Sea in the Kuroshio current, but most move into the Yangtze River estuary (Lu and Zhang, 2007).

Mature squid dominate fishery catches in fall and winter, whereas spring and summer catches are dominated by juvenile squid (Yang et al., 2010). Recent harvests have mostly taken place in the fall and winter due to the summer fishing moratorium, so catches are expected to be predominantly mature squid. In China, fishermen do not separate catches of fall, winter, and summer stock squid, and it may be difficult to do so on a practical level.

Figure 2. Migration route of JFS for the winter stock. From Song et al. (1999).
2.2 Fishery overview

2.2.1 Location

The scope of the planned FIP encompasses Chinese fisheries supplying JFS to Chinese squid processors from fisheries within the Chinese Exclusive Economic Zone (EEZ) under Chinese jurisdiction. The possible supply chain implications of Chinese vessels catching JFS in the EEZs of South Korea, Japan, or North Korea under respective bilateral agreements and landed in China are discussed in Section 4. A summary of the Chinese JFS fishing categories for the full range of JFS landings in China is presented in Table 2.

The pre-assessment covered both the East China and Yellow Seas; however, at the time of writing, the fishery of interest was believed to originate from vessels largely fishing in the East China and southern Yellow Seas and delivering in Zhoushan. The current distribution of Chinese JFS fisheries appears to have shifted from the East China and southern Yellow Seas more northerly to primarily the Yellow Sea, particularly the Shidao fishing ground (Figure 3). A large factor is the lengthened summer fishery closure, which prohibits fishing during June, July and August. The winter stock makes a northerly migration from May/June through to October, so the prime timing and distribution of JFS in the more southerly areas such as the Zhoushan fishing ground off Zhejiang province and the southern Yellow Sea is largely inaccessible to legal fishing. Also, increasing demand for both domestic and export markets, combined with availability, has resulted in the fishery largely being conducted from Shandong Province.

Based on JFS ecological habitats and migration patterns, Chinese fishing vessels from Shandong and Liaoning can harvest JFS in the northern Yellow Sea, while vessels from Zhejiang province can harvest JFS fishery in southern Yellow Sea and waters of northern East China Sea. Figure 3 shows the geographic distribution of traditional fishing grounds for JFS in China’s coastal waters.

Figure 3. JFS fishing grounds within China’s EEZ.
Table 2. Various categories of fishing operations for Chinese flagged fishing vessels that harvest Japanese flying squid fishery within Chinese and neighboring EEZs.

<table>
<thead>
<tr>
<th>Sea area</th>
<th>Sea district jurisdiction</th>
<th>Chinese fishing ground or distant water fishery</th>
<th>Target squid species</th>
<th>Province of vessels or numbers of DWF vessels</th>
<th>Gear</th>
<th>Annual production</th>
<th>Operation time</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Yellow Sea</td>
<td>Jurisdiction of China, C1 Sea district</td>
<td>Shidao Lianqingshi</td>
<td>Japanese flying squid (T. pacificus)</td>
<td>Liaoning</td>
<td>Trawl</td>
<td>See Table 6</td>
<td>Closed: 1 May - 31 Aug</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Common Japanese squid (L. japonica)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Beka squid (Lololus beka)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>South Yellow Sea and East China sea</td>
<td>Jurisdiction of China, C2 Sea district</td>
<td>Dasha Yangtze estuary Jiawang Zhoushan</td>
<td>Japanese flying squid (T. pacificus)</td>
<td>Zhejiang</td>
<td>Trawl Purse seine</td>
<td>See Table 6</td>
<td>Closed: 1 May - 31 Aug</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sword-tip squid (U. edulis)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yellow Sea</td>
<td>Jurisdiction of South Korea</td>
<td>Chinese DWF</td>
<td>Japanese flying squid (T. pacificus)</td>
<td>755 trawl, 60 purse seine</td>
<td>Trawl Purse seine</td>
<td>All Species Quota: Trawl - 37,638 t; Purse seine - 8,299 t</td>
<td>Closed: Trawl: 16 Apr - 15 Oct; and Purse seine: 1 May – 31 Aug</td>
</tr>
<tr>
<td>Sea of Japan</td>
<td>Jurisdiction of Japan</td>
<td>Chinese DWF</td>
<td>Japanese flying squid (T. pacificus)</td>
<td>47</td>
<td>Jigging machine</td>
<td>3,520 t</td>
<td>Oct 1st - Dec 31st</td>
</tr>
<tr>
<td>Sea of Japan</td>
<td>Jurisdiction of North Korea</td>
<td>Bilateral fishery cooperation arrangements</td>
<td>Japanese flying squid (T. pacificus)</td>
<td>Shandong</td>
<td>Trawl</td>
<td>Unknown</td>
<td>No season set</td>
</tr>
</tbody>
</table>

NOTE: Except by special approval of Chinese government, Chinese fishing vessels authorized to operate in the four marine areas listed above are not allowed to operate in two sea areas simultaneously.
Table 2 shows the sea area fished according to sea district jurisdiction fishing permissions. The traditional fishing grounds for vessels of Shandong and Liaoning Provinces include the Shidao Fishing Ground and Lianqingshi Fishing Ground in the Bohai; northern Yellow Sea Region (referred to as C1 Sea Zone of China). The traditional fishing grounds for vessels from Zhejiang Province include the Dasha Fishing Ground, Yangtze Estuary Fishing Ground, Jiangwai Fishing Ground, and Zhoushan Fishing Ground in the southern Yellow Sea and the East China Sea Region (C2 Sea Zone of China).

2.2.2 Gear, seasons and other characteristics

Squid fisheries globally use a variety of gear types, some of which also are used to target JFS. These include jigging, bottom and midwater trawls, stow nets, set nets, purse seines, and gillnets. In the East China Sea, trawls and stow nets (now increasingly seines) appear to account for the largest proportion of squid harvest, whereas trawls and seines predominate in the Yellow Sea, and jigging gear is most prevalent in the Sea of Japan. In North Korean fisheries, trawl is reportedly a common gear for squid (O2, 2016).

The 2016 Chinese JFS pre-assessment identified paired midwater trawls in outer continental shelf waters as the primary gear type examined; however, potential bottom contact by the gear has been noted based on some incidence of demersal species in the catch. China has instituted a 54 mm minimum mesh size for trawl gear. Examples of paired and single trawls are shown in Figures 4 and 5.

Our scoping has indicated that fishing vessels in Shandong and Liaoning Provinces mainly harvest JFS via midwater trawl. They also typically have freezing and refrigerated capacity that enable long fishing trips, since storage conditions ensure high product quality.

According to vessel statistics provided by the city of Zhoushan, trawlers are the most common vessel type licensed in Zhejiang province that can be used offshore (Table 3). Stow nets are also common but are generally used close to shore. Seines tend to be used in the eastern fishing grounds of the East China Sea. The fishery improvement project will need to collect and analyze more detailed information about the Chinese trawl fleet fishing for JFS.
Table 3. Numbers of vessels (No.) registered to Zhoushan ports and their total power (in megawatts; MW), separated by gear type. Source: Fishery Statistics Yearbook of Zhejiang Province by Zhejiang Ocean and Fishery Bureau.

<table>
<thead>
<tr>
<th>年份</th>
<th>拖网船</th>
<th>围网船</th>
<th>刺网船</th>
<th>张网船</th>
<th>钓业线</th>
<th>其他</th>
<th>远洋渔船</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>艘 No.</td>
<td>千瓦 MW</td>
<td>艘 No.</td>
<td>千瓦 MW</td>
<td>艘 No.</td>
<td>千瓦 MW</td>
<td>艘 No.</td>
</tr>
<tr>
<td>2010</td>
<td>2345</td>
<td>485</td>
<td>267</td>
<td>66</td>
<td>956</td>
<td>108</td>
<td>2475</td>
</tr>
<tr>
<td>2011</td>
<td>2125</td>
<td>448</td>
<td>290</td>
<td>73</td>
<td>1134</td>
<td>115</td>
<td>2536</td>
</tr>
<tr>
<td>2012</td>
<td>2110</td>
<td>452</td>
<td>336</td>
<td>85</td>
<td>1235</td>
<td>76</td>
<td>2543</td>
</tr>
<tr>
<td>2013</td>
<td>2123</td>
<td>473</td>
<td>327</td>
<td>81</td>
<td>1107</td>
<td>114</td>
<td>2362</td>
</tr>
<tr>
<td>2014</td>
<td>1954</td>
<td>412</td>
<td>342</td>
<td>87</td>
<td>1215</td>
<td>127</td>
<td>2204</td>
</tr>
</tbody>
</table>

### 2.2.3 Seasonal characteristics of the domestic JFS fishery

The availability of JFS in Chinese waters is from late April to the middle of November though a four month summer fishing closure from 1 May until 31 August currently limits JFS opportunity within China’s EEZ. In addition to trawlers, purse seiners from Zhejiang Province also fish Japanese flying squid in the East China Sea, with their productive fishing season lasting until May. The best availability of JFS for China coastal fishing vessels would be in July, August and September as its population migrates to South Korea’s EEZ by mid to late October every year, where Chinese vessels are not allowed to fish without a special permit. China’s 4-month summer fishing closure noted above, represents an increased restriction in 2017, which reduces fishing time by an additional month. The impacts of the expanded closure on JFS harvested in China’s EEZ remain to be observed in the future but the expansion probably creates some incentive to illegally fish.

Chinese coastal fishermen only work part of January and then typically begin their fishing activities again in late February, after the Chinese spring festival, operating in Chinese coastal waters in March and April. These fishing vessels return to the fishing port for the summer fishery closure period from 1 May through to 31 August. On 1 September, these coastal vessels resume fishing again until two weeks before the Chinese spring festival, which occurs in late January or early February.

### 2.2.4 Catch information

JFS is a widely distributed species in the North Pacific with commercial fisheries occurring in China, North Korea, South Korea, Japan, Taiwan and Russia. The distribution of JFS abundance and catch in Chinese waters is considerably less than other countries as China is at the southern end of the species distribution.

In China, official government statistics describe catches for cephalopod species groups but catch data is not generally recorded by species. Catches are reported according to province but refer to catches by vessels based in each province, which may include catches from outside the province or even outside of China’s EEZ. For example, the reported 2004 cephalopod catch by China provinces along the East China Sea was 485,700 mt (of which 351,200 mt, or 72%, was harvested by the Zhejiang province). Of the 485,700 mt, about 259,800 mt (88,500 mt of Sepiidae, 123,400 mt of Loliginidae and 47,800 mt of Octopoda) were from the East China Sea,
and most of the remainder was from non-Chinese waters. Thus, official statistics do not provide a clear picture of species abundance or species-specific harvest over time. Notwithstanding that caveat, a comparison of regional catch data using available data is provided in Table 4, noting again that squid landing data for China does not differentiate between individual species. With respect to northern provincial squid landings from Chinese domestic fisheries, Table 5 provides a recent summary.

Table 4. JFS annual TACs in Japan, JFS catch statistics for Japan and South Korea and all species domestic squid catch for China (per 1000 tons). Source: O2, 2016.

<table>
<thead>
<tr>
<th>Year</th>
<th>Japan JFS TAC</th>
<th>Japan JFS harvest</th>
<th>S. Korea JFS harvest</th>
<th>China harvest (all squid)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>232.4</td>
<td>202.2</td>
<td>778.4</td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>219.3</td>
<td>191.3</td>
<td>708.4</td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>197.2</td>
<td>205.1</td>
<td>600.8</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>322</td>
<td>250.8</td>
<td>171.4</td>
<td>718.2</td>
</tr>
<tr>
<td>2008</td>
<td>333</td>
<td>215.8</td>
<td>176.5</td>
<td>350.9</td>
</tr>
<tr>
<td>2009</td>
<td>333</td>
<td>216.7</td>
<td>188.4</td>
<td>351.8</td>
</tr>
<tr>
<td>2010</td>
<td>318</td>
<td>207.3</td>
<td>173.4</td>
<td>365.4</td>
</tr>
<tr>
<td>2011</td>
<td>297</td>
<td>237.3</td>
<td>183.1</td>
<td>390.4</td>
</tr>
<tr>
<td>2012</td>
<td>339</td>
<td>167.9</td>
<td>159.7</td>
<td>385.8</td>
</tr>
<tr>
<td>2013</td>
<td>329</td>
<td>173.9</td>
<td>165.7</td>
<td>361.1</td>
</tr>
<tr>
<td>2014</td>
<td>301</td>
<td>172.0</td>
<td>155.0</td>
<td>374.7</td>
</tr>
</tbody>
</table>

Table 5. All species squid harvest of China’s three key JFS provinces (tons) Source: O2, 2016.

<table>
<thead>
<tr>
<th>Province</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>Proportion in 2016 total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liaoning</td>
<td>30,884</td>
<td>37,920</td>
<td>30,343</td>
<td>33,065</td>
<td>33,147</td>
</tr>
<tr>
<td>Zhejiang</td>
<td>82,163</td>
<td>87,747</td>
<td>83,412</td>
<td>84,044</td>
<td>88,180</td>
</tr>
<tr>
<td>Shandong</td>
<td>106,531</td>
<td>71,119</td>
<td>79,506</td>
<td>72,824</td>
<td>75,757</td>
</tr>
<tr>
<td>Total 2016</td>
<td>385,845</td>
<td>361,058</td>
<td>374,727</td>
<td>380,105</td>
<td>388,634</td>
</tr>
</tbody>
</table>

www.oceanoutcomes.org
3. Squid sector supply chain overview

3.1 Global

About 40 species of squid account for an annual commercial harvest globally of around 4 million tonnes (t), representing about 5% of global marine capture fishery landings.

Squid fisheries represent a new frontier for the global sustainable seafood movement, for instance, no squid fisheries have been MSC certified until May 2018, when the US Northeastern longfin squid fishery in the Northwest Atlantic became the first squid fishery in the world to meet the MSC standard. Squid stocks are prime candidates for sustainability improvements because of their commercial importance to fisheries and seafood markets across multiple jurisdictions. Additionally, many stocks have the biological potential to recover quickly from overharvest due to their short generation times and inherently high productivity. Furthermore, squid improvement efforts have the potential to generate new ideas and management models that could have broad global application in that traditional stock assessment and management approaches have very limited application to this species group, and relatively few squid fisheries are actively managed from a global perspective. On the supply chain side of the equation, effective approaches to tackling traceability of complex squid supply chains could also have wide and consequential application.

3.2 China

China plays a pivotal role in the global squid supply chain. Based on Ocean Outcomes’ preliminary research, the combined importance of China to the global squid supply chain and of squid to China’s seafood industry is illustrated by the fact that China has become the world’s largest squid fishing and processing country, with three supply chain components: 1) domestic harvest from the coastal fishery in China’s EEZ; 2) Chinese harvest in its distant-water fisheries, shipped back to China for processing; and 3) importing through international trade. Each year, over 1 million t of squid (about a quarter of the global total) get caught or imported by China for domestic consumption, export and processing/re-exporting. In 2012, imports, domestic fisheries, and distant water fisheries (DWF) each accounted for roughly 300+ -400+ kilotonnes (kt) (Figure 6).

---

5China defines DWF in its national catch reporting as any landings from outside the Chinese EEZ.

www.oceanoutcomes.org
However, by 2014, the total production of squid surpassed 1.6 million t as a result of the DWF component rapidly expanding to a level of 878.5 kt (Figure 7). China hosts the world's largest squid fishing fleets, with its distant water fisheries primarily operating in the NW Pacific, SE Pacific near Peru, and SW Atlantic near Argentina. Whilst, as mentioned below, the supply of Chinese DWF squid appears to affect the overall demand for imports of squid into China, we found no evidence that Chinese DWF target *Loligo* species or that the species involved are likely involved in product substitution for *Loligo*. Consequently, this report does not provide detailed elaboration on Chinese DWF fisheries or their supply chains.

3.2.1 China's national squid export overview

3.2.1.1 Global market

Total Chinese squid exports and re-exports represent over one-third of China’s total supply and have significantly grown since 2012, recently stabilizing around 440,000 metric tons in 2015 and 2016 (Table 6). In 2016 Chinese exports to 11 countries accounted for 84% of its total squid exports (including squid that may have been imported, reprocessed and exported) (Figure 8). Japan is the largest importing country, representing a long-standing consumption market, with other traditional export markets including EU countries, US, Korea and Taiwan. Meanwhile, Southeast Asian countries, namely Thailand and the Philippines, have received dramatic increases of squid exports from China in recent years. In 2016, the export volume of squid from China to Thailand and the Philippines had increased eight-fold since 2012, with the main origin of exports being the Fujian Province. Russia’s squid import volume from China decreased in 2016 due to the unfavorable impacts of domestic political-economic policies.

Table 6. Squid exported from China to largest target markets (tons).

<table>
<thead>
<tr>
<th>Country or region</th>
<th>Year</th>
<th>Proportion of total 2016 squid exports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>72,938</td>
<td>83,265</td>
</tr>
<tr>
<td>Thailand</td>
<td>8,465</td>
<td>27,632</td>
</tr>
<tr>
<td>European Union</td>
<td>49,112</td>
<td>61,324</td>
</tr>
<tr>
<td>USA</td>
<td>40,634</td>
<td>42,782</td>
</tr>
<tr>
<td>Philippines</td>
<td>4,360</td>
<td>8,170</td>
</tr>
<tr>
<td>South Korea</td>
<td>9,709</td>
<td>8,296</td>
</tr>
<tr>
<td>Taiwan</td>
<td>15,951</td>
<td>15,186</td>
</tr>
<tr>
<td>Australia</td>
<td>9,663</td>
<td>11,844</td>
</tr>
<tr>
<td>Malaysia</td>
<td>9,364</td>
<td>11,724</td>
</tr>
<tr>
<td>Canada</td>
<td>4,180</td>
<td>4,598</td>
</tr>
<tr>
<td>Russia</td>
<td>13,611</td>
<td>18,867</td>
</tr>
<tr>
<td>Total China squid exports</td>
<td>305,361</td>
<td>371,383</td>
</tr>
</tbody>
</table>
3.2.1.2 European countries

Eight countries account for 96% of Chinese squid exports to the EU, with the Spain and Italy being the major importers followed by UK and Portugal (Table 7). UK hasn’t been a traditional squid consumption country in Europe, but its increasing demand partly stems from the need to substitute squid for price-increasing shrimp to moderate seafood prices.

Table 7. Squid exported from China to largest EU country markets (tons).

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spain</td>
<td>2012</td>
<td>19,352</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2013</td>
<td>24,167</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2014</td>
<td>18,856</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2015</td>
<td>21,690</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2016</td>
<td>26,351</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>2012</td>
<td>9,319</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2013</td>
<td>12,960</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2014</td>
<td>11,155</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2015</td>
<td>13,683</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2016</td>
<td>13,454</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UK</td>
<td>2012</td>
<td>4,628</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2013</td>
<td>5,956</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2014</td>
<td>3,914</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2015</td>
<td>3,062</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2016</td>
<td>4,610</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Portugal</td>
<td>2012</td>
<td>1,801</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2013</td>
<td>2,854</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2014</td>
<td>2,647</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2015</td>
<td>3,033</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2016</td>
<td>4,097</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greek</td>
<td>2012</td>
<td>2,964</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2013</td>
<td>3,638</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2014</td>
<td>2,971</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2015</td>
<td>2,827</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2016</td>
<td>3,110</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Holland</td>
<td>2012</td>
<td>2,319</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2013</td>
<td>2,860</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2014</td>
<td>1,683</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2015</td>
<td>1,514</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2016</td>
<td>2,513</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td>2012</td>
<td>2,446</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2013</td>
<td>2,211</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2014</td>
<td>1,800</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2015</td>
<td>1,095</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2016</td>
<td>1,334</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belgium</td>
<td>2012</td>
<td>2,767</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2013</td>
<td>2,833</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2014</td>
<td>2,068</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2015</td>
<td>835</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2016</td>
<td>1,262</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Chinese squid exported to EU</td>
<td></td>
<td>49,112</td>
<td>61,324</td>
<td>47,761</td>
<td>50,148</td>
<td>59,050</td>
<td>96.1%</td>
</tr>
</tbody>
</table>

Figure 8. 2016 China squid export proportions to global markets.
3.2.2 Main squid processing and exporting regions in China

China's main processing and exporting zones lie in five coastal provinces; Liaoning, Shandong, Zhejiang, Fujian and Guangdong (Figure 9). The export species, sources of raw materials and target markets vary from province to province.

The squid supply chains of Liaoning, Shandong and Zhejiang Provinces are similar. They mainly process squid: (1) harvested in coastal China seas off the northern provinces (e.g. Japanese flying squid (Todarodes pacificus); (2) landed by China’s distant-water fishery, primarily including imported Japanese flying squid (T. pacificus), arrow squid (Nototodarus spp.), Argentine shortfin squid (Illex argentinus), neon flying squid (Ommastrephes bartramii) and jumbo flying squid (Dosidicus gigas); and (3) from imports destined for the Chinese domestic market and/or for processing and re-export (which are expected predominantly to be the species noted above).

Guangdong and Fujian Provinces appear to share similar supply chain characteristics since they mainly process indigenous Loligo squid species (e.g. Uroteuthis chinensis, U. edulis, and U. duvauceli). Besides that, Fujian Province also processes Argentine shortfin squid (Illex argentinus) shipped back from distant-water fisheries. The processing zones of the provinces lie in Zhangzhou city in Fujian Province and its adjacent Guangdong region, Shantou City. The squid industries of two provinces have close relations despite belonging to separate administrative precincts. Therefore, they should be considered as an integrated region, functioning as an intensive industry in terms of squid processing, especially for Loligo species.

Guangdong and Fujian Provinces appear to share similar supply chain characteristics since they mainly process indigenous Loligo squid species (e.g. Uroteuthis chinensis, U. edulis, and U. duvauceli). Besides that, Fujian Province also processes Argentine shortfin squid (Illex argentinus) shipped back from DWF. The processing zones of the provinces lie in Zhangzhou city in Fujian Province and its adjacent Guangdong region, Shantou City. The squid industries of two provinces have close relations despite belonging to separate administrative precincts. Therefore, they should be considered as an integrated region, functioning as an intensive industry in terms of squid processing, especially for Loligo species.
Detailed information on the predominant countries or regions in each province that have been the destination of squid exports in recent years is provided in Tables 8 to 12.

Note the total exports reported in the last row of each table include other lessor export destinations.

**Table 8. Exported squid from Liaoning Province (tons).**

<table>
<thead>
<tr>
<th>Country or region</th>
<th>Year</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>13,777</td>
<td>15,025</td>
<td>14,370</td>
<td>12,697</td>
<td>13,044</td>
</tr>
<tr>
<td>European Union</td>
<td>1,752</td>
<td>3,092</td>
<td>3,710</td>
<td>5,878</td>
<td>5,045</td>
</tr>
<tr>
<td>South Korea</td>
<td>1,878</td>
<td>1,380</td>
<td>1,911</td>
<td>2,511</td>
<td>4,461</td>
</tr>
<tr>
<td>US</td>
<td>3,431</td>
<td>2,556</td>
<td>3,937</td>
<td>3,153</td>
<td>4,132</td>
</tr>
<tr>
<td>Russia</td>
<td>832</td>
<td>1,362</td>
<td>1,392</td>
<td>1,391</td>
<td>1,079</td>
</tr>
<tr>
<td>Brazil</td>
<td>250</td>
<td>110</td>
<td>106</td>
<td>326</td>
<td>1,046</td>
</tr>
<tr>
<td>Canada</td>
<td>17</td>
<td>64</td>
<td>214</td>
<td>125</td>
<td>163</td>
</tr>
<tr>
<td><strong>Total 2016 exported squid from Liaoning</strong></td>
<td><strong>23,739</strong></td>
<td><strong>24,573</strong></td>
<td><strong>26,991</strong></td>
<td><strong>28,334</strong></td>
<td><strong>30,329</strong></td>
</tr>
</tbody>
</table>

**Table 9. Exported squid from Shandong Province (tons).**

<table>
<thead>
<tr>
<th>Country or region</th>
<th>Year</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>39,474</td>
<td>46,613</td>
<td>43,163</td>
<td>42,562</td>
<td>44,179</td>
</tr>
<tr>
<td>European Union</td>
<td>14,960</td>
<td>21,388</td>
<td>19,117</td>
<td>17,792</td>
<td>23,004</td>
</tr>
<tr>
<td>US</td>
<td>9,397</td>
<td>10,915</td>
<td>12,341</td>
<td>11,383</td>
<td>13,351</td>
</tr>
<tr>
<td>Australia</td>
<td>8,815</td>
<td>11,110</td>
<td>11,122</td>
<td>10,817</td>
<td>12,940</td>
</tr>
<tr>
<td>South Korea</td>
<td>4,688</td>
<td>4,038</td>
<td>5,521</td>
<td>5,070</td>
<td>10,907</td>
</tr>
<tr>
<td>Morocco</td>
<td>2,208</td>
<td>2,051</td>
<td>2,958</td>
<td>3,435</td>
<td>3,225</td>
</tr>
<tr>
<td>Canada</td>
<td>1,744</td>
<td>2,186</td>
<td>2,379</td>
<td>2,175</td>
<td>3,189</td>
</tr>
<tr>
<td>Russia</td>
<td>8,675</td>
<td>12,591</td>
<td>14,484</td>
<td>9,916</td>
<td>2,924</td>
</tr>
<tr>
<td>Brazil</td>
<td>1,813</td>
<td>3,081</td>
<td>4,350</td>
<td>2,418</td>
<td>2,196</td>
</tr>
<tr>
<td><strong>Total 2016 exported squid from Shandong</strong></td>
<td><strong>117,378</strong></td>
<td><strong>142,361</strong></td>
<td><strong>146,474</strong></td>
<td><strong>133,155</strong></td>
<td><strong>139,498</strong></td>
</tr>
</tbody>
</table>
Table 10. Exported squid from Zhejiang Province (tons).

<table>
<thead>
<tr>
<th>Country or region</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>18,912</td>
<td>20,612</td>
<td>20,553</td>
<td>15,566</td>
<td>15,641</td>
</tr>
<tr>
<td>European Union</td>
<td>22,332</td>
<td>22,824</td>
<td>12,544</td>
<td>11,897</td>
<td>13,876</td>
</tr>
<tr>
<td>South Korea</td>
<td>1,311</td>
<td>1,199</td>
<td>1,250</td>
<td>981</td>
<td>2,881</td>
</tr>
<tr>
<td>Norway</td>
<td>220</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2,406</td>
</tr>
<tr>
<td>Taiwan</td>
<td>1,394</td>
<td>988</td>
<td>1,600</td>
<td>1,965</td>
<td>2,114</td>
</tr>
<tr>
<td>Thailand</td>
<td>229</td>
<td>932</td>
<td>821</td>
<td>2,944</td>
<td>1,822</td>
</tr>
<tr>
<td>Russia</td>
<td>3,647</td>
<td>4,386</td>
<td>2,973</td>
<td>2,001</td>
<td>1,444</td>
</tr>
<tr>
<td>South Africa</td>
<td>1,600</td>
<td>1,165</td>
<td>899</td>
<td>1,343</td>
<td>1,304</td>
</tr>
<tr>
<td>Malaysia</td>
<td>1,193</td>
<td>1,817</td>
<td>1,106</td>
<td>1,550</td>
<td>1,241</td>
</tr>
<tr>
<td>US</td>
<td>4,125</td>
<td>2,602</td>
<td>2,647</td>
<td>1,241</td>
<td>1,202</td>
</tr>
<tr>
<td><strong>Total 2016 exported squid from Zhejiang</strong></td>
<td><strong>61,485</strong></td>
<td><strong>62,624</strong></td>
<td><strong>50,424</strong></td>
<td><strong>46,280</strong></td>
<td><strong>51,387</strong></td>
</tr>
</tbody>
</table>

Table 11. Exported frozen squid from Fujian Province (tons).

<table>
<thead>
<tr>
<th>Country or region</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thailand</td>
<td>6,109</td>
<td>23,760</td>
<td>49,355</td>
<td>88,600</td>
<td>62,470</td>
</tr>
<tr>
<td>Philippines</td>
<td>3,604</td>
<td>7,082</td>
<td>13,469</td>
<td>24,511</td>
<td>29,353</td>
</tr>
<tr>
<td>Taiwan</td>
<td>13,775</td>
<td>12,563</td>
<td>19,056</td>
<td>17,498</td>
<td>20,271</td>
</tr>
<tr>
<td>Europe Union</td>
<td>9,834</td>
<td>13,713</td>
<td>11,196</td>
<td>11,386</td>
<td>13,240</td>
</tr>
<tr>
<td>US</td>
<td>16,275</td>
<td>16,988</td>
<td>13,847</td>
<td>11,877</td>
<td>12,312</td>
</tr>
<tr>
<td>Malaysia</td>
<td>3,643</td>
<td>3,527</td>
<td>3,273</td>
<td>5,195</td>
<td>7,996</td>
</tr>
<tr>
<td>South Korea</td>
<td>67</td>
<td>225</td>
<td>3,969</td>
<td>782</td>
<td>6,891</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>12,564</td>
<td>10,999</td>
<td>11,793</td>
<td>6,738</td>
<td>6,445</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>280</td>
<td>1,769</td>
<td>2,882</td>
<td>5,529</td>
<td>3,734</td>
</tr>
<tr>
<td><strong>Total 2016 exported squid from Fujian</strong></td>
<td><strong>75,495</strong></td>
<td><strong>97,754</strong></td>
<td><strong>137,983</strong></td>
<td><strong>180,546</strong></td>
<td><strong>178,466</strong></td>
</tr>
</tbody>
</table>
Table 12. Exported frozen squid from Guangdong Province (tons).

<table>
<thead>
<tr>
<th>Country or region</th>
<th>Year</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>7,079</td>
<td>9,339</td>
<td>11,257</td>
<td>15,251</td>
<td>16,093</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>6,460</td>
<td>10,898</td>
<td>6,054</td>
<td>5,187</td>
<td>6,082</td>
</tr>
<tr>
<td>Europe Union</td>
<td>91</td>
<td>306</td>
<td>1,123</td>
<td>2,598</td>
<td>3,566</td>
</tr>
<tr>
<td>Canada</td>
<td>916</td>
<td>991</td>
<td>1,592</td>
<td>1,738</td>
<td>2,106</td>
</tr>
<tr>
<td>Taiwan</td>
<td>96</td>
<td>315</td>
<td>264</td>
<td>253</td>
<td>485</td>
</tr>
<tr>
<td>Philippines</td>
<td>-</td>
<td>248</td>
<td>-</td>
<td>26</td>
<td>447</td>
</tr>
<tr>
<td>Macao</td>
<td>276</td>
<td>446</td>
<td>394</td>
<td>380</td>
<td>348</td>
</tr>
<tr>
<td>Mexico</td>
<td>422</td>
<td>513</td>
<td>317</td>
<td>195</td>
<td>215</td>
</tr>
<tr>
<td><strong>Total 2016 exported squid from Guangdong</strong></td>
<td><strong>15,827</strong></td>
<td><strong>25,334</strong></td>
<td><strong>21,804</strong></td>
<td><strong>26,323</strong></td>
<td><strong>26,323</strong></td>
</tr>
</tbody>
</table>

For the U.S market, the exported squid species present distinctive geographic difference in China. Liaoning and Shandong provinces mainly export JFS and re-export processed longfin inshore squid (Loligo pealei) to US markets. Several Loligo species (e.g. common Chinese squid (U. chinensis), swordtip squid (U. edulis) and Indian squid (U. duvaucelli) are the primary squid species exported to the U.S. market from Guangdong and Fujian Provinces.

It is interesting to note that the large, recent increases of total Chinese squid exports to Thailand and Philippines shown in Table 6 and 7 appear to be associated with Fujian Province only, the province where increases of imported squid from Indonesia have also been received in recent years. There also could be some association with increases in DWF landings made there.

The key landing region for squid in northern China is mainly in Shidao of Weihai City in Shandong Province, while in southern China, the main landing regions are in Zhoushan, Xiangshan and Wenling of Zhejiang Province. The processing industries are well developed in these regions, providing convenient access and flow into squid processing enterprises in those areas. As a result, squid landings in these regions are prioritized to flow into processing and export enterprises as raw materials.

With a growing domestic consumption market in China, local market shares of squid products are increasing as are the price of squid materials. It is noteworthy that Shidao attracts catch landings from a large number of Liaoning fishing vessels by advantage of having more purchasers of raw material, better industrialization and more diverse and stable marketing channels. By law, Liaoning fishing vessels are allowed to land catches in Shandong ports, as both Liaoning and Shandong are allowed to send fishing vessels into C1 Sea Zone of China.

Our investigation indicates in addition to meeting the demand of the local processing industry in Shandong, a significant number of Japanese flying squid are landed in Shidao and transported
to Zhejiang Province, where they are used as raw materials for processing and export enterprises. Some processors appear to be specializing in that type of procurement business for JFS, where these trans-provincial purchases are facilitated by brokers from Zhejiang who reside in Shidao to purchase raw materials. One of the factors for Shidao’s more abundant supply of JFS appears to be that it is the main landing area for Chinese squid fishing vessels operating in North Korea’s eastern coastal area.

### 3.3 China’s likely JFS squid import trade

Given the known distribution and fisheries for JFS, Chinese imports of this species appear largely linked to South Korea, Japan and North Korea as the three main source countries. Although Japan ranks first in JFS harvest globally, China’s squid imports from Japan are far less than those it receives from South Korea. Chinese squid imports from South Korea to China were relatively stable from 2014 to 2016 at a little more than 22,000 tons. It should be noted that total squid imported from South Korea also include a considerable proportion of arrow squid (*Nototodarus spp.*) harvested by South Korea’s fishing vessels fishing under agreement in New Zealand’s EEZ, so South Korea’s specific export level of JFS to China is unclear given information collected in Chinese customs records.

Prior to 2016 China also had imported large numbers of JFS from North Korea. We attribute the sharp decline to be a result of international United Nations’ resolutions restricting trade with North Korea. As a result, North Korean imports are no longer considered a source of JFS that is capable of significantly supporting China’s squid processing capacity. At the same time some product flow of JFS from North Korean waters to China still continues via harvest by Chinese fishing vessels off North Korea’s eastern coast and shipped back/landed in China for processing.

China’s recent imports of squid from its three Asian neighbors can be found in Table 13.

**Table 13. Chinese squid imports from South Korea, Japan and North Korea (tons).**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>South Korea</td>
<td>18,466</td>
<td>42,625</td>
<td>24,006</td>
<td>23,467</td>
<td>21,841</td>
<td>15.3%</td>
</tr>
<tr>
<td>Japan</td>
<td>10,733</td>
<td>2,793</td>
<td>2,167</td>
<td>3,615</td>
<td>1,758</td>
<td>1.2%</td>
</tr>
<tr>
<td>North Korea</td>
<td>52,772</td>
<td>54,642</td>
<td>68,147</td>
<td>24,926</td>
<td>270</td>
<td>0.2%</td>
</tr>
</tbody>
</table>

**China’s total 2016 squid Imports**: 338,900 353,839 398,090 316,731 142,337 16.8%

Because the Chinese imports and processing of JFS from South Korea could create supply chain uncertainties/complications for current international markets sourcing JFS believed to originate from Chinese fisheries, we collated Chinese customs data to help assess future traceability needs with involved processors. That information is not presented in this report due to its potential commercial sensitivity.
4. Analysis of partner JFS supply chains

Analysis of FIP buyer partners’ supply chains provided important information for FIP design as well as key information to help companies identify supply chain uncertainties and potential risks with respect to JFS product traceability. While the company specifics are not appropriate for inclusion here, common elements and considerations related to JFS traceability are presented below as categorized four sectors: fishery, storage and transportation, processing, and export. For the cases examined thus far, aside from the fishery sector, all other supply chain components are controlled by Chinese suppliers from which buyer partners are procuring their export products, meaning that key suppliers typically maintain ownership of squid materials after their procurement from the fishery catch sector until sold and exported to FIP partners.

4.1 Trawl fishery supply sector

The largest portion of Chinese caught JFS in the FIP’s supply chain is sourced from paired trawl fishing vessels with registration in Shandong Province. These vessels can legally operate in the Yellow Sea region under jurisdiction of China, and in some cases via bilateral agreement with adjacent countries, some trawl vessels may have permits to fish in neighboring country waters (see further discussion below). Chinese supplier (processor-exporters) partners typically purchase trawl fishery squid materials offloaded at Shandong provincial fishery ports, commonly located in Rongcheng, using dealers or local purchase agents.

4.1.1 Landing - first purchase

Local agents work with local Shandong supply companies whom the exporter-processors have established cooperation and purchasing arrangements, who have communicated detailed procurement requirements by their international buyer partners. Since these agents may be securing product for a number of chains with varying sourcing requirements, the agents must insure that the requirements of FIP partners are being met via targeted purchases.

The local supply companies with whom processor-exporters have purchasing agreements may have a variety of arrangements with fishing vessels that directly supply JFS from the fishery. In some cases, the companies may own trawl vessels outright, wherein they can directly control fishing operations. In other cases, the local seafood companies provide certain services to fishing vessels for a trust management fee, such as undertaking vessel registration with the responsible agency and arranging for annual vessel inspections. These vessels may be nominally registered under the local company, but the relationship entails no direct control of fishing operations. A third relationship involves business cooperation agreements between the local companies and involved fishing vessels, which can include features like exclusive sales of fishery harvest, vessel equipment maintenance, providing supplies and making loans to vessels. Under these arrangements the local seafood companies take control of fishing harvest sales and transfers the income from landed catch to the owner vessel after deducting the cost and agreed profits.

4.1.2 Post landing materials storage

Trawl JFS catch in this fishery is quick-frozen into squid blocks onboard the fishing vessels, which are equipped with instant freezing capacity. The fishery’s storage portion of the supply
chain typically relies on the local seafood business from which the agents are purchasing products on behalf of FIP buyers’ processor-exporter partners. Practically this means that while the product has been sold, it is not yet directly controlled by the processor-exporters, who often may be located in other locations, such is the case with Zhejiang companies who have relationships with current FIP partners. The following scenario represents a typical pattern during the initial post-purchase storage phase.

Fishery catch is landed at the fishing port operated by the local seafood company, and then delivered to the freezer warehouse it owns where it is stored until shipped to the processor-exporter who now owns the product. In some cases, exclusive freezer space may be rented by the product owner, with the handover and inspection of fishery catch most often taking place by the owner’s agent at the freezer warehouse. Because of the unfixed arrival time of fishing vessels, processors headquartered in other parts of the country, cannot easily send people to supervise the catch offloading process. Whilst processor staff occasionally may observe some aspect of landings at the port, our interviews indicate this is not the standard location for taking legal ownership of the raw JFS materials. The processor-exporter then transfers product to its facilities via refrigerated lorries for further processing and export.

As a practical matter, there can be no advance assurances, when vessels land at port, that all the squid from a specific vessel’s catch will be purchased as part of an order to meet the processor-exporter’s needs. The agent’s inspection of product to ensure it meets quality and other purchase specifications occurs at the cold storage facility, where buyer relies on the local seafood company to deliver product and also arrange the buyer to receive specific information on the product, such as vessel trip reports, if required by the international buyer, once purchases are finalized. As noted above, the local seafood company only has operational control over the few vessels it might own, so procurement requirements for some factors controlled by the vessel captain, such as if particular areas fished were specified cannot be independently verified under the current circumstance; however, it is noteworthy that this verification has been a particular objective that has been explored during a portion of the FIP scoping activities.

Regarding product traceability in the freezer warehouse, the owner of the storage space has actual product control, though the processor-exporter who owns the product usually would have specific storage space allocated for owner labelled pallets of product. The potential uncertainty here is not chain of custody once the product is received and labeled at the warehouse but the verification that the product originates from vessels fishing according to potential specifications of the international buyer for whom the product is ultimately destined, such as areas and times fished, which ideally would require product labeling at sea and independent verification of fishing activities.

4.1.3 Processing and export

The further processing of JFS products for export occurs once the materials are transported from Shandong to the processing plant, which as noted above may involve transport to another province. The processor-exporter would be responsible for maintaining product segregation and traceability under its control at this stage as assurance to their international buyers to meet specific sourcing specifications.
4.2 JFS purse seine supply chain (Zhejiang)

While the purse seine gear component of the Chinese domestic JFS fisheries is not an initial focus of the planned FIP, in some cases international buyers may have small elements of their overall import that originate from seine vessels. Our scoping indicated that involved vessels registered in Zhejiang province fish on the Zhoushan and Changjiangwai fishing grounds, located in the East China Sea region under jurisdiction of China (see Figure. 3), and delivery of this catch relies upon transshipment vessels to land JFS primarily at the fishing port of Zhoushan. This JFS harvest is chilled as fresh catch onboard since the purse seiners do not have instant freezing capacity.

The main JFS fishing season for purse seine vessels in Changjiangwai fishing ground is from 1 August to early September, as the summer fishing moratorium for these purse seine vessels is from 1 May to 31 July, allowing it to open a month earlier than JFS trawling in Shandong province. After that approximate month of JFS fishing, these purse seine vessels shift to target other species, as JFS have migrated north out of the fishing grounds in the East China Sea.

4.3 JFS gillnet supply chain (Shandong)

Some FIP partners may source some of their export requirements from the drift gillnet component of Chinese domestic fisheries, by vessels registered in Shandong province and operating in the Yellow Sea region under jurisdiction of China. Typically, JFS harvested by gillnets are damaged during the fishing operation, with the main damage being to the squid’s fins when they are tangled in the net. Specifically, when squid are removed from the net, often the fin will be torn from the squid’s body. There is can be some advantage to the processor in purchasing these gillnet JFS materials since their main final product is squid ring, which does not require the fin. Sourcing raw squid from the fishery without fins actually increases the yield rate of the final products, thus representing a helpful cost savings for the processing business.

The flow of raw materials is as follows: harvested whole squid get offloaded at the local port of Shidao from the fishing vessels, and then are transported to a local processing plant to be processed into preliminary products called ‘clean squid body’. This product is transported to the purchasing company for final processing.

Figure 10. Map released by the Japanese government showing EEZs (in aqua) and co-managed fishing zones (green and pink). The Chinese government has not released a precise map of the EEZ it claims.
4.4 Further analysis of Chinese JFS trawl fishery based in Shandong

The coastal fishing fleet of mechanized engine trawlers registered in Shandong province can only operate in the permitted areas of the north Yellow Sea Zone (C1 Sea Zone), within the area northward to 35° N Latitude in the Yellow Sea, within boundaries permitted for motorized trawl, and under the jurisdiction of China. They are unable to operate outside these areas. An exception is that some coastal fishing vessels of Shandong province, through agreements between Chinese and adjacent countries, can harvest JFS outside of Chinese jurisdiction with specific Chinese government issued permits.

Outside of China’s EEZ, offshore trawlers harvest JFS in the East China Sea, Yellow Sea, and Sea of Japan, in areas co-managed with Japan and South Korea through bilateral agreements (Figures 10 and 11a and 11b). For example, Chinese vessels have obtained fishing rights in central and southern areas within the Sea of Japan (36°N~39°N, 132°E~136°E), and off the east coast of North Korea in the northwestern Sea of Japan. The Chinese government does not release details about these agreements, though some information about these fisheries is known. In 2015, the agreement between China and Japan permitted 58 Chinese squid vessels (55 fishing vessels and 3 transport vessels) to operate in Japan’s EEZ and catch 4,141 mt of squid, most of which was likely winter stock JFS harvested by jigging in November and December (JFA, 2015). Some Japanese vessels were also permitted to operate in China’s EEZ, but details about their squid fishing activities were not described. The fishery off North Korea targets a JFS fall stock from May to November, with peak fishing occurring from July to September, likely using bottom and/or midwater trawls. The annual catches fluctuate but are quite large, on the scale of thousands of metric tons (Song et al. 2008b).
Figure 11 a and 11b. Detailed maps of co-managed fishing zones, colored medium blue, in the Yellow Sea (top) and East China Sea (bottom). The Yellow Sea zone is co-managed by China and South Korea, while the East China Sea zone is co-managed by China and Japan. Source: Zhang, F., pers. comm. 03/18/2016.

Additional information about these activities can be within the following categories is summarized below:

- South Korea’s EEZ under South Korean jurisdiction (Yellow Sea);
- Japan’s EEZ under Japanese jurisdiction (Sea of Japan); or
- North Korea’s EEZ under North Korean jurisdiction (Sea of Japan).

4.4.1 South Korea

Under the Fishery Cooperation Agreement between China and South Korea, authorized Chinese fishing vessels can fish in South Korea’s EEZ within the Yellow Sea under South Korea’s jurisdiction, where JFS can be harvested through trawl and purse seine. Under this agreement, Chinese trawlers currently have an annual quota limit of 37,628 tons of all species catch, of which JFS is one species and accounts for a proportion of the Chinese trawl quota. Similarly, the annual all species quota set for Chinese purse seiners is 8,299 tons, so again JFS represents a portion and the agreement requires that mackerel catches should be less than 95% during purse seine operation. Despite no reliable data being available for the JFS catch harvested by Chinese vessels in these areas, this product theoretically cannot exceed the sum
of the two quotas. Authorized Chinese seiners are allowed to operate for the whole year in this Yellow Sea area north of 47° N latitude, while they are prohibited to operate from 1 May to 1 September south of this latitude.

4.4.2 Japan

According to the Fishery Cooperation Agreement between China and Japan, authorized Chinese fishing vessels are allowed to operate a jig fishery for squid in the Sea of Japan under Japan’s jurisdiction. The permitted time is during the fourth quarter every year, from 1 October to 31 December. In 2017, 47 Chinese fishing vessels obtained permits to fish squid under this agreement, with JFS as the target squid species. The total squid quota for Chinese fishing vessels is 3,520 tons and the China Overseas Fisheries Association oversees vessel qualification permits for this fishery.

4.4.3 North Korea

North Korean civil fishing companies or fishing organizations are authorized to make arrangements with Chinese fishing companies to fish in marine waters under North Korean jurisdiction in the Sea of Japan. Authorized fishing vessels have the option to operate in both Chinese and North Korean waters. According to the interviews with fishermen and boat captains, the characteristics of the two types of fishing vessels capturing JFS is depicted in Table 14.

Table 14. Chinese coastal JFS fishing vessels in Shandong by legal season and area.

<table>
<thead>
<tr>
<th>Qualifications</th>
<th>Fishing season A (March to April)</th>
<th>China fishing closure season (1 May 1 - 31 August 31)</th>
<th>Fishing season B (1 September to traditional New Year, ~ early February)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common fishing vessels</td>
<td>Jurisdiction of China (C1 sea zone)</td>
<td>Tied up on fishing port of vessel registration</td>
<td>Jurisdiction of China</td>
</tr>
<tr>
<td>Fishing vessels permitted in North Korea</td>
<td>Jurisdiction of China (C1 sea zone)</td>
<td>Move to Sea of Japan under North Korea jurisdiction</td>
<td>Round trip fishing activity between Jurisdiction of China and Sea of Japan</td>
</tr>
</tbody>
</table>

In China, the fishing operation of Chinese vessels in the Sea of Japan under North Korean jurisdiction is known as Fishery Affairs and occurs in marine areas off North Korea’s east coast. Since 2016, based on the non-governmental cooperation among private fishing companies or fishery cooperatives between two countries, certain Chinese fishing vessels are allowed to continue fishing in this sea area. Currently, such Chinese fishing vessels are mainly large vessels with freezing and refrigeration capacity from Shandong Province. The main target species include JFS, and fishing operations are conducted during China’s summer fishing closure season. However, no reliable catch statistics are collected for Chinese vessels in this area. Interviews from our scoping work indicate that Chinese fishing vessels continue fishing in North Korean waters, targeting JFS squid during May to August.
4.4.3.1 Seasonal characteristics of Chinese vessels in North Korea

These fishermen follow the same pattern of activity through April, but during the 1 May to 31 August summer closure, these fishing vessels go to Sea of Japan under the jurisdiction of North Korea. Their catch during this summer period is delivered back to China by transshipment vessels. From 1 September, they can choose to stay in Sea of Japan under the jurisdiction of North Korea or return to coastal areas of China. Some may fish in September and early October in China’s EEZ and then go back to North Korean waters after mid to late October when JFS have mostly migrated to areas east of 124° E Longitude, which are located in South Korea’s EEZ. As noted earlier Chinese vessels can only fish in South Korean waters with a special permit.

Theoretically, there are only two prime months after the summer closure (September and October) for coastal fishing vessels of Shandong to capture JFS that meet European market preference for size, as after mid-October the species migrates into South Korean waters and by then they tend to exceed 120 grams (g) in size. As for fishing vessels that are authorized to fish in the Sea of Japan under North Korean jurisdiction, they are able to operate cyclically between the northern Yellow Sea and the Sea of Japan.

4.4.4 Role of transshipment vessels and transshipment at sea

The trip duration of Chinese coastal squid fishing vessels varies according to storage capacity on board and target species. Large pair trawlers fishing JFS in coastal China seas can stay at sea for 15 to 20 days before voyaging back to Shidao Port with frozen squid by virtue of freezing and refrigeration facilities on board.

They typically have little dependency on transshipment vessels, as their trip times are usually short, unless there is a very abundant fish season. Circumstances changed to some extent in 2017, however, due to the lengthening of the summer fishing closure period in the Yellow-Bohai Sea Zone, extending it to four months, causing the fishing season of JFS to be reduced from 4 ½ to 3 months, and again for a very limited window for the Shidao fleet since May JFS distribution is further south.

This changed operational plans for fishing vessels trying to compensate for lost fishing time by spending longer trips at sea, and as a result, significantly increased use of transshipment vessels to ship catches back to landing ports, rather than the fishing vessels landing their catches to shore directly.

As for Chinese fishing vessels fishing in Sea of Japan under North Korea’s jurisdiction, they usually rely on transshipment vessels to transport catches and for obtaining periodic supplies. The operational cycle of each vessel is based on their independent decision and particular context so there is no uniform rule.

There are two types of maritime transporters. One is the purchasing-transshipment vessel, which directly purchases catches from fishing vessels as an independent dealer. In this case, transshipment at sea is also the process of transferring ownership of catches. Those kinds of vessels are in small quantity in this area. The other type is a contract transporter, which receives orders from parent companies or ship owners, and transships catches at the agreed or appointed location at sea, while also providing daily supplies to fishing vessels as a logistics
Each contract transporter, usually coordinated by the ship’s owner company, collects catch from multiple fishing vessels and transships their catches back to port. This is the main business mode for China’s fishery transshipment vessels.

4.4.5 Potential challenges for meeting area fished purchase specifications
Field investigations conducted at Shidao fishing ports from September to November 2017 identified uncertainties and potential risks within the JFS supply chain as related to verifying the area of origin for landed JFS catch, which has importance to any FIP partners that require catch area specifications. While we do not have independent vessel fishing area information or other direct evidence to verify the extent to which some of these challenges present risks within FIP partner supply chains currently, the uncertainties do exist and they have been categorized below.

Challenge #1: Summer Moratorium
An inherent challenge in the JFS fishery is that the summer fishing moratorium from May until August precludes Chinese fishing vessels from fishery access to JFS when they are at optimal abundance and market conditions within the Chinese EEZ. This creates a negative incentive and risk for illegal, unreported and unregulated fishing (IUU). Specifically, we learned that at least some vessels fished for JFS in China’s Yellow Sea during the summer closure and shipped catches back to a fishing company’s freezer warehouse in August 2017. The respondent interviewed mentioned that higher economic return stimulated a number of fishing vessels to operate during the closure period due to favorable squid resources and increasing market price. It is unquestionable that this operation is defined as IUU fishing. However, there appear to be no enforcement measures in place to address JFS fishing during the moratorium, either at sea or with respect to verification of legal product landed by via transshipment. Furthermore, the optimum aggregation of JFS in waters off Shidao-Rongsheng is during July and August, both in terms of abundance and size of squid being in the small-medium size range often preferred for export markets. During May and June, similarly favorable abundance and size occurs in waters off Zhoushan where a number of JFS processors are located. In both cases, these circumstances combined with the timing of the summer fishing moratorium create incentives for illegal JFS fishing, which could potentially enter export supply chains.

Challenge #2: Chinese catches harvested in Sea of Japan waters of North Korea
As mentioned above, the source of JFS also can potentially originate from North Korea’s Sea of Japan fishing areas. The involved vessels can operate flexibly as discussed above, being able to harvest JFS in both the Yellow Sea and North Korea’s Sea of Japan, using transshipment vessels to unify all their catches before shipping them back. Given the fact that there is no requirement to label or separately store catches at sea in these separate Chinese and North Korean waters, the catches from each harvest zone are less likely to be distinguished and identified to trace their sources. Since small and medium sized JFS in Chinese waters are in short supply due to the summer closure, there is a risk that small and medium sized squid harvested in Sea of Japan could enter into buyer’s supply chains. It should be noted that in this case, the Chinese government presumably considers catches from North Korean waters under bilateral agreement are taken during legally open fishing periods. However, it is clearly
understood that certain international buyers have very clear purchase specifications that no catches from North Korea must enter their supply chain. Verification to differentiate the catch at sea from different fishing areas remains a challenge that needs to continue to be addressed through the planned FIP.

**Challenge #3: Catches involving transshipment at sea**

It is difficult to trace the source of catches when transshipment at sea is involved, for similar reasons outlined in the preceding discussion. Since the implementation of the lengthened summer fishing moratorium, the increased use of transshipment by Chinese vessels in its Yellow Sea to maximize fishing time increases transshipment and thus the proportion of catch whose provenance becomes more difficult to verify for individual vessels.

**4.4.6 Possible management approach to address domestic JFS fishery interests**

On a longer-term basis, Chinese JFS fishery improvement efforts have the potential to reduce the incentive for illegal fishing if a sustainable basis for re-opening all or a portion of the summer fishing ban for JFS is developed. For instance, if total allowable exploitation controls and fishing practices were demonstrated or modified to ensure a targeted harvest of JFS in Chinese waters during the summer when they are at optimal availability and market size, with effective monitoring and accountability measures in place, a strong rationale could be developed to influence current regulations, optimizing both biological and market benefits and reducing IUU incentives. Our project research partners at Shandong Marine Resource and Environment Research Institute (SMRERI), who provided JFS fishery monitoring services in 2017, have been actively advocating a special JFS permit to allow JFS fishing during the current summer closure period.

**4.5 Vessel fishing area verification**

As noted above, our scoping work has suggested considerable uncertainty surrounding the veracity of area fished information for Shandong landed JFS squid in the export supply chain, and specifically whether catches entering that supply chain are from the Chinese EEZ. Ultimately, the most direct route to verify this information would come from the Chinese government’s vessel monitoring system (VMS) requirements. However, at this stage of the project’s development, we have not yet reached a point of sufficient government engagement and support to reach the ultimate stage of an effectively functioning fishery monitoring system. Transparently highlighting activities of fishing vessels that operate in a largely unmanaged environment presents reputational risks to the government, as well as possible market issues, for instance, if false catch certifications were issued to comply with certain international import requirements.

During scoping, as an interim approach, we discussed two other avenues for verifying the catch locations of fishing vessels that supply FIP partners. First, we had hoped that our collaborating team from the SMRERI would be able to directly examine and confidentially analyze the government’s VMS records for vessels and trips reported as supplying FIP partners. But apparently the lack of government capacity and transparency presented the same impediments as direct government noted above.
4.5.1 AIS evaluation

As an independent option for acquiring vessel fishing tracks, O2 explored the possible use of the Automatic Identification System (AIS), which is globally used by many large vessels to track and monitor vessel movements and originally developed to support vessel safety. Although vessels are not required to use AIS, most do and we endeavored to test its application through this scoping effort. O2 received a list of 14 vessels (seven paired trawl operations) selling into Sea Farms’ supply chain in 2016, which we used to assess the AIS as a tool since the 2017 vessel information wasn’t available until late February 2018.

We had the assistance of the European company Navama to test feasibility of collecting useful AIS vessel track information from what is reported to be an extremely challenging signal environment. The areas fished in 2016 for 14 vessels (seven paired trawlers) that made 30 individual vessel landings associated with 15 fishing trips, as reported on completed vessel trip reports, are shown in Figure 12. Navama’s analysis sought to independently verify the 2016 area fished information. The search spanned January 2010 through mid-January 2017 in an effort to test the fundamental question whether vessels could be located in the database and if so, whether their signal quality would be sufficient to support independent verification of vessel fishing areas.

Navama could only identify two vessels that had provided catch reports and concluded that reception quality was poor in general. They advised that questions regarding the data would limit the utility of restricting the analysis to a shorter timeframe, and we concluded these limitations made it not worthwhile to explore AIS data from additionally collected, 2017 voluntary vessel reports. At least two main issues appear to be at play regarding poor quality of signal reception that may be particular to this Chinese application. First, the type of equipment being

---

6Note that Figure 12 contains information on areas fished as reported voluntarily by vessels for both 2016 and 2017 but only 2016 information was available at the time that the AIS evaluation was conducted.
used by Chinese vessels in the fishery, if they are equipped with AIS, may be a key factor. Of the two types of AIS systems – Class A and B – the former transmits stronger signals that satellites can consistently detect, while the latter class is very different and typically transmits signals that are only reliably detected by land-based receivers. The signal detection by an international provider from this region would need to rely on satellites.

The second potential issue is that regardless of signal strength related to the AIS system class, the sheer volume of vessel traffic known to occur in Chinese waters can overwhelm satellite reception. Finally, there also could be simple quality issues with the specific AIS devices used by Chinese vessels in this fishery (as related to ‘external reception’) or the vessels might inconsistently be using their AIS equipment, if installed.

4.5.2 Future verification efforts

FIP work plan development for Chinese JFS fisheries necessarily will include a strong component of on-water area fished verification. Independent vessel monitoring approaches, combined with reliable labeling of product batches at sea, ultimately would be needed to provide high certainty. Observers could supplement this information, but it is unlikely that 100% fleet observation is a realistic long-term goal from a cost-effectiveness standpoint.

Options for remote vessel location tracking include: (1) an improved application of the AIS technology described above (believed to be least promising); (2) collaboration with vessel captains on application of low-cost GPS positioning devices in combination with mobile phone transmission (e.g. GSM and satellite networks); and (3) VMS, the transparent access to which would be the ultimate goal in this fishery. In many other countries, where VMS is required within fishery management regulations, vessels obtain equipment and service through private vendors. And while they transmit this data to government management authorities, they have the capacity to voluntarily share their VMS data as they chose. Our understanding in the Chinese case is that the VMS system is owned and operated by the government, so the sharing of this information by vessels would need to be authorized or provided via government agencies.

In all cases one or more stepwise solutions to address this verification likely will require a transparent commitment by vessels and fishing companies that ultimately participate in the FIP and/or feed associated supply chains. Voluntary systems could be workable while longer-term transparency of VMS data is achieved. FIP work planning will need to include first year measures for stakeholder engagement, education and technology testing.

5. Fishery sustainability performance

In conjunction with O2’s 2016 pre-assessment for the JFS fishery we summarized performance status of the fishery (Table 15). The pre-assessment examined available but limited information primarily related to trawl gear in the northern East China and southern Yellow Sea, while recognizing that picture was significantly affected by data deficiencies.

Table 15. Summary of draft scoring category outcomes for East China Sea and Yellow Sea Japanese flying squid scoring categories - number of scorable PIs by performance category for within each MSC Principle.
### In addition to the important fishing area verification objective discussed in Section 4, our 2017 scoping investigations endeavored to examine whether there were notable differences from the 2016 pre-assessment and analyses related to a shift in geographic focus to more northerly areas of China’s Yellow Sea, as such, differences could have a bearing on future FIP action plan design. Our additional scoping through this project has concluded that O2’s previous assessment of performance and recommendations for the Chinese trawl JFS fishery improvement needs have not materially changed as a result of the fishery shifting northward more exclusively into the Yellow Sea as a result of the extended summer fishing moratorium.

#### 5.1 Pre-assessment and fishery improvement need by MSC performance indicator

As a foundation for Chinese JFS improvement efforts, based on the 2016 pre-assessment and subsequent scoping, a summary of fishery improvement needs by MSC performance indicator is provided in Table 16. Potential timeframes have been included in this summary (short, medium and long) as being generally indicative of the relative amounts of time that might be needed to address different issues if actions were undertaken. While these timeframes are not intended to be precise specifications, one could use the following as a general guide for this discussion: short = 0 to 3 years; medium = 3 to 6 years; long over 6 years.

It is important to note these recommendations are not intended to constitute an action plan but rather highlight issues needing to be addressed to meet the MSC standard performance. The anticipated approach to developing a fishery improvement work plan is one of active engagement and co-design with involved stakeholders. A detailed 5-year work plan to address these issues, as Phase 1 of a Chinese JFS fishery improvement effort is being separately developed.

With the decline of coastal fishing resources, JFS in Yellow and East China Seas have become an increasingly important fisheries resource. The annual harvest of JFS in the late 20th century experienced continued growth, with the formation of a large-scale fishing industry somewhat exclusively focused on this species. At the same trawl gear has less gear selectivity than some
other squid gear such as jigging. Though bycatch\(^7\) appears to be a relatively modest portion of the overall landings in this JFS fisheries, the non-selective characteristics of trawl gear is a key factor in current regulatory approaches like the summer fishing moratorium and can limit the flexibility for more tailored management. As noted above, JFS has a short lifespan, fast growth, is widely distributed (seasonally) in China EEZ, has high economic value and lacks active biomass assessment or a surrogate measure of stock status in real time. These factors all contribute to the significant need for improved and specific management measures for improving the selectivity and sustainable utilization of JFS.

Table 16. Fishery improvement needs for Chinese trawl fisheries on Japanese flying squid, based primarily on O2’s 2016 pre-assessment of the fishery.

<table>
<thead>
<tr>
<th>MSC Principle/Performance Indicator</th>
<th>Fishery improvement need &amp; other comments</th>
<th>Expected timeframe for improvement(^8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principle 1 – Target Species</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PI 1.1.1 - Stock status(^9)</td>
<td>There is considerable uncertainty about stock status of JFS in the East China and Yellow Seas, in large part because the fisheries management system does not regularly monitor or assess stocks. To obtain a passing score for this PI, some abundance estimates or indices of JFS will be needed. Alternatively, a surrogate assessment and management approach for this short-lived species will be needed to ensure maximum sustainable yield (MSY) objectives can and are being met. Additionally, PI 1.1.1 scores can be affected by management approach and results of other national jurisdictions, which can affect overall status of this transboundary stock.</td>
<td>Short to long</td>
</tr>
<tr>
<td>PI 1.1.2 – Rebuilding plan</td>
<td>Given the uncertainty about JFS stock status in the Yellow and East China seas, which should be resolved through further risk assessments and/or stock assessment surveys, it is not yet clear whether a rebuilding plan is currently necessary. A FIP work plan needs to resolve this uncertainty and accommodate the potential need for a rebuilding strategy.</td>
<td>Short to long</td>
</tr>
<tr>
<td>PI 1.2.1 - Harvest strategy</td>
<td>Lack of a well-defined, precautionary harvest strategy is a clear risk in this fishery, although the current summer moratorium period has limited harvest access by Chinese vessels to JFS in the Chinese EEZ due to seasonal migration characteristics. The fishery requires a harvest strategy that is responsive to stock status and will help maintain stock abundances around MSY, though as a species with a 1-year life history, this strategy may be tailored to surrogate MSY approaches. The FIP effort will need to work with the fishery management system to develop such a strategy. Because the Chinese fishery managers will ultimately be responsible for implementing this strategy and there is no structured management system currently in place, including catch and biological data collection from the fishery, this is likely to be a long-term activity with need for interim milestones.</td>
<td>Long</td>
</tr>
<tr>
<td>PI 1.2.2 - Harvest control rules and tools</td>
<td>No specific harvest control rules (HCR) or tools exist for Chinese JFS fisheries that adjust exploitation levels or rates in response to stock status indicators. These ultimately need to be developed in concert with the Chinese fishery management system. Again, these could be developed in the context of surrogate MSY approaches consistent with the species’ short-lived life history and productivity.</td>
<td>Long</td>
</tr>
<tr>
<td>PI 1.2.3 - Information and</td>
<td>Some information is available on stock structure and fleet composition, but to fully support the harvest strategy, better monitoring of stock abundance and</td>
<td>Short to long</td>
</tr>
</tbody>
</table>

\(^7\)Bycatch is used in this report synonymously with secondary species catch during the JFS targeted fishery. None of this secondary catch is currently discarded – all is landed and sold.

\(^8\)Short = 0-3 yrs; Medium = 3-6 yrs; Long = > 6 yrs

\(^9\)Green = > 80; Yellow = 60-79; Red = < 60 (MSC scoring system)
monitoring harvesting (from all sources of fishing mortality) is needed. Regular monitoring of appropriate abundance indicators, or indicators of reproductive success (e.g., proportion of the stock escaping the fishery to spawn) will be needed to support implementation of HCRs and assess population status.

| PI 1.2.4 - Assessment of stock status | This PI automatically scored as an unconditional pass as instructed by MSC’s risk-based assessment methodology, which was used in the pre-assessment, when PI 1.1.1 receives a conditional pass or higher. From a management perspective, however, given the sheer data deficiencies in the system, some stock assessment estimates or indices related to stock size will ultimately be needed to provide an evaluation reference for the management system. This is especially true with respect to detecting low population thresholds. While immediate work on this is possible, establishment of methods will require several years of data. | Short to long |

**Principle 2 - Ecosystem**

| PI 2.1.1 | By MSC definition, there are no primary species in the fishery |
| PI 2.1.2 | By MSC definition, there are no primary species in the fishery |
| PI 2.1.3 | By MSC definition, there are no primary species in the fishery |

**PI 2.2.1 - Secondary species outcomes**
The pre-assessment identified three secondary species that may be encountered with some frequency and medium risk: largehead hairtail, spinyhead croaker, and chub mackerel, based on limited data. Additional information from the trawl fishery off Shandong Province suggests that other species such as Japanese Spanish mackerel and yellow croaker may also be commonly encountered. The priority need will be to verify the species encountered and their proportion in the catch to see if any exceed a threshold level that would require demonstrating a high likelihood that they are above biologically based limits. Should purse seine vessels be included within the FIP, additional pelagic species encounters may occur, in which case a determination of whether they are main (MSC Criteria 2.1) or secondary species, and related improvement needs.

| PI 2.2.2 – Secondary species management | A partial harvest strategy does not exist beyond the general summer fishing moratorium. A specific partial strategy will be needed depending on clarification of any main and/or secondary performance issues based on catch and biological data collected. | Medium |

**PI 2.2.3 – Secondary species information**
Catch and biological monitoring of the fishery does not occur and as noted above establishing such data collection will be a very high priority for initial FIP work plan activities. This information will lead to a better understanding of specific improvement needs that may exist for outcome and management PIs for primary (purse seine) and secondary species (trawl, purse seine, other) if any.

| PI 2.3.1 – ETP outcomes | Trawls reportedly have minimal impacts on ETP species due to their slow operating speed, but impacts should be investigated further to verify whether this is the case. Purse seine fisheries could have additional issues in this regard. An encounter with a smooth hammerhead shark was documented in recent trawl landing observations. Documenting ETP encounters and further risk assessment are recommended needs. | Medium |

**PI 2.3.2 – ETP management**
According to Article 37 of China’s Fishery Law, “Killing and injuring of important aquatic wild animals protected by the State is prohibited.” However, the 2016 pre-assessment didn’t reveal evidence of more specific management measures aimed at reducing fishery impacts on ETP species. Management measures will need to be developed to minimize impacts of ETP species if they are demonstrated to be an issue.

| PI 2.3.3 – ETP information | Catch and biological data collection will be needed to better evaluate potential ETP issues and can be integrated with addressing similar needs for target, | Medium |

---

10 Scores for PIs 2.1.1 – 2.1.3 scored as >80 as by MSC definition, there are no primary species in the fishery.
The fishery reportedly uses midwater trawls, which should have minimal habitat impacts. However, the limited catch information available suggests that the trawls are used near the seafloor, where they would be more likely to physically interact with and harm seafloor habitats. This could be more if a potential issue during daytime trawling when JFS are oriented deeper in the water column. A better evaluation of habitat types and interaction will be needed to verify an acceptable outcome for habitat. Potential habitat impacts of purse seine gear would depend on water depths in which they are fishing, which will need to be documented.

To obtain a passing score for this PI, the fishery needs to develop a partial strategy for minimizing harm to habitats. This will be a greater challenge if the gear contacts the seafloor. The information obtained under 2.4.3 and better assessment of 2.4.1 will be importantly linked to information collected under 2.4.3.

Information for determining habitat risks from the unit of assessment (UoA) is lacking. To obtain a passing score for this PI, we suggest collecting quantitative information on main habitat types in fished areas, ideally including information on distribution and vulnerability of these habitats. Information on interactions between fishing gear and habitat will also be needed.

Insufficient information to assign a score without full risk assessment; although the impact of China’s harvest is probably unlikely to disrupt ecosystem structure and function, initial analysis to assess possible issues might involve comparing harvest to likely stock size and whether JFS has any key prey interrelationships with other species. Ideally this might be evaluated in the context of a structured risk assessment. As a precautionary approach until data or adequate risk assessment is available to score this PI we have assigned a <60 score.

While some evidence suggests the summer fishery moratorium has a positive impact on population densities, a partial strategy for restraining the fisheries impacts on the ecosystem within the UoA (potential FIP fishery area) is lacking. Such a strategy should be developed, which may include measures such as protection of vulnerable habitats or populations.

A broad understanding of key elements of the ecosystem and JFS’ role exist, but information regarding UoA ecosystem impacts has not been summarized or studied in detail. We suggest that monitoring catches of all target and non-target species area fished in the JFS fisheries will support a better understanding of the fishery’s potential impacts on local ecosystems within the UoA. A risk assessment related to PI 2.5.1 also would help indicate whether any specific or unique ecosystem data collection needs exist for this fishery.

The management system and associated local and national laws aimed at achieving sustainable fisheries appear limited in scope and insufficient for delivering outcomes consistent with MSC Principles 1 and 2. There is a dispute resolution framework, but it may not be transparent and effective. There is a need to work with relevant management authorities to better clarify the management and dispute resolution framework, and establish approaches for improving cooperation between management, fishers, and other stakeholders.

Roles of organizations and individuals involved in the management process are generally understood, although MCS-related roles are currently in the

---

11There is a general assumption in assigning long timeframes to all the management PIs that since no structured fisheries management system currently exists in China and that it will be a long-term prospect to fully establish one. At the same time given the top down nature of government authority in China, once decisions are made to reform, changes could occur relatively quickly. All future improvement efforts should make efforts to engage government fishery managers at provincial and central levels as fully as possible.
roles and responsibilities

process of being reformed and better defined. Input from stakeholders is solicited and taken into consideration. However, scientific recommendations are often ignored. Maintaining and acting on communications with fishery scientists is needed to develop practical measures for improving sustainability of fishing practices, including fishermen in the dialogue.

PI 3.1.3 - Long term objectives

There is limited evidence of a precautionary approach for fishery management. While the current, all-species summer fishing moratorium is certainly restrictive for JFS, that is an artifact of the closure being coincident with the timeframe JFS have prime availability within the Chinese EEZ. A more rational and specific precautionary approach will ultimately be needed for JFS (that provides reasonable fishing access to JFS), which a FIP could help motivate and inform. First clarifying long-term management objectives would be logical, and then considering how best to integrate precautionary management within the long-term plan framework.

PI 3.2.1 - Fishery specific objectives

Species-specific management is lacking, as are fishery-specific objectives consistent with MSC’s Principles 1 and 2. There is a need to work with relevant management authorities to establish and better understand management objectives, toward an outcome of develop and/or strengthen objectives.

PI 3.2.2 - Decision making processes

Decision-making processes respond to serious issues identified in research, but not in a timely, adaptive, and precautionary manner, as shown by the failure to implement greater restrictions on use of stow nets. A process is needed to provide fishery-specific information to stakeholders, and for considering and implementing scientific recommendations for the fishery.

PI 3.2.3 - Compliance and enforcement

Monitoring, control and surveillance (MCS) mechanisms appear to exist to a limited extent but are not completely effective. Fishermen comply with some regulations and are subject to sanctions when they violate regulations. However, evidence of compliance is needed. In addition, catch verification is limited. There is a need to develop and implement efforts that support increased compliance and catch verification, including obtaining better information on levels of compliance.

PI 3.2.4 - Management performance evaluation

There is some internal review of the management system, and research institutes may evaluate management policies. However, comprehensive external review is lacking. Regular, transparent internal and external review processes are needed.

Traceability

Scoping work suggests a current risk that IUU JFS could be entering the supply chain from catch taken during the summer closure or from other IUU outside China entering the supply chain via transshipment. Further some buyers have an objective to preclude from their supply chains Chinese vessel catch of JFS taken in North Korean waters under bilateral agreement or JFS landed in China through transshipments. Independent fishing vessel catch area verification and in plant traceability systems will be needed to address these issues with JFS supply chain traceability. Further a risk assessment would be suggested to evaluate the likelihood that imports of squid from South Korea may be mixed with Chinese domestic supplies of JFS, and to what extent such mixing might involve both JFS and arrow squid caught by South Korean vessels through bilateral agreement in New Zealand waters.

5.2 Further scoping considerations

5.2.1 Non-trawl gear

During 2017 scoping, we sought to understand possible differences in fishery characteristics, especially related to species composition in the catch, that might exist between purse seine and trawl gear, since there was some interest in including the former within the scope of the FIP. However, we were unable to answer this question during our scoping as timing of the Zhejiang...
Based seine vessels selling into a FIP partner’s supply chain precluded our ability to observe any transshipment offloads into Zhoushan.

Our current understanding of the purse seine fishery component is that it’s likely to be focused during nighttime hours when squid are more oriented to the upper water column and vessels use attraction lights to help concentrate schools of squid, and possibly other species, for harvest. While we don’t have specific information for specific activities on the seine fishing grounds referenced in Section 4, other MSC pre-assessments for purse seine using lights in Fujian Province indicate the fishery targets at multiple species, including blue scad (*Decapterus maruadsi*), sardines (*Sardinella aurita*) and Pacific mackerel (*Scomber japonicus*), with a bycatch mainly consisting of squid; mitre and JFS. While these Fujian fisheries are likely more oriented to nearshore fishing areas than vessels fishing in offshore feeding areas for juvenile JFS, it could be reasonable to expect the that the purse seine JFS fishery in the East China Sea could involve higher levels of ‘bycatch’ than that currently reported for trawl. At the same time, purse seine fisheries have the potential to selectively fish through release of non-target species, if necessary.

In the context of planning for a JFS FIP launch and implementation we would not anticipate any circumstances in the purse seine (or, for that matter, gillnet) JFS fisheries that would create any insurmountable improvement obstacles. For all JFS gears, the collection of catch and biological data is an extremely high priority as it underpins a large portion of other improvement actions. If or when there is future interest to expand the FIP’s scope to other gears, we believe any fishery differences would be quickly uncovered through FIP implementation, such as an improved understanding of species composition, so that any refinements in improvement needs and approaches could be developed accordingly.

### 5.2.2 Trawl fishery insights from scoping investigations

Additional sources of Yellow Sea JFS fishery data discussed below didn’t provide any indication that significant, new issues need to be addressed through JFS trawl fishery improvement efforts. For instance, the proportion of secondary species catch appears consistent with our previous assessment, and while the observation of the smooth hammerhead shark does confirm incidence of ETP species in the fishery, improvement needs outlined in Table 16 already address this potential issue. While comprehensive catch data will need to be collected as part of fishery improvement efforts and may uncover new information, there is no additional data that needs to be collected before design and initiation of a fishery improvement project. A summary of information from SMRERI’s 2017 investigative efforts also contains some recommendations on future monitoring that will be useful for FIP work plan design (Appendix A).

Qualitative information from limited 2017 fieldwork by indicated that bycatch species mainly consisted of Japanese Spanish mackerel (*Scomberomorus niphonius*), Japanese anchovy (*Engraulis japonicus*), Largehead hairtail (*Trichiurus lepturus*), and Pacific chub mackerel (*Scomber japonicus*). Additional species observed in the landings are contained in Table 17. Photographs of species observed are provided in Appendix B. The non-selective nature of trawl gear seems to be supported by the diverse species observed, which might be characterized as pelagic and benthopelagic.
Our examination of the 2016 and 2017 JFS vessel trip reports provided to Sea Farms from vessels selling into its supply chain indicated some of the same species landed as those in Table 17. It seems likely that the trip reports only contained the more common secondary species encountered in the catch, which from those 2016 and 17 records included largehead hairtail (ribbon fish), yellow croaker, Japanese Spanish mackerel and Pacific chub mackerel. The reported landed weight for each of these species from the 2016 and 2017 trip reports are presented in Table 18. It is commendable that Sea Farms has been able to work with its supplier to require voluntary trip reports for vessels landing JFS into its supply chain. But as with all voluntary fisheries information, these data should be considered primarily as indicative until the fishery can be observed on the water or quantitative fishery landing data can be comprehensively collected.

Table 17. Bycatch species observed in Japanese flying squid landings monitored by SMRERI in fall 2017 in Shidao.

<table>
<thead>
<tr>
<th>中文名</th>
<th>English Common Names</th>
<th>Scientific Name</th>
<th>ETP species</th>
</tr>
</thead>
<tbody>
<tr>
<td>蓝点马鲛</td>
<td>Japanese Spanish mackerel</td>
<td>Scomberomorus niphonius</td>
<td>No</td>
</tr>
<tr>
<td>日本鳀鱼</td>
<td>Japanese anchovy</td>
<td>Engraulis japonicus</td>
<td>No</td>
</tr>
<tr>
<td>带鱼</td>
<td>Largehead hairtail (or ribbon fish)</td>
<td>Trichiurus lepturus</td>
<td>No</td>
</tr>
<tr>
<td>日本鲐</td>
<td>Pacific chub mackerel</td>
<td>Scomber japonicus</td>
<td>No</td>
</tr>
<tr>
<td>银鲳鱼</td>
<td>Silver pomfret</td>
<td>Pampus argenteus</td>
<td>No</td>
</tr>
<tr>
<td>黄条鰤</td>
<td>Yellowtail amberjack</td>
<td>Seriola lalandi (prev. S. aureovittata)</td>
<td>No</td>
</tr>
<tr>
<td>鳀鲭鱼</td>
<td>Dolphinfish</td>
<td>Coryphaena hippurus</td>
<td>No</td>
</tr>
<tr>
<td>鳀鲭鱼</td>
<td>Yellow goose fish (or monkfish)</td>
<td>Lophius litulon</td>
<td>No</td>
</tr>
<tr>
<td>狭鳕鱼</td>
<td>Alaska pollock</td>
<td>Theragra chalcogramma</td>
<td>No</td>
</tr>
<tr>
<td>锤头双髻鲨</td>
<td>Smooth hammerhead shark</td>
<td>Sphyrna zygaena</td>
<td>cites II</td>
</tr>
</tbody>
</table>

Table 18. Species and landed weights recorded in 2016 and 17 voluntary JFS trawl vessel trip reports.

<table>
<thead>
<tr>
<th>Species</th>
<th>Reported landing weight (kg)</th>
<th>Ratio to JFS by weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2016</td>
<td>2017</td>
</tr>
<tr>
<td>Japanese flying squid</td>
<td>2,217,715</td>
<td>1,722,224</td>
</tr>
<tr>
<td>Largehead hairtail (or ribbon fish)</td>
<td>41,049</td>
<td>11,115</td>
</tr>
<tr>
<td>Yellow croaker</td>
<td>43,007</td>
<td>6,940</td>
</tr>
<tr>
<td>Japanese Spanish mackerel</td>
<td>3,789</td>
<td>5,690</td>
</tr>
<tr>
<td>Pacific chub mackerel</td>
<td>29,144</td>
<td>12,095</td>
</tr>
</tbody>
</table>

5.2.3 Issues and recommendations from 2017 monitoring

SMRERI endeavored to collect field data from the 2017 trawl catch in Roncheng but encountered some challenges. The vessels available to sample were limited, partly due to

12Species listed in Cites Appendix II are not yet endangered and can be traded with the appropriate permits.
lengthened trips motivated by the extended summer closure, resulting in very few sampling opportunities. Also, because of the September 1 opening and extended trip length, the first survey and associated sampling conducted did not occur until late September, when almost the main JFS the highest availability has already been observed. Furthermore, vessels encountered did not understand the purpose of the project, so they were reluctant to cooperate, for instance by recording and providing examination of the vessel logs.

SMRERI offered the following recommendations when considering future monitoring:

**Strengthen the communication with fishing vessel**

The limited communication with candidate fishing vessels led to a lack of understanding and cooperation. A special education program is needed for future project execution.

**Expand the number of candidate vessels to sample and train**

An expanded pool of 30 pairs of trawl fishing vessels would provide an improved likelihood of identifying fishing vessels to sample during the season. This larger potential supplier pool, when combined with an education and training program for vessel captains, would increase data collection cooperation, credibility and accuracy. Part of the training should include teaching captains to better collect fishery logbook data.

**Continue the effort to propose a specific fishing permit for JFS during the current summer fishing ban period**

By demonstrating responsible management in the fishery (such as verifiable catch area information, the ability selectively harvest JFS, and effective monitoring and compliance measures) a case could be made for allowing special access for squid vessels during the summer moratorium.

### 6. Stakeholder mapping and engagement

The fishery’s sustainability challenges and improvement needs outlined in Sections 4 and 5 cannot be overstated, and project planning to date has recognized an essential need to secure deep, active engagement of key stakeholders to motivate and support these efforts. This includes various levels of Chinese government; university science institutes; various associations of the Chinese seafood industry, including processors; Sea Farms Ltd. and its partners; other international seafood buyers; and NGOs.

#### 6.1 Key government management authorities

While the Chinese fisheries management system is not well advanced in terms of producing sustainable resource outcomes, the levels of national, regional and local management authorities are well established. The main and highest administrative body is the Fisheries Bureau under the Ministry of Agriculture and Rural Affairs (农业部渔业局, FBMOA). This governmental branch is responsible for broad national policy and, on behalf of the Central Government, sets overarching fisheries goals and objectives every five years in the form of a five-year plan. For instance, the thirteenth five-year plan recently issued for the period 2016 to 2020 established the intent to adopt fisheries management system reforms. The implementing approach has been to select a pilot demonstration fishery in each of five provinces, including...
Shandong and Zhejiang where Chinese JFS fisheries and processing are centers. While demonstration projects under this policy have been coined total allowable catch (TAC) pilots as shorthand, we believe their purpose is to trial a suite of fishery management measures that can achieve maximum sustainable yield (MSY) outcomes. O2 has worked with partner organizations such as Chinese Aquatic Products Processing and Marketing Alliance (CAPPMA) and government advisors to influence these decisions in an effort to align our emerging FIPs with government reform pilots. While we haven’t viewed this as essential for government engagement in fishery improvement efforts, it does provide certain advantages.

In the case of Zhejiang Province, it was the first to identify a national reform pilot in 2016, with the selection of highly iconic and domestically valuable Gazami swimming crab. For the Shandong Province we made attempts to influence a pilot decision through discussions with partners and government advisors. However, it quickly became clear that JFS would not be selected as Shandong’s pilot. First, the Province appeared to be motivated to select some species and fishery that would not present significant challenges or work to implement. Second, JFS does not have a high enough domestic value profile in domestic Chinese fisheries to generate immediate interest as a national fishery reform pilot. Initially, jellyfish were identified as the candidate pilot, and subsequent discussions have also involved mackerel. As a result, we believe that the most likely pathway to garner government engagement and support in the FIP will be through the efforts of a critical mass of industry partners highlighting the economic interests of China and its international reputation as drivers.

There are two important provincial fisheries management entities responsible for regional management of China’s JFS fisheries as described below.

### 6.1.1 Oceanic and Fishery Bureau of Shandong Province

This Shandong provincial bureau (山东省海洋与渔业厅) has main responsibility in the following areas:

1. Implementing marine and fishery laws, regulations, guidelines and policies, and drafting relevant local laws and regulations; and formulate the provincial marine and fisheries development planning, policies and organize the implementation.
2. Undertaking responsibility for marine economic operation, monitoring, assessment and information release; coordinating ocean affairs with other relevant departments; developing proposals to optimize marine economic structure and associated industrial adjustments; and being responsible for oceanographic and fishery economic statistics, accounting and information.
3. Regulating the use of sea areas and non-resident islands, including ecological protection; implementing associated planning systems for sea and island areas, such as systems for ownership management and paid-use, organizing preparation and implementation of provincial marine zone planning, island/coastal protection and utilization planning; administer sea boundaries, mainland coastline surveys and their management; and organizing/implementing dynamic observation and monitoring of provincial maritime islands.
4. Protecting the marine environment and ecological aspects of fishery waters, including
formulation of plans for remediation and standards for discharge (including control of total amounts); investigating, monitoring and evaluating the marine environment throughout the province; supervising discharge of terrestrial pollutants into the sea; protecting marine biodiversity and ecological environment, including supervising management of marine and fishery protected areas; and organizing implementation of major marine ecological restoration projects.

5. Formulating, organizing and implementing policies and measures to promote development of fishery production; guiding the shape of fishery industry structure adjustments; overseeing fishery breeding, proliferation, fishing and seed management; guiding cooperatives of aquatic products processing, distribution, marketing systems and fishery development; and implementing aquaculture disease prevention to protect endemic aquatic animals and plants, and related quarantine work.

6. Maintaining pre-warning systems and plans for marine disasters and associated prevention and mitigation of impacts for marine areas and fisheries; monitoring and forecasting of the marine environment, assessment of marine natural disaster impacts; responding to climate change in the field of oceans and fisheries; and supervising and managing fishery safety.

7. Supervising/administering quality and safety of aquatic products, including publishing relevant information, organizing monitoring and directing construction of quality systems for aquatic products; and managing for pollution-free aquatic products.

8. Implementing marine and fishery science and technology development plans; implementing comprehensive marine surveys; implementing energy conservation and emission reduction, high and new technology and applied technology research, transformation of scientific and technological achievements and technological popularization in the marine and fisheries fields; implementing oceans fishery-related standards and technical specifications; organizing/guiding training of marine and fishery systems; and organizing/directing reform and construction of fishery technology extension systems.

9. Organizing economic and technological exchanges and cooperation with foreign countries; supervising implementation of international maritime and fishery conventions, treaties and agreements, management of foreign-related marine scientific investigation and research activities, coordination of marine and fishery-related foreign affairs, as well as overseas (offshore) fishery development and management work; and providing provincial leadership to strengthen the comprehensive management of fisheries at sea.

10. Supervising and inspecting fishery vessels and fishing ports; implementing marine surveillance and law enforcement, fishery resource protection of aquatic wildlife in the province and investigating/punish illegal activities; and ensuring traffic safety of fishing ports province-wide; and

11. Undertaking other tasks assigned by Provincial Party Committee and the provincial government.

The strategy we have envisioned for building a strong relationship with Shandong provincial fishery managers to support the merging JFS FIP is to leverage O2’s relationship with our
partners at SMRERI, who are actively supporting the current JFS scoping work and have strong connections with the Shandong Bureau. In addition, there may be opportunity to leverage some local relationships upward to the Province. For instance, a representative of the Rongcheng Ocean and Fishery Bureau, a subordinate municipality authority to the provincial bureau, met with Sea Farms and O2 at the stakeholder meeting held in Shidao in August 2017. Initial interest was expressed in the developing JFS fishery improvement efforts, which also seemed partly related to local interest in MSC certification for China’s distant water tuna fishery activities for vessels based in Shandong.

6.1.2 Zhejiang Province Ocean and Fisheries Bureau

This Zhejiang provincial bureau (浙江省海洋与渔业局) has main responsibilities that are very similar to those described above for its sister agency in Shandong, so they won’t be elaborated here. Since our initial scoping reported in 2016, the center of China’s JFS fishery has significantly shifted more northerly into the Yellow Sea, also partly due to the expanded summer fishing closures implemented in 2017. We have developed active relationships at Zhejiang’s local research institutes that can assist with provincial fishery manager partnership, and O2’s key consultant, Qing Fang, has a good personal relationship with a senior official at Zhejiang Ocean and Fisheries Bureau due to his work experience at CAPPMA and MSC.

6.2 Science institutes

Science and research institutes have an important role to play in the emerging fishery improvement efforts for JFS. Because much of their work is guided by government priorities and funding, a direct connection exists between leveraging government management commitment and the necessary science support to implement sustainability improvements, particularly to receive this as funded assistance. At the same time, in the absence of direct government priorities and funding, we have learned that key scientists and researchers are encouraged to accept ‘outside’ research opportunities, and we have taken advantage of this immediate reality in the conduct of scoping work.

Our experience to date also suggests that university students may provide the most economical source of data collection in the initial stages of improvement work, especially related to dockside catch monitoring or fishery observation. While this idea needs continued cultivation, we do have good relationships currently with the Chinese Academy of Fisheries Sciences (CAFS) and two key research institutes in the JFS regions.

While O2 brings considerable science and fisheries management expertise to JFS improvement projects, particularly in framing potential strategies for sustainable management of short-lived species like squid based on international best practice, one of O2’s key roles will continue to be helping locate and organize delivery of priority inputs from Chinese and international science and management experts necessary to design and implement a JFS FIP action plan. Relationships that O2 has developed with researchers at the institutes described below have been instrumental in the JFS fisheries improvement scoping conducted for Sea Farms to date.
6.2.1 Shandong Marine Resource and Environment Research Institute (SMRERI)

SMRERI (山东省海洋资源与环境研究院), which was established in 1957, is a nonprofit, provincial scientific research institute located in Shandong’s port city of Yantai, on the Yellow Sea. It focuses on the investigation, development and protection of marine resources and environment, sustainable use of sea islands, marine biology and genetic breeding, nutrition and feed for marine aquatic animal, aquatic processing and quality safety of aquatic products, fishery engineering and marine industrialized aquaculture and ocean development strategy.

To date, the institute has undertaken hundreds of public, nonprofit research projects from the state and provincial departments, and its achievements have won over 120 rewards at all levels, many of which have reached the international top and advanced level. It provided a strong scientific basis and technical support for Shandong Province to formulate and implement fishery regulations, plan marine functional zoning, protect the marine environment, restore fishery resources, ensure the food safety of aquatic products and promote the sustainable development of the ocean and fisheries. During 2016 and 2017 O2 established an important relationship with Professor Lv and his team at SMRERI, who were subcontracted to conduct essential fishery monitoring efforts of JFS vessels landing JFS destined for Sea Farms and its partners.

6.2.2 Marine Fishery Institute of Zhejiang Province

Marine Fishery Institute of Zhejiang Province (浙江省海洋水产研究所) was established in 1953 and is a nonprofit provincial scientific research institute. This institute is mainly engaged in the fields of marine fishery resources, focusing on the following topics: fishery resources and ecosystem, mariculture and enhancement, fishery environment, and quality testing for aquatic products. In addition, the institute also is involved in public nonprofit research such as mariculture disease prevention, feasibility assessment for use of sea areas, ocean fisheries, and fishery engineering design. In June 2001, the institute was incorporated into Zhejiang Ocean University, which is now under the leadership of both Zhejiang Ocean University and the Marine and Fishery Office of Zhejiang Province. The institute is made up of separate marine fishery resource, marine fishery environmental, mariculture and marine engineering, surveying and mapping laboratories; aquaculture engineering design for business units; and a number of subordinate units, including: a ministerial service platform (Fishery Environment & Aquatic Product Quality Supervising & Testing Center of Agriculture Ministry); a key provincial laboratory (Zhejiang province Key Lab of Mariculture & Enhancement), and four other specialized laboratories (Joint Laboratory of Nutrition and Feed for Marine Fish, Marine Culture Disease Prevention Center of Zhejiang Province, Laboratory of Marine Biology & ecology and Germplasm Resources & Molecular Biology Lab).

O2 has an active relationship with Dr. Feijun Zhang, Zhejiang Ocean University, who has considerable expertise with Chinese squid and materially assisted the initial JFS pre-assessment and scoping efforts in 2015 and16.
6.3 Key Chinese seafood industry associations

6.3.1 Chinese Aquatic Products Processing and Marketing Alliance (CAPPMA)

CAPPMA is the national, non-profit umbrella association, which consists of enterprises engaged in aquatic production, processing, transportation and trade, including private companies, institutions for aquatic research and training, as well as social entities that provide voluntary services for aquatic processing and circulation across China. The association is dedicated to improving self-discipline among its members in their business operations, standardizing and maintaining seafood market orders, protecting the members’ legal rights, coordinating relationships among internal enterprises and international parties, and upgrading technologies and management in the seafood industry ensuring sustainable fisheries and aquaculture development.

CAPPMA has quasi-governmental status and has significant influence directly at the national level and provincially through its relationship with its regional member organizations. O2’s China team has enjoyed a long-standing relationship with Dr. Cui He, CAPPMA’s current president, and his team and in 2016 signed a partnership MOU with CAPPMA, which includes an express purpose for CAPPMA to actively support and advocate for fishery improvement efforts that O2 is helping lead in China with its seafood partners. As noted above, CAPPMA is instrumental in advising national fisheries policy and strongly supported O2’s recently successful efforts for one of its FIP fisheries, red swimming crab, to be selected as a national fisheries reform pilot by Fujian Province. Though JFS wasn’t selected as a national fisheries reform pilot, Dr. Cui is keenly supportive of the emerging JFS sustainability improvement project and has committed his efforts to help mobilize various governmental and industry engagement and support for the project. His staff assisted O2 in acquiring the squid supply chain data analyzed and he is personally familiar with the fishery traceability issues that present challenges for the Chinese JFS fisheries.

6.4 Chinese JFS supply sector

Processing and catching sectors have already played an important role in JFS scoping efforts to date and will have an increasingly important role when JFS fishery improvement efforts are launched. While involved enterprises represent important contributors to FIP implementation, it’s useful to also recognize that certain aspects of information flow, including supply chain traceability, must be subject to verification to ensure credible outcomes of these efforts. Those topics are addressed elsewhere in the report, but the concept of ‘trust but verify’ is a useful concept to guide such collaborations.

6.4.1 Processors

The JFS FIP seafood business partners have key relationships with their primary processor-suppliers, who have been extremely important in work to date, for instance in at least one case acquiring information from the vessels supplying the export supply chain. This has included requiring vessel reports for each fishing trip that is supplying JFS that specific catch, fishing location and other trip information. In subsequent discussion about next step pre-competitive, collaboration of international buyers to motivate and support Chinese JFS fishery improvement...
efforts, its useful to note that each of the participating buying enterprises have similar relationships with their processor-suppliers. We expect that these relationships can be leveraged, and additionally that the increased volume of products involved can only serve to amplify this leverage in support of sustainability measures.

6.4.2 Catching sector
Fishing vessels companies or associations also play an influential role in fishery improvement efforts as a path for directly motivating fisher behavior and participation and we hope to leverage these relationships through the key processor-supplier relationships that each of the FIP partners has. At least one association has been actively involved and we expect that implementation of a JFS fishery improvement effort will entail expansion of these relationships, being led by both processors and eventually directly involved government fishery managers. The formation of FIP industry partnership group will leverage current relationships in a similar way.

6.5 International buyers and retail partners
The founding industry members of this FIP, Sea Farms (with its UK partners) and PanaPesca, have been leaders and first movers in this emerging effort to initiate a Chinese JFS FIP. One of the challenges we have understood through this initial scoping is that the supply chain of any individual buyer is simply not large enough to exert enough market demand to influence Chinese government engagement. Our further recommendations below are directed at counteracting this limitation through expanded collaboration with other international buyers. The decisions by Aqua Star and Quirch Foods to join this industry alliance in 2018 are extremely welcome and more partners are needed. Continued industry leadership is fundamentally essential for successful FIP implementation. The key roles for international seafood partners will be:

- Continued industry thought leadership and critical thinking to drive the effective design and credibility of improvement actions.
- Financial support for the project, equitably shared with other industry partners and used to leverage Chinese and government funding as the project progresses.
- Potential core partner organizing and leadership role with CAPPMA and O2.
- Exerting supply chain demand for Chinese partners to meet FIP commitments, including engagement in annual stakeholder meetings.
- Support of joint fundraising with O2 and other project partners.

A critical mass of major buyers with shared expectations, unified commitment, concerted actions and a fair and equitable cost-sharing mechanism will be a key enabling condition to get improvement of such a challenging species (short-lived, highly migratory/with many straddling stocks and very complicated supply chain) initiated.

6.6 Ocean Outcomes (O2)
O2’s key role in the developing improvement effort is underpinned by the organization’s fishery management and sustainability improvement expertise, which is anchored by its experienced
and knowledgeable team in China. The latter includes the leadership of Songlin Wang, China Program Director, and the recent addition of Fenjie Chen, China Fisheries Program Manager, who has undergraduate and graduate fisheries training in both China and Japan. Before coming to O2, he had practical experience on the ground with government fisheries institutes in China. Qing Fang, O2’s Senior Chinese Fisheries Advisor, with his uniquely rich work experience with CAPPMA, the Fishery Bureau of Ministry of Agriculture and MSC, has been contributing invaluable knowledge on the JFS supply chain and insights about how to engage Chinese government and industry stakeholders. The China team has the key support of Dr. Jocelyn Drugan, O2’s Analytics Team Director and Fishery Scientist, and Rich Lincoln, O2 Founder and Senior Advisor, who has over 40 years of relevant fisheries management experience, including a breadth of international fisheries work. The involvement of these key staff reflects O2’s deep commitment to ensuring the Chinese JFS FIP’s successful implementation and conduct.

Beyond this current scoping and project organizing effort, O2 envisions continuing to play a central role in FIP implementation through collaborative project management in support of locally organized operational oversight, engagement with fishery participants, and coordination with other project partners and stakeholders. O2 would use its key relationships with government, industry and other stakeholders to help fundraise, leverage science and manage inputs to the project and work closely with project partners to help ensure accountability to improvement commitments.

6.7 Other NGOs

A variety of international and Chinese NGOs have useful enabling roles to assist moving the Chinese JFS FIP forward. These involve fisheries technical contributions, helping support funding needs for implementation and also collaborating on fishery improvement needs within China that might cross species in order to gain efficiencies through aligned efforts. An example of the latter might include aligning JFS and Loligo squid efforts in areas that might have logical synergies.

For example, even though the locations of these fisheries are geographically separated and involve different constituents, improvements in fishery management system approaches could have similarities both in approach and government institutions, especially at the national level. Sharing approaches for the two species across provinces could also be useful. NGO partners can also encourage their business partners to pre-competitively engage in improvement efforts of mutual benefit. Along these lines, we have begun the process of deepening NGO collaboration through the existing Asian squid roundtable, which has involved discussions with SFP, WWF-US and China Blue.

Also of note is WWF-UK, who have been actively involved in an advisory role with Sea Farms and its UK retail partners. O2 has a good relationship with WWF-UK staff and has welcomed their reasoned advice during scoping efforts to date. Finally, WWF-China and MSC also have a country presence, and O2 would anticipate seeking their support of the FIP’s implementation to the extent it could add value.
7. FIP implementation

7.1 Year 1 (2018) FIP activities — pathway to launch

The goal is to grow fishery improvement efforts in manageably sized and scaled increments so that the initial program isn’t so cumbersome that it would be destined for suboptimal performance. Interested parties met at Seafood Expo North America in March 2018 to cement their commitment and outline steps that would be taken to launch and implement the Chinese JFS FIP in November 2018. These steps specifically include designing a 5-year work plan, budgets, milestones and underlying cooperation agreements/MOUs, explained in full detail in Appendix C.

7.2 FIP structural considerations

7.2.1 O2’s role

O2 is in a very unique position, as it has on the ground programs in the three key countries where JFS migrate and which conduct significant fisheries; China, Japan and Korea. O2 is engaging stakeholders in all of these countries to ensure that the stock is not in a FIP in one country while being depleted in another. And, O2 understands that there is catch from one country (i.e. Korea) that is going to another country (i.e. China) for reprocessing, which skews the understanding and leverage that a FIP might perceive to be in place. O2’s work on all the fisheries together is critical to the success not least because, ultimately, concerted efforts of all three nations are essential to realize sustainable management of this highly migratory species.

7.2.2 FIP Industry Commission

We envision the value and potential to constitute some form of FIP ‘commission’ that would be key to securing and maintaining support and motivating outcomes for the fishery improvement effort, while importantly engaging and motivating Chinese government investment and reform. This group would at a minimum involve major buyers, CAPPMA (processors) and NGO advisers (e.g., O2, WWF and SFP).

As the fishery improvement effort evolves and expands to other Asian jurisdictions, it will be essential to phase in Korean and Japanese industry stakeholders. There is also a strong opportunity for international coordination via the recently formed North Pacific Fisheries Commission (NPFC), an RFMO that has responsibility for management mechanisms in international waters outside existing RFMO mandates. In this case the NPFC will have jurisdictional responsibility for JFS in international waters.

7.2.3 FIP Secretariat

Our initial recommendation is to form a secretariat to manage the FIP as a cooperative task of O2 and CAPPMA.
7.2.4 FIP Scientific Advisory Group

We envision such a group comprised of 2 to 3 leading experts from SMRERI and potentially from CAFS. Members from Zhejiang-based research institutes would be identified and phased in. Similarly, Korean and Japanese experts would join when the FIP is ultimately expanded geographically to neighboring countries.

These concepts are pictured in Figure 13.
Figure 13. Draft concepts for structural mechanisms for forming, organizing and implementing Chinese JFS fishery improvement efforts.
8. References


Japan Fisheries Agency. 2015. [Results of the “16th Japan-China Fisheries Joint Committee” and the “16th Japan-China Fisheries Joint Committee Second Preparatory Meeting.”] (In Japanese.) http://www.jfa.maff.go.jp/j/press/kokusai/150716.html


www.oceanoutcomes.org

Appendix A. Supplemental 2017 JFS fishery research report

A team from Shandong Marine Resource and Environment Research Institute (SMRERI) led by Professor Lv provided key assistance in 2017 scoping efforts. Their summary insights are followed by additional research information on the fishery.

A.1. SMRERI insights

A.1.1 JFS fishery overview

Since the 1960s, China began to evaluate JFS fishery resource potential, a time when it was primarily a bycatch harvest in fisheries focused on other species, and when the annual harvest of JFS varied from dozens to hundreds of tons. The fishing volume continued to increase through advanced fishing methods, longer fishing seasons and expanded fishing grounds.

The winter cohort is the mainstay of Chinese JFS resources and fisheries, hatching during the winter then able to grow more than 500 g after eight months before completing their reproductive cycle, spawning and dying. Because of this life cycle and related feeding and reproduction migrations, the main opportunity for optimal JFS fishing season in Chinese waters is from May to October by otter trawling with key fishing grounds concentrated in the Changjiangkou, Shidao, Shidong, and Haiyangdao areas.

Research evaluated by SMRERI suggests that JFS resources in China may still have potential capacity for further development with a hypothesized sustainable fishing volume around 8,000 tons per year. While there is considerable uncertainty surrounding this hypothesis, the institute has offered ideas for a path to sustainable fishing and future development of the JFS fishery.

A.1.2 Suggestion for improved fishing efficiency

SMRERI has suggested that several indicators could be used for potential JFS resource evaluation to enhance the annual prediction of available production available for upcoming JFS fishing seasons in the Yellow Sea. These include ecological conditions within the Kuroshio Current and the abundance of juvenile squid that accumulate near Changjiangkou surrounding adjacent fishing grounds each year in late spring (i.e. May).

Research also has indicated that JFS make regular migrations annually for foraging and breeding. Specifically, during the summer season (around June) squid cohorts migrate north of the East China Sea, into the Yellow Sea, for feeding. The growth rate of squid reaches high levels at this time and the season is suitable for fishing by trawling. After October, the cooling of seawater temperatures north of the Yellow Sea triggers JFS to start their return migration southward, mainly reaching the middle of the Yellow Sea (Shidong, Lianwai fishing ground) during November then further southward, arriving in Shawai, Jiangwai, and Zhouwai fishing grounds around December. Around December, JFS mostly complete their reproductive life with the females depositing mature eggs, which form a new winter cohort once hatched, when their aggregations are suitable for fishing with jig gear. Records showed that Japan and South
Korean squid jigging vessels frequently operate in this sea zone and season with abundant harvest.

In addition, JFS demonstrates vertical migrations daily, inhabiting mid to bottom depths during the day and moving up toward surface depths at night. This behavior essentially determines which fishing methods will be more effective, for instance, bottom-oriented trawling during the daytime and pelagic trawling at nighttime. JFS can also be fished by gillnet based on its phototaxis characteristics and backward movement pattern, which may indicate a better method to reduce bycatch of other marine species usually tangled by the trawling. Currently, gillnetting is used to fish foraging squid groups and mesh sizes should be adjusted based on season to maintain the harvest efficiency.

A.1.3 Specific JFS fishing permit regulation

SMRERI has recommended a specific fishing permit that would allow fishing JFS during the current summer moratorium. The rationale is that summer JFS resources show higher abundance in the Yellow Sea zone than during autumn and spring seasons based on research surveys they evaluated. The current summer fishing ban impedes access to peak concentrations in Chinese waters and results in a major portion of the Chinese JFS resource migrating into Korean waters during the autumn season. Given the increase in JFS seafood market price during 2017, fishermen have a strong interest to pursue JFS fishing during the summer for high profit. In conjunction with its 2017 JFS subcontract work, SMRERI has recommended to fishery administration officials in the Shandong Provincial Fishery Bureau that they allow specific fishing operations at the summer fishing ban suitable for JFS while using measures to ensure their sustainable utilization.

A.2 Stock and fishery description

A.2.1 Biological and stock characteristics

_Todarodes pacificus_ belongs to the order _Teuthoidea_ and the family _Ommastrephidae_. Its accepted common name is Japanese flying squid, but also is sometimes called Japanese common squid or Pacific flying squid. Its Chinese common names include Yellow-Sea squid, Rocketfish, North squid, Orient squid, Japan squid, and dark-skinned squid.

*T. pacificus* is a cephalopod with a one-year lifespan, favoring warm-temperate waters and has a wide oceanic migration behavior with high abundance in the western Northwest Pacific Ocean. While this species is oceanic, they mainly distribute in the adjacent seawater of islands and also live in the Yellow Sea, East China Sea and South China Sea. *T. pacificus* prefers to inhabit marine waters with greater than 10-meters of water transparency and sandy or sand-mud substrate.

A.2.1.1 Population and migration

_T. pacificus_ in China’s coastal water is an independent stock. It has different ecological races as its proterogenesis occurred in different seasons of the year. The stock in the Shandong coastal waters has a one-year life history with relatively complex biome structure. Its relatively long reproductive period, discussed below, results in a long recruitment process, causing different
ecological races within the population. The stock consists of a winter-spawning subpopulation whose spawning season occurs from January to February, a summer-spawning subpopulation whose spawning season occurs from July to August and an autumn-spawning subpopulation whose spawning season occurs from September to November. The winter-spawning subpopulation is dominant in these waters, representing approximately 80% to 90% of the total stock. None of the associated spawning grounds are in the coastal waters of Shandong Province.

*O. pacificus* migrates twice per year in long distances. The juvenile fish spawned by winter subpopulation migrate northward in April to May from the spawning ground in the East China Sea. It is a forage migration that is performed along the approximate 123° E line of the western Kuroshio Current. The juvenile fish then divide into two branches. The eastern branch follows the Tsushima Current and migrates along the western coast of Wu Island. The western branch travels through the southeastern waters of the Yellow Sea and heads to the northwestern waters of Daheishan Mountain. When they reach 32° N in May, the western branch further divides into two branches: one migrates northwest to forage food, reaches 34° N in July and arrives offshore of Chengshantou in August. This branch spends its summer and autumn at the edge of cold-water areas. The other branch migrates towards the west coast of the Korean Peninsula. It then mixes with the Kyushu-spawned subpopulation that migrates eastwards to the west coast of North Korea along the Yellow Sea Current and arrives in the Shidong forage ground.

With the decrease of seawater temperature in October, the population of *O. pacificus* in the northern Yellow Sea migrates southwards along the eastern margin of the Yellow Sea current at low speed. The main group reaches the outer sea of Chengshantou around mid-November and spends the majority time staying in the north central part of Yellow Sea until late November. Its breeding and overwintering migration occurs after late November. It reaches waters around 34° N, 125° E in early December. In the Yellow Sea, the Haiyang Island fishing ground and Lianxiang-Shidong fishing ground are two main distribution areas of *O. pacificus*, associated with water depths of 20 to 80 m. The autumn-spawning population of *O. pacificus* arrives in the spawning and overwintering grounds earlier than the winter-spawning population. From Figure A.1. Migration characteristics of Japanese flying squid.
December to early January of the following year, the winter population (main group) successively moves into the southern part of the Yellow Sea. In mid and late January, they swim into spawning grounds in the East China Sea for spawning or overwintering. The overwintering population has two main distribution areas. One is $29^\circ \sim 30^\circ$ N, $124^\circ \sim 127^\circ$ E and the other is in the waters between southeast Jeju Island and Five Islands. The depth of overwintering $T.\ pacificus$ is more than 70 m and with a bottom water temperature range of $10 \sim 15^\circ$ C. The wintering period starts from December to February. From January to February, the spawning population arrives in the reef spawning grounds and the western Kyushu spawning grounds. The spawning period is from January to March, with February being the peak month. These various migrational patterns are depicted in Fig. A.1.

A.2.1.2 Size characteristics

A.2.1.2.1 Body length

The body length of $T.\ pacificus$ ranges from 110 to 250 mm. The average body length is 197.6 mm. The largest portion of the length distribution is $\geq 195$ mm (Fig. A.2).

A.2.1.2.2 Weight

The weight of $T.\ pacificus$ ranges from 31.0 to 411.0 g. The average weight is 200.2 g. The dominant weights appear to be in the 110 to 200 g range (Fig. A.3).

A.2.1.2.3 Relationship between body length and weight

The functional relationship between body length and weight is described by

---

Figure A.2. $T.\ pacificus$’ body length composition in Chinese waters.

Figure A.3. $T.\ pacificus$’ body weight composition.
W=3.96×10^{-6}×L^{3.346}; (R^2=0.873) (Fig. A.4).

A.2.1.3 Reproductive characteristics

As noted above the spawning grounds for *T. pacificus*, which migrate into Shandong coastal waters, are mainly located in highly saline and deep waters between northern reefs of East China Sea to western waters of Japan’s Kyushu Island, rather than in the coastal waters of Shandong Province. The spawning season is from November to March in the following year.

A.2.1.3.1 Sexual Maturity

In late May, the milky-white prostate and crystal-colorless testis for male individuals and the spindly strip of crystal-colorless ovoid gland for females can be visually observed. The body length of harvested individuals during this time is mainly from 120 to 150 mm. In late June, white testis and distinct prostate (males) and crystal-colorless ovary in addition to its spindly strip of ovoid gland (females) become further visible. The spindly-strip spermatophore sac for males has formed. The body length of harvested squid at this stage is mainly from 130 to 170 mm. In mid-July, males have formed spermatophores in their sacs along with white-stringed ductus deferens. The spiral prostatic hyperplasia becomes milky white and enlarged. Most of the testes are milky white in color. The females’ ovoid glands become wider and light white. Their transparent fallopian tube and fallopian glands can be easily observed. The body length of individuals harvested at this stage is mainly from 150 to 190 mm.

Of individuals found in the north central of the Yellow Sea in mid-to-late August, over 80% of male testes are mature and their spermatophores spill from their bodies from hand pressure. The edges of oviparous glands for females have traces of mating, caused by the males’ white spermatophores. Their ovoid glands become wider and ovary size increases. The rate of observed mating (fertilization) is about 40 percent and the body length of harvested squid is mainly from 210 to 240 mm.

In mid-to-late September, the mating rate for females reaches up to 60.8%. From late October to early November, the fertilized eggs within female individuals have begun to mature. The fallopian tubes of most female individuals have light-brown, matured eggs that vary in number.

Figure A.4. The plotted relationship between body length and weight.
The ovary differs greatly in weight, ranging from 4.0 to 16.5 g. Male’s testicle weight ranges from 6.8 to 9.6 gram. Males have varying numbers of spermatophores in their sacs, some of which are still full and plump. In December, males that have mated display atrophic testicles, shrunken spermatophores, faded body color, opacity in eyeballs, reduced livers, and thinned carcass, with 30.1% reduction on average thickness. It can be inferred that they are approaching death. The lips of mouths in mating individuals are commonly found to have cone-shaped white spots, which are the sperm sacs left after mating. Some spots are attached at the base of tentacles. Anatomical examination indicates that a number of matured eggs in the brown fallopian tubes of the ovoid glands are about to be deposited by the females. In general, *T. pacificus* starts copulation and fertilization in August/September and the female starts depositing eggs, which will soon be ready to hatch in December.

The majority of males die during the mating season, with deaths mostly due to physical exhaustion. The remaining males continue to migrate with the females. The males primarily rely on the nutritional storage in their liver, feeding little along this late stage migration. Males die when their energy reserves are depleted, and females die after depositing fully matured eggs.

The minimal body length in sexual maturity is 200 mm. Individual fecundity for this life cycle is $3 \times 10^5 \sim 5 \times 10^5$ gametes.

**A.2.1.4 Diet and growth characteristics**

**A.2.1.4.1 Diet and feeding behavior**

Japanese flying squid (JFS) is a carnivorous oceanic species whose diet is comprised of various natatorial species. Small and juvenile fish, cephalopods (mainly squid) and various species of the Macrura suborder of decapods account for 85.9% of the diet. Krill (*Euphausia pacifica* Hansen) and amphipods (*Themisto gracilipes*) comprise 12.8%, while the benthic genus *Obelia* (class Hydrozoa) accounts for the remaining 1.3%, based on results from survey research examined.

The Japanese flying squid in Chinese waters have relatively low feeding intensity during the spring season. Research survey analysis found 44.4% of individuals sampled were categorized as being from half to fully fed, while those stomachs that were empty and had minor feed fullness accounted for 55.6% of those sampled. During the summer season, feeding intensity shifts to high levels (half and complete fullness), which accounted for 70.3% of survey samples, with empty and minor fullness representing the remaining 29.7%. The autumn season reflects a second feeding intensity decrease with only 39% showing half to complete fullness and 61% empty to minor fullness. Finally, during the winter season newly recruited Japanese flying squid demonstrate high feeding intensity with half to complete fullness at 71.4% and empty to minor fullness at 28.6% based on survey results.

**A.2.1.4.2 Growth at age characteristics**

Based on historical research data, the growth mantle length and body weight of Japanese flying squid fishing at Yellow Sea following equations:

$$L_t = 285.7 \times \left[1 - e^{-0.37 \times (t-2.43)}\right]$$
$W(t) = 522.2 \times \left[1 - e^{-0.374(t-2.43)}\right]^3$

Here 285.7 is the asymptotic mantle length size, 522.22 is the asymptotic body weight, 0.37 is the growth rate of Japanese flying squid.

Following this equation, the theoretical age of squid ($t_0$) can be calculated. The age when the mantle/weight equals zero is 2.43 months and the males demonstrate distinctly higher growth rates compared to females at this stage. The sexual growth difference appears to switch by 5 months of age when females are generally larger than males (when $t_{0♀}=2.42$ months, $k_{♀}=0.34$, $L_{∞♀}=303.10$ mm, $W_{∞♀}=601.68$ g; $t_{0♂}=2.43$ months, $k_{♂}=0.43$, $L_{∞♂}=260.64$ mm $W_{∞♂}=433.04$ g).

Before each May, the mantle growth of juvenile JFS tend to slow, usually reaching only 40-70 mm at a 3 month period, then the mantle growth decreases. Both mantle and weight gains display a ‘S’ type curve with an inflection point at around July when applying above equation. The growth from May to September is calculated as 170 mm in mantle length (40 mm/per month) and 250 g on body weight (60g/per month).
Appendix B. Photographic examples of 2017 monitoring

Several photos were taken to document species observed during SMRERI’s 2017 monitoring of JFS landings in Rongcheng.

2017 JFS landing site in Rongcheng

Japanese Spanish mackerel (*Scomberomorus niphonius*)
Japanese anchovy (*Engraulis japonicus*)

Largehead hairtail (*Trichiurus lepturus*)
Pacific chub mackerel (*Scomber japonicus*)

Silver pomfret (*Pampus argenteus*)
Yellowtail (*Seriola quinqueradiata*)

Dolphinfish (*Mahi mahi*)
Yellow goosefish (*Lophius litulon*) (monkfish) and Alaska pollock (*Gadus chalcogrammus*)

Smooth hammerhead shark (*Sphyrna zygaena*)
Japanese flying squid (*Todarodes pacificus*) observed during SMRERI’s 2017 fieldwork
Appendix C. 2018 Scope of Work

Chinese Japanese Flying Squid Comprehensive Fishery Improvement Project
April 1 – November 14, 2018

Task Area 1 – Preparation of project documents, outreach materials and organizing arrangements; begin stakeholder identification and engagement

1.1 Create prospective FIP profile and post on www.fisheryprogress.org.

1.2 Produce publicly available, composite fishery scoping report from existing confidential scoping documents.

1.3 Draft and sign project MOU/agreements to confirm commitments for Year 1 work.

1.4 Draft 5-year plan with comprehensive FIP work plan elements, to be used to engage key Chinese parts and frame discussions with working group and cost prioritize comprehensive FIP action plan items.

1.5 Develop project brief(s) on background, need and benefits for JFS FIP. (The Chinese versions are intended to support outreach to key Chinese stakeholders and potentially outside funders to help supplement annual FIP implementation costs.)

1.6 Identify fishing groups involved in supplying international buyer partners, especially any organized fishing groups that are fishing in the YS for squid. Establish our ‘target universe’ of fishing groups for 2018 by early June.

1.7 CAPPMA assists making initial contacts in June and early July with fishing groups, by leveraging local government, research institute and processor organizations, to describe the effort, its importance to China seafood industry and setting the stage for July meetings for discussions on what it will take to get their groups and individual vessels that may supply FIP buyer partners to commit to participate.

1.8 Identify/confirm and make initial contacts with other key project stakeholders in provincial government and research institutes to ‘evangelize’ project and prepare them for positive, productive engagement in July meetings.

The objective of this task area is to prepare materials necessary for education and substantive engagement for the comprehensive FIP and then begin outreach with key fishing groups as a priority target. The initial groups (or supply vessels if no organized groups) used by the international buyers’ processing partners represent the starting nucleus. We will need specific processors involved for any additional FIP international buyer participants as a means to identify additional fishing companies or vessels involved, and how much overlap there may be among FIP partners in terms of fishing companies that may be supplying their processors. Once supplied with specific processor contact information (key representatives and contact details) we will review the information with CAPPMA so they can identify the best local government representatives and any other processors needed to leverage the engagement of catcher/fisher groups in the fishery that could be important in the US and EU supply chains. Initial contacts will be made by CAPPMA in June and early July with local government and processors to
familiarize them with the project, enlist their support for outreach to catcher/fishing groups, and collect practical ideas about what it might take to get their commitment to the FIP generally and specifically to initial priority improvement actions surrounding catch accounting and area fished verification. Examples of such actions would be sharing their logbook information with dockside interviewers, willingness to provide access to dockside observation and sampling of offloads cooperate (for logbook verification) and enlisting some vessels from possible supply pool to use/test small location recorders that could transmit their fishing positions via cell phone signals (reliably and cheaply), or alternatively arrangements to use reliable AIS equipment.

CAPPMA would seek assistance of government and processor partners to make contacts with catcher/ fishery representatives to share information and prepare their participation for July meetings. The overarching objective of this task would be to lay essential foundation, enlist tentative willingness to engage, and identify key incentives that will be needed, all of which will be needed for reaching substantive agreement among all project cooperators, including international buyers, at planned meetings in mid-July. Catcher sector representatives are identified as a priority, along with necessary engagement of their processing partners, but other key stakeholders will also be initially contacted to begin process of enlisting support in preparation for in-person meetings in Shidao. Focus will be on Shandong Province as the initial supply point, and any key Zhejiang processors securing product who are identified as supplying international buyer partners.

**Task Area 2 – Chinese stakeholder outreach, finalizing comprehensive FIP work plans and preparing for formal launch event**

2.1 Continue and build on initial contacts and engage key Chinese stakeholder representatives; catcher/fishing group representatives, seafood businesses, government managers and science institutes to build engagement and project commitments: includes additional processors of international buyer partners. The objective of this continuing, pre-July meeting engagement will be to have stakeholders come to the face-to-face meetings in Shandong pre-disposed and willing to make commitments to needed improvement actions.

2.2 O2 and CAPPMA will plan stakeholder meeting(s) during the week of July 16\(^{th}\) in Shandong to discuss/review project goals, objectives and improvement needs, including review and refinement of draft 5-year work plan. The plan will include an organization and strategy to reach agreement in principle on work plan commitments to the greatest extent possible, including fishing industry collaboration in initial catch monitoring and vessel verification steps. CAPPMA’s He Cui will facilitate meeting discussions with this intent. We expect the FIP’s international buyer partners to enlist the help and financial support of their Chinese processing partners to plan logistics for the meetings and host venue and meals.

2.3 Finalize work plans and budget requirements for JFS fishery improvements with key Chinese partners and stakeholders, in communication with international buyer partners.

2.4 Finalize arrangements for project management and science advisory function (2-3 leading experts from SMRERI).

2.5 Plan Qingdao launch event; organize meeting space, invite participants, and create agenda.
This task intends to result in agreements in principle at the July meetings to the greatest extent possible among key project stakeholders for committing to support the 5-year work plan as refined through discussions and additionally define the follow-on work needed before November to complete and finalize agreements necessary to launch a comprehensive FIP. We anticipate additional work to complete and refine these arrangements, so agreements can be finalized and signed in conjunction with the China Seafood & Fisheries Expo in Qingdao.

We have recognized that the catcher sector likely constitutes the most challenging immediate priority for engagement and commitment, and it is unrealistic to expect that an entire fleet engagement until the pool of international buyers represents a much more extensive portion of the export supply chain and/or the government becomes fully engaged and invested. Nevertheless, with the leveraging work of CAPPMA under Task 1, we expect that there will be willing fishery groups/constituents participating in the meeting. We also expect that CAPPMA will have specific ideas and recommendations about approaches (including incentives) that could formalize support and lead to necessary, substantive agreements at the meetings. CAPPMA cannot guarantee these agreements, which will require contributions from each party involved, but the goal is to build foundation before the in-person meetings. CAPPMA and O2 will work together on a strategy for organizing the content and approach to the meetings to create the best conditions for reaching agreements. CAPPMA will specifically facilitate the discussions among the parties to maximize likelihood of successful outcomes.

The exact strategy for organizing the meetings’ discussions will be designed after intelligence gained from initial stakeholder outreach. We expect it will include a combination of small and large group sessions. For planning purposes, a total number of around 40 participants could attend the July meetings as roughly indicated by the following potential targets:

- International buyers: 6 to 8
- CAPPMA: 2 to 3
- O2: 4 to 5
- Chinese processors: 8 to 10
- Fishery-catcher organizations: 5 to 10
- Buyer-processor brokers: 5
- Research Institute: 3
- Provincial government fishery management: 1 to 2
- Local government fishery management: 1 to 2
- Other NGOs: 2 to 4

The exact participants and numbers will be determined by mid-June.

Follow up discussions and work plan/agreement refinement are anticipated after the mid-July meetings and will entail continued outreach and drafting by CAPPMA and O2, in close cooperation with FIP buyer partners. While the objective is to have most of this finalized before October, we anticipate the launch event is more than a public ceremony but an essential opportunity for final face-to-face discussions where formal agreements may need to be signed.

**Task Area 3 – Hold launch event and finalize Year 2 plans**

3.1 Hold launch event preceding China Seafood & Fisheries Expo, Qingdao (6 Nov 2018).
3.2 Solidify any final commitments and sign final agreements among key stakeholder partners responsible for implementation actions.

3.3 Finalize contracts and operational plans for Year 2 comprehensive FIP implementation, according to work plan and available budget.

As noted under Task 2, this is expected to be more than a ceremonial event. A key reason for scheduling it in Qingdao is the expectation that key stakeholders will be present that we must ensure are all in final, formal agreement for moving the project forward and announcing it publicly. This is an essential check point for the project’s credibility and foundation, not simply expected to be a media opportunity, though we see that as an obvious benefit to project partners. At the same time, recognizing the limited overall budget for 2018, and the considerable work needed to build foundation and agreements for launching the FIP during the May to October timeframe, we have trimmed back initially planned O2 participation in Qingdao so that more focus could be placed on essential earlier steps.