

Rapid Fishery and Aquaculture Sector Diagnosis Using Fishery Performance Indicators in the Gaza Strip

May 2020

PROBLUE

Administered by
THE WORLD BANK
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Abbreviations and Acronyms

AICS	Italian Agency for Development Cooperation
BOD	Board of Directors
BOP	Bank of Palestine
BMSY	Biomass level required for maximum sustainable yield
COC	Chamber of Commerce
CPI	Consumer Price Index
DANIDA	Danish International Development Agency
DFID	Department for International Development of the United Kingdom
DOF	General Directorate of Fisheries
EPI	Environmental Performance Index
EQA	Environment Quality Authority
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FSS	Food security cluster
FSU	Fishermen's Syndicate of the Union
FTE	Full-time Equivalent
FPI	Fishery Performance Indicator
GAA	General Administration of Marketing
GDP	Gross Domestic Product
GPS	Global Positioning System
GS	Gaza Strip
GIZ	German Corporation for International Cooperation GmbH
HP	Horsepower
IEF	Index of Economic Freedom
ILO	International Labour Organization
IUU	Not reported, unregulated, unreported
JICA	Japan International Cooperation Agency
MEPC	Marine Environmental Protection Committee
MOA	Ministry of Agriculture
MOL	Ministry of Labor
MONE	Ministry of National Economy
MOT	Ministry of Transportation
MPAs	Marine Protected Areas
MSC	Marine Stewardship Council
MSY	Maximum sustainable yield
NGO	Non-governmental organization
NIED	National Institute for Environment and Development
NIP	National Investment Plan
NM	Nautical mile
NIS	Israeli New Shekel
OCHA	United Nations Office for the Coordination of Humanitarian Affairs
PA	Palestinian Authority
PARC	Palestinian Agriculture Development Association
PCBS	Palestinian Central Bureau of Statistics
PCP	Palestinian Coastal Police

PLA	Palestine Land Authority
PMDP	The Palestinian Market Development Programme
PMKC	Palestinian Maritime Knowledge Centre
PMNA	Palestinian Marine Navigators Association
PNGO	Palestinian Non-Governmental Organizations
PWA	Palestinian Water Authority
SIDA	Swedish International Development Cooperation Agency
TAC	Total allowable catch
TLC	Tension leg cage
TC	Al Tawfeek Cooperative
TURF	Territorial Use Right for Fishing
UAWC	The Union of Agricultural Work Committees
UCAS	University College of Applied Science
UNDP	United Nations Development Programme
UPA	United Palestinian Appeal
US\$	United States Dollar
UNRWA	United Nations Relief and Works Agency
WB	The West Bank
WB&G	The West Bank and Gaza
WWTP	Wastewater Treatment Plant

Acknowledgements

We would like to thank the staff of the Ministry of Agriculture and Environment Quality Authority for their guidance and support in the preparation of this report.

Many people contributed to this report, especially the participants of the consultation workshop in February 2020. The preparation of this report was led by Sachiko Kondo (Natural Resources Management Specialist) in collaboration with Zeyad Abu-Hassanein (Senior Environment Specialist), Marcelo Hector Acerbi (Senior Environment Specialist), Darshani De Silva (Senior Environment Specialist), Emeran Serge M. Menang Evouna (Senior Environment Specialist), Shafick Hoossein (Environment Specialist), and Nora Patricia Fitzgerald (External Affairs Specialist, Consultant). Mimako Kobayashi (Senior Environmental Economist) provided valuable support in finalizing the report. Jingjie Chu (Senior Environmental Economist) supported the review of Fishery Performance Indicator (FPI) scores. The team also received inputs from Miguel Angel Jorge (Senior Fisheries Specialist), Gunilla Greig (Senior Fisheries Specialist), Charlotte De Fontaubert (Senior Fisheries Specialist), Jack Benjamin Randolph (Portfolio management, Consultant), Dahlia Lotayef (Lead Environment Specialist), Ciro Fiorillo (Representative of the Food and Agriculture Organization of the United Nations in West Bank and Gaza (FAO WB&G), Azzam Saleh (Program Coordinator, FAO WB&G), Rafael DeLaSota (Field Operation Coordinator, FAO WB&G), Stefania Vannuccini (Senior Fishery Officer, FAO Fisheries and Aquaculture Statistics and Information Branch), donor meeting partners and participants, consultants, and workshop participants. The team received peer review comments at the concept stage from Peter Kristensen (Lead Environment Specialist) and Melissa Landes (Senior Natural Resources Management Specialist). The team appreciates the logistical support provided by Jessey Niyongabo (Environment Analyst), Marie A. F. How Yew Kin (Senior Program Assistant), Nadege Mertus (Program Assistant), Maha Muhammad Bali (Operations Analyst), Yousef Al-Jamal (Resource Management Analyst), Areej Mamon Faidi Madi (Team Assistant), and Fifi Z. Antar (Program Assistant).

The team appreciates the guidance it received from Lia Carol Sieghart (Practice Manager) and the valuable support of Kanthan Shankar (Country Director), Ranjana Mukherjee (Country Program Coordinator), Ivo Imperato (Sustainable Development Program Leader), Mark Eugene Ahern (Equitable Growth, Finance and Institutions Program Leader), Samira Ahmed Hillis (Human Development Program Leader), and Wael Zakout (Senior Technical Advisor).

The team would also like to acknowledge the generous financial support that the PROBLUE Multi-Donor Trust Fund provided during the preparation of this report.¹

Executive Summary

This report is prepared with the objective of conducting a rapid diagnosis of the fisheries sector and establishing an overview of it in the Gaza Strip (GS). The fisheries and aquaculture sector in the GS has many challenges, including institutional structure, movement constraints of people and goods, degraded infrastructure, and deteriorating vessels. Despite various challenges, the sector has some promising characteristics. These include (i) a relatively well-organized fishing industry, (ii) existing and emerging entrepreneurship in aquaculture, and (iii) a local knowledge base within the academic community in the GS. A rapid diagnosis and understanding of the current state of the fisheries sector is a first step towards potential future engagement. Given that other industries that also operate in the coastal and maritime areas face serious limitations and uncertainty (for example, shipping, offshore oil and gas, and coastal tourism), fisheries and aquaculture would represent the principal industry in the future development of a Blue Economy (BE) in the GS.

The Fishery Performance Indicators (FPIs) were selected as the rapid sector assessment instrument for economic, community, and ecological outcomes of fisheries. The FPIs have been applied to different fisheries in different countries. In this report, the instrument was applied to overall fisheries, as opposed to specific fisheries, in the GS. As a prerequisite to applying FPI scoring, a descriptive fishery profile was developed.

The fisheries sector in the GS plays a significant role in job creation and food security and is a vital source of employment. Currently there are 3,951 registered fishers in the GS. This translates into 18,000 people who directly rely on fishing for their livelihood, including onshore support staff, and about 110,000 people who depend on the sector, including family members. The primary species landed in the GS are small pelagic fish, for example, anchovies and sardines. Other large landed species include swim crab, squid, and common pandora. With international donor support, assessments were conducted for several stocks, concluding that the stock of round sardinella in the GS is moderately overexploited, and that the stock of brushtooth lizardfish in the GS is highly overexploited. There are four official fish-landing areas in the GS. There are 1,261 registered fishing vessels in the GS, distributed across the four ports. Most vessels are old, and not all registered vessels are operational. Some vessels are non-operational because of physical disrepair, in part due to the financial constraints of vessel owners and operators. Annual fish consumption in the GS is approximately 20,000 tons. Traditional fishing produces 26 percent of locally consumed fish, while in-land aquaculture produces 3 percent. The deficit is supported by fish imports, which accounts for more than 66 percent of locally consumed fish.² Both local consumption and external trade—West Bank (WB) and Israel—of fish has experienced a steady increase. There were no fish exports between 2008 and 2013, but the export trade has recently been increasing, mostly because of aquaculture production increase.

Based on this information, the FPI exercise was conducted. While FPI input scores provide ideas about general conditions and resource management aspects of the sector, FPI output scores provide information about the performance of both the fishing and the post-harvest segments of the sector. The conditions of the sector can be improved by having an effective marine fisheries resource management system in place and by managing the expansion of aquaculture and its impact on public health and environment. The value generated in the post-harvest and processing segments can be improved by maintaining the quality of landed and harvested fish better.

1. Introduction

This report was prepared with the objective of conducting a rapid diagnosis of the fisheries sector and establishing an overview of it in the Gaza Strip (GS). A rapid diagnosis and understanding of the current state of the sector is a first step towards potential future engagement there.

Fisheries and aquaculture would, by any measure, rank among the leading industries in the effort of the Palestinian Authority (PA) and the GS to develop a Blue Economy (BE). The Middle East and North Africa region is endowed with rich marine ecosystems. A blue economy that promotes the sustainable use of marine resources for economic growth, improved livelihoods, jobs, and overall ecosystem health³ would help PA/GS in the effort to eliminate extreme poverty and promote shared prosperity in a sustainable manner. There are several other industries that could contribute to the blue economy of the PA/GS, should the conditions surrounding the coastal and maritime areas change. Shipping, offshore oil and gas, and marine renewable energy industries could be developed under a BE framework, but these would be conducted outside the maritime space currently under the control of the PA. There is potential for coastal tourism development, but the focus is domestic tourists. In this context, the BE of GS would rely mainly on the fisheries and aquaculture sector in the near term, and therefore a better understanding of the sector is of utmost importance.

A territory of the PA, the GS is located at the southeast corner of the Mediterranean Sea, sharing its southwest border with Egypt and its larger northeast and southwest borders with Israel. The Gaza Strip's coastline is approximately 41 kilometer long (see annex 1 for a West Bank and Gaza (WB&G) map).

The fishing zone in the GS has been exogenously determined and has fluctuated over time, generating serious implications for safety at sea and posing major challenges in developing a BE. Fishing zone here implies the area where the residents of the GS are allowed to fish. According to the Oslo II Accord of 1995, the fishing zone was defined as within 20 nautical miles (NM) of the coastline. Later, it was reduced and enforced at 6 NM. In 2019, after the “Great Return March” of late March 2018, the restrictions were eased, including an expansion of the fishing zone to 15 NM in the center of the coastal areas of the GS.⁴ With the fishing zone exogenously determined by Israel and constantly changing, Israel's effort to enforce the zoning is a cause of tension with the GS fishing industry as well as a threat to safety at sea.

The GS fisheries sector already plays a significant role in job creation and food security. Currently there are 3,951 registered fishers in the GS. This translates into about 18,000 people who directly rely on fishing for their livelihood, including shore support staff, and about 110,000 people who depend on the sector, not counting their family members.⁵ These 110,000 people include fishers, retailers, exporters, owners of seafood restaurants, input suppliers, researchers, and transporters. Considering the GS's total population of approximately 1.8 million people, almost 10 percent of the population rely on, or are affiliated with, the fisheries sector. Overall, the number of registered fishers has been increasing—from 2,448 in 2003 to 3,617 in 2017,⁶ and then to 3,951 in 2019.⁷

Most fishers are very poor. According to the General Directorate of Fisheries (DOF) in the Ministry of Agriculture (MOA), 90 percent of fishers live below the poverty line.⁸ Currently, on average, fishers live on less than 700-900 Israeli New Shekels (NIS) (US\$200-250) a month.

The average per-capita income from fishing has decreased from 3,000 NIS before 2007 to less than 700 NIS in 2017. Fishers have been using the same vessels and equipment for a long time and have not been able to earn enough to replace or repair their capital goods and equipment.

A better understanding the fisheries and aquaculture sector is the first step towards identifying meaningful interventions in the effort to improve the sector’s performance and the food security, livelihood, and wellbeing of the fishing community. A clearer understanding is also critical for building a productive BE in the PA/GS. The primary objective of the World Bank Assistance Strategy⁹ is to support private sector investments and job creation, and it is important to understand the role the fisheries and aquaculture sector can play in job creation. Until the rapid diagnosis, not much was known about the sector. This rapid sector diagnostics will present an overview of the fisheries and aquaculture sector in the GS, ideally to be followed up by further studies and engagements with a wide range of stakeholders and partners.

Other donors and partners are working in the fisheries and aquaculture sector, and their continuous support and collaboration is essential to unleash the potential of the sector. Previously, the European Union (EU) and the German Corporation for International Cooperation GmbH (GIZ) supported an analysis of BE development in the Gaza Strip, and the UN Food and Agriculture Organization (FAO) has a long history of providing technical assistance in fisheries and aquaculture sector development in Gaza. Recently, FAO started a marine cage aquaculture pilot project, with financing from the Italian Development Cooperation. Japan International Cooperation Agency (JICA) also has been supporting capacity development in aquaculture via training programs conducted in Indonesia, and is planning to offer a program in Egypt this year. At the regional level, the Gaza Strip and West Bank are participating members in the regional EastMed project referred to as “Scientific and Institutional Cooperation to Support Responsible Fisheries in the Eastern Mediterranean,”¹⁰ which is supported by the FAO, the EU, the Italian Ministry of Agriculture, and various Greek government ministries.

2. Methodology

The Fishery Performance Indicators (FPIs)¹¹ were chosen as the instrument to conduct a rapid diagnosis of the fisheries sector in the Gaza Strip (GS). The FPIs are a rapid assessment instrument for measuring economic, community, and ecological outcomes of the world's fishery systems. They were developed under the guiding principle that a successful fishery management system is one that is ecologically sustainable and socially acceptable, and generates sustainable resource rents or profits. The World Bank has used this instrument in different countries, including recent studies in Guinea¹² and Guinea Bissau¹³, previous piloting in Indonesia and Philippines¹⁴. FPIs can be applied in specific fisheries or in general. In the GS, the instrument was applied to fisheries in general.

The FPIs, which total 121, fall into two categories: input indicators and output indicators. The input indicator category examines the condition and process of meeting economic, community, and ecological sustainability. The output indicator category identifies and measures key factors that reflect the levels of success or failure in the attainment of environmental, social, and economic sustainability.

In implementing the FPIs, each of the 121 individual measures is assigned with a score ranging from 1 to 5 (5 being the best score). Scoring uses bins that are designed to be easy to score across a wide range of fisheries and that are generally chosen to reflect the quintiles of performance. In addition, each measure is also given a quality score ranging from A to C (A means the reviewers were highly confident of the result score, while C means that they were not confident or did not have enough information and data to support the observation) to indicate how confident the scorer is regarding the accuracy of the chosen bin.

It was decided that the FPI tool was to be applied to overall fisheries in the GS, as opposed to specific, individual fisheries. This is because the experts who were consulted initially considered that there were mixed fisheries on-going and it would be hard to distinguish different fisheries.

Before implementing FPIs, a basic fishery profile needs be developed. The profile includes a narrative description of various aspects of the fishery that are crucial to implementing the FPIs scoresheet. Chapters 3 is the descriptive fisheries profile. Sub-chapter 3.1 describes the policy and legal frameworks of the sector, defining the fundamental objectives and rules of fisheries management. The main stakeholders and their relationships, described in sub-chapter 3.2, are also essential because they collectively define and determine the capacity of the sector, including that for fisheries management. Sub-chapter 3.3 shows the status and trend of capture fisheries, explaining landing sites and their conditions, number and trend of fishing vessels and gear, and captured fish species. In sub-chapter 3.4 of the report, a description of inland and marine cage aquaculture is presented, because the two fish production segments interact in the market and, in particular, marine cage aquaculture can contribute to the BE development. Sub-chapter 3.5 discusses the trend in fish consumption and trade, which is essential information on assessing post-harvest utilization of fish catches.

The FPI application involved a series of consultations as follows. First, the fishery profile was developed with facilitation by FPI consultants and contribution of basic information by General Directorate of Fisheries (DOF), Al Tawfeek Cooperative (TC), Fishermen's Syndicate of the Union (FSU), Ministry of Transport (MOT), and academia. Then, with facilitation by the FPI consultants, experts from DOF who were knowledgeable about GS fisheries conducted FPI

scoring, using available data and the profile. Subsequently, experts from TC and FSU were also consulted to fill gaps in the FPI scoring. Finally, diverse stakeholders in the GS were consulted at a multi-stakeholder workshop in February 2020. The list of workshop participants is presented in annex 2. At the workshop, the FPI results were presented and discussed, while the participants provided clarifications and verified the scores. The detailed scoring result can be found in annex 3.

3. Descriptive fisheries profile

3.1 Policy and legal frameworks

Although there are several policy documents and laws that officially govern the GS fisheries sector, their implementation is extremely weak. The main reason is the fact that these policies and laws were initiated by the Palestinian Authority (PA) based in Ramallah, West Bank.¹⁵ Accordingly, because of the PA's political differences with the *de-facto* authority in the GS and the physical separation of the West Bank and GS, implementing them faces practical challenges. The human resource limitations are particularly critical. Some public officers assigned to the GS by the PA have difficulty staying in the GS continuously because of the distance between West Bank and GS as well as the reporting line of the PA in the West Bank. This has resulted in a lack of enforcement of the laws, as well as of engagement with different stakeholders. There is a general difficulty in raising awareness of the policy and legal frameworks and conducting consultations with the various stakeholders in the GS. Further, the Fisheries Law of 1936, amended 1954 and 1967, the main governing law in the fisheries and aquaculture sector, is antiquated and does not reflect the current situation.

3.1.1 National Policy Agenda 2017-2022

The PA's "National Policy Agenda 2017-2022 – Putting Citizens First," approved by the Council of Ministries in 2016,¹⁶ stipulates ten priorities. The Agenda mentions that the full implementation of the Early Recovery and Reconstruction Plan for Gaza¹⁷ represents a beginning of the long process of restoring Gaza's economy, physical infrastructure, and social cohesion. Policy interventions under the National Policy Agenda include rebuilding productive sectors of the Palestinian economy, focusing on manufacturing, agriculture, and tourism, and restoring Gaza's industrial base. The GS fisheries sector is one of the main economic drivers and therefore needs to be developed further in accordance with the Agenda.

3.1.2 National Agricultural Sector Strategy, 2017-2022

The "National Agricultural Sector Strategy, 2017-2022 – Resilience and Sustainable Development" of 2016¹⁸ includes the fisheries sector. The strategy supports the vision of a sector that achieves "sustainable agriculture, capable of competing locally and globally, and effectively contributes to strengthening food security." The strategy aims to double the agricultural productivity and incomes of small-scale food producers (women in particular), family farmers, marginalized people, pastoralists, and fishers through secure and equal access to land, other productive resources, inputs, knowledge, financial services, markets, and opportunities for value addition and non-farm employment.

3.1.3 Law on Agriculture No. 2 of 2003, and Law on Agriculture No. 11 of 2005

The PA issued the Law on Agriculture No. 11 of 2005, which is an amendment to the Law on Agriculture No. 2 of 2003. The Law on Agriculture No. 2 of 2003 was developed based on a review of different laws, including the Law on Fisheries No. 6 of 1937, which was made in force by the governorates in the GS.

This law governs the fisheries and aquaculture organizations, including some aspects of resource management. Its purpose is (i) Promoting the General Plan for the Protection of Fisheries and the Long-term Conservation, Sustainability, Development, Processing, and Utilization of Fishery Resources; (ii) Organization and management of fishing and aquaculture; (iii) Programs to protect the marine environment, reduce pollution of fishing waters, work to

address the adverse environmental effects of fisheries resulting from human activities, avoid excess fishing capacity, and maintain the exploitation of fish stocks from an economic point of view in coordination with the competent authorities; (iv) Development of investment in fisheries; (v) Scientific research in the field of fisheries and aquaculture; (vi) Setting standards of conduct for all those involved in fisheries and aquaculture and developing and rationalizing fishing methods; and (vii) Enhancing the contribution of fisheries and aquaculture to food security.¹⁹

Chapter 3 is related to fisheries, comprising Articles 73, 74, and 75. According to the Law, the Ministry of Agriculture (MOA) is responsible for developing rules on fisheries to be promulgated by the Council of Ministries, provided that it includes the following: (i) regulation of the fishing profession as well as necessary licenses and fees; (ii) regulation of the importing, exporting, and marketing of fish and other aquatic products; (iii) definitions of the specifications and conditions involving aquaculture projects and fish farming; (iv) specification of fishing nets, feeds, medicines, vaccines, and hormones for the control of fish diseases; and (v) designated seasons and times of fishing in the sea. Article 74 states that no solid or liquid waste or wastewater may be discharged into Palestinian fishing waters, no sand may be taken, no rocks may be removed from the coast, nor may the nature of the seabed be changed. Article 75 states that beach bulldozers may not be used nor fishing nets be set up at a distance less than 100 meters from the beach, except by permission of the Minister.

3.1.4 Fisheries Law of 1937, amended in 1954 and 1967

Fisheries Law No. 6 of 1937, amended in 1954 and 1967, is one of the main laws governing the fisheries sector. The Law was enacted by the British High Commissioner during the British Mandate for Palestine, and it is considered to be the first law that regulated and organized fisheries in the Palestine territories. The Law included 13 articles. However, the Law is old and it does not correspond with the current fisheries and resources management challenges.

3.1.5 Palestinian Environmental Law No. 7 of 1999

This Law also touches on the fisheries sector. The Law provides a framework for the protection of the environment, public health, and biodiversity in WB&G, including marine areas. It includes a stipulation that the Environment Quality Authority (EQA) of the Ministry of Environment shall, in coordination with specialized agencies, set standards for the quality of seawater and set rules and regulations for the prevention of marine environment pollution generated by the dumping of waste and wastewater.

3.1.6 Gaza Coastal and Marine Environmental Protection and Management Action Plan

The PA developed the “Gaza Coastal and Marine Environmental Protection and Management Action Plan” in December 2001.²⁰ Developed almost 20 years ago, the Plan is largely outdated but some of the issues raised in it are applicable to the current situation. Its overall objective was to reverse and prevent further depletion and deterioration of the Gaza Coastal Zone and Marine Environment. The Plan cites the main challenges, including coastal erosion, depletion of sand resources, disturbances in marine and coastal ecology, pollution by wastewater, pollution by solid waste, lack of cooperation among the stakeholders, and lack of information.

3.2 Main stakeholders

The fisheries sector includes many stakeholders with different mandates, interests, roles, responsibilities, and followed actions. A brief explanation of the main stakeholders is presented in the subsections below. The summary is divided into (1) Government ministries and other institutions, (2) Fisheries-related groups, and (3) Academia. In addition, development partners, including donors, international agencies, and NGOs, are supporting the GS fisheries and aquaculture sector with these stakeholders.²¹

3.2.1 PA ministries and institutions

Different ministries and departments are involved with the GS fisheries sector. In general, ministries and agencies had significant roles until 2007, but much has changed since then. Until 2007, the PA mandated that all boats and ships have telecommunications equipment and tools so that fisheries and maritime police could communicate with and track them. The Ministry of Agriculture (MOA) conducted more training for fishers, and the Ministry of Transport (MOT) updated vessel data in the areas of efficiency, effectiveness, licensing and registration. The vessels were previously licensed based on specific lengths and standards, but currently new licenses are frozen. In the past, there were regulations that monitored a protected area where fishing was prohibited during the mating and spring seasons, while also preventing fishing within three miles of shore.

3.2.1.1 Ministry of Agriculture (MOA)

The General Directorate of Fisheries (DOF) in the Ministry of Agriculture (MOA) is the primary agency responsible for fisheries management and collecting fisheries related statistics.²² The DOF played a significant role in fisheries management until 2007, including issuing licenses to fishers, supervising the construction of ships, collecting and analyzing data, resolving disputes between fishers, enforcing laws and regulations, ensuring the health and safety of fishers, checking the quality of fish before arriving at the auction market, and capacity-building in health and safety and on the technical issues of fishing. Since 2007, however, the DOF's role has diminished because of political and financial difficulties.

The 2019 DOF annual report lists the Directorate's main activities, including management of a Tilapia fish hatchery station; management of a marine park and museum with support from the Qatar Foundation; supervision of the construction of a packaging and market outlet in the port of Gaza City, with support from the Islamic Development Bank;²³ and the daily inspection of fish quality in the auction markets, inland fish farms, and ports.

3.2.1.2 Ministry of National Economy (MONE)

The Ministry of National Economy (MONE) is responsible for the economic sectors in the West Bank and Gaza, including the fisheries and aquaculture sector. The Department of Consumer Protection within MONE monitors the health condition and quality of fish at the marketplace. MONE also facilitates the importation of tools and equipment for the fisheries sector and coordinates with the marketing and export department at MOA to facilitate and monitor both the import and export of fish.

3.2.1.3 Ministry of Transport (MOT)

The Ministry of Transport (MOT) is responsible for the registration of all vessels, including fishing vessels. Similar to the DOF, before 2007, the MOT played an essential role in the fisheries sector by providing technical inspections of fishing vessels, issuing new and

renewal vessel licenses, keeping the ownership registration of the vessels, providing maintenance services to the ports of Gaza, monitoring the places of manufacture and maintenance of ships, and providing investigation services in the event of accidents between fishing vessels. Currently, the services it provides are limited to monitoring vessel registration and issuing licenses to vessels. A complete list of registered vessels does not exist. During the February 2020 workshop, participants mentioned that some vessels are not operational, some because of physical maintenance issues and others because of financial issues. However, the MOT has limited capacity to develop the database of vessels. The MOT provides modest services in the maintenance and restoration of ports following damage from floods, erosion, and seawater rise, especially during winter.

3.2.1.4 Ministry of Labor (MOL)

The MOL's main task is to register agricultural cooperatives, including fisheries cooperatives. The MOL supports capacity-building in fisheries in the areas of labor rights, health, and safety. The MOL also acts as a mediator in disputes involving fishers and their employers.

3.2.1.5 Palestine Coastal Police (PCP)

The PCP monitors fishing activities in the fishing zone.²⁴ Its tasks include the monitoring of port security; issuance of entry permits to the ports; coordination with the Israeli government to solve problems involving fishers; and surveillance to combat illegal drug and arms trafficking. The police also act as the coast guard in the event of shipping accidents, providing ambulance services and assisting the DOF to monitor activities and enforce the law.

3.2.1.6 Environment Quality Authority (EQA)

The EQA at the Ministry of Environment aims to protect environmental assets, including water, soil, air, natural resources, nature, and biodiversity. The EQA Cross-Sectoral Environmental Strategy (2017-2022) tackles the challenges of coastal and marine deterioration through a series of urgent actions, including wastewater and solid waste management, marine ecological protection, institutional strengthening, and a coastal and marine environmental information system. The EQA chairs the Coastal and Marine Environmental Protection Committee (MEPC).

3.2.1.7 Palestinian Water Authority (PWA)

The PWA is in charge of water resources management. The PWA was established in 1995, and its mandate is defined by Decree No. 14 for 2014²⁵ in relation to the water law. The water law aims to protect all water resources and their surrounding environment through the establishment of protection zones to prevent pollution, in cooperation and coordination with relevant authorities. The PWA facilitates many projects for the Wastewater Treatment Plant (WWTP) in Gaza to treat water for agricultural use and for the protection of marine life.

3.2.1.8 Palestinian Land Authority

The PLA is in charge of zoning and land management, including aquaculture zone. PLA was established by Presidential Decree No. 10 of 2002 as the legal entity responsible for the management of the land sector and various services related to land registration. The PLA governs land allocation, and its role includes assessment of suitable lands for aquaculture.²⁶

3.2.1.9 Municipalities

There are five municipalities in the GS: North Gaza, Gaza City, Deir Albalah, Khan Yunis, and Rafah. Each municipality is responsible for the organization and management of

auction markets, according to the Law of Municipalities of 1934 No. 1, the Law of Village Management in 1944, the Law of Market System in 1966 and 1973, the Law of Local Government Units in 1997, and the Foundation Law in 2003. There is no auction hall in the North Gaza; the fishers there use Gaza City Port and its auction hall.

3.2.2 Fishers related groups

There are several fisheries-related associations in the GS. The two largest and most influential are the Fishers' Syndicate of the Union (FSU) and the Al Tawfeek Cooperative (TC). FSU and TC share responsibilities for the management of donor-based projects, participation in discussions with public authorities about fisher disputes, and participation in committees related to marine and inland fishing.

3.2.2.1 Fishers' Syndicate of the Union (FSU)

The Fishers' Syndicate of the Union (FSU) was established in 1996, registered with the Ministry of Labor (MOL) in 2002 and the Ministry of Justice in 2005. **It has about 4,000 registered fishers.** Its members include owners of vessels (called Maggia in Arabic); captains of vessels (called Royasa in Arabic); and fishers (called Bahria in Arabic). Each member of the FSU must renew their membership annually. The annual membership fee is 20 NIS (US\$5.70). The FSU's board of directors (BOD) has 11 members: four from Gaza City, two representing Deir Albalah, three members from Khan Yunis, and two from Rafah.²⁷ The general assembly committee of the FSU includes all members, plus 11 elected members of the BOD representing each port in each city.

The FSU provides a variety of services to fisheries, including coordination with all parties in managing the fishing sector, resolving disputes among fishers, lobbying and advocacy for the interests of fishers, and involvement in the management of donor-based projects.²⁸ The FSU owns and manages the following assets: the headquarters in Deir Albalah fishing port; offices in all four fishing ports; and a fuel station in Deir Albalah fishing port that sells fuel to the fishers.

According to the FSU's demographic analysis, more than 70 percent of the fishers are refugees. Ninety-eight percent of the fishing vessels are operated by family members, which means the captains are often the fishers' father, older brother, or eldest son, and crews are from the same family. Generally, the captains tend to be older than other fishers on board.

3.2.2.2 Al Tawfeek Cooperative (TC)

Al Tawfeek Cooperative (TC) was established in 1973 with an initiative of 32 fishers. It was the sole cooperative for fishers at that time. Currently there are 480 members who are the owners of trawlers (Gar in the local language) and purse seiners (Shanshula in the local language). Between 2017 to 2019, 45 new members joined the TC.

TC is managed by a board of directors consisting of nine members elected every two years by the members of its general assembly. To run daily duties, TC employs seven administrative and technical staff, six males and one female, with an average salary of 1,500 NIS (US\$400) a month. Their financial resources also include a contribution from each member in the form of shares. Each TC member makes a one-time payment of 100 NIS (US\$29) for membership, and a yearly payment of 500 NIS (US\$145). The member is free to sell his/her share at any time, but the share price is determined by supply and demand among members.

TC offers credit facilities of 10,000 NIS (US\$2,857) for fishers (only to owners of trawlers and Shanshula) as revolving credit to fund their operational activities.²⁹ The borrowers must repay the credit within the fishing season because failure to pay back the credit will set other potential borrowers back.

TC follows a business and investment model in running their activities and provides commercial facilities and services to the fisheries sector, including ice and cold storage.

TC owns and manages the following assets: the headquarters at Gaza Port; a store that sells fishing gear at the Gaza port; a storage refrigerator for the purpose of export; a supply store at the Khan Younis fishing port; and an ice factory with an optimal capacity of 20 tons per day.³⁰ This factory is not running at its full capacity, and it currently produces only five tons of ice, while the market requires at least 12 tons per day. The TC tries to fill this gap in the summer by outsourcing ice from private ice cream factories.

Besides TC, some other firms also sell fishing gear, tools and equipment. These include echosounders and global positioning systems (GPSs), which are useful for determining the location of fish, avoiding the risk of collision with other ships, and identifying ports quickly, especially in the event of power outages at night.

3.2.2.3 Palestinian Marine Navigators Association (PMNA)

The PMNA was established in May 2004 in the GS and holds License No. 7365. PMNA works on the development of the GS marine sector by building capacity in various scientific and technical fields; contributing to the protection of the marine environment from land-based pollution sources; and contributing to the development of the fisheries sector while combating the problem of overfishing. Each member of PMNA pays a 150 NIS (US\$43) membership fee and a 120 NIS (US\$35) annual fee. All management staff, 23 men and two women, are volunteers. The PMNA includes senior GS naval officers who have a high level of technical expertise and graduate level degrees in marine science from a variety of countries. The board of directors currently has seven members, all of whom currently are men, elected every three years. There are 42 members of the general assembly.

3.2.2.4 Fish retailers, processors, merchants, and restaurants

There are about 250 fish retailers who buy fish from the auction market or from intermediary traders. The retailers in turn sell fish in the public market, on street corners, or on the streets using cars, carts, and motorized tricycles called “toktok.” The majority of retailers sell fish such as *Sardina spp*, *Scomber scombrus*, and fingerlings for less than 20 NIS per kilogram. For example, they buy *Sardina spp* at 18 NIS per kilogram and sell it at 20 NIS per kilogram and make a net revenue of 30-50 NIS (US\$8.60) a day by selling 15-25 kilograms per day.

There are some fishers who work for noncommercial, subsistence purposes, using hand case nets and rods. If they catch more than they need, they sell it to family members or neighbors. They fish within 100 meters of the coastline and tend to be concentrated in Shaikh Ejleen (Gaza City) and Alzahra-Wadi Gaza and Nusairta.

Most of the fish catches in the GS are processed on vessels. Processing includes washing, sorting, scaling, and packaging into boxes for the auction market. Other operations such as gutting, freezing, salting, drying, and smoking are performed outside the vessels. Gutting services are available at the port of Gaza, at the public market, and on the street. For each

kilogram of fish, a worker or retailer receives 2 NIS (US\$0.57), enabling them to make about 30 NIS (US\$8.50) a day. Freezing and packaging services are very limited and available only for fish that is to be exported. Production of dried, salted, and smoked fish is also very limited in the GS. Most transportation services are either hired or owned by the captains, fishers, and retailers. The DOF estimates that about 600 people are engaged in such post-harvesting services, and the majority of them represent informal businesses, making about 30-35 NIS (US\$8.50-10) a day.

The restaurants that offer only seafood in Gaza are Al-Salam Abu Haseira fish restaurant, Al Bahhar Restaurant & Fish, Al-Akwakh Sea Resort in Rafah Beach, and Fish & Fresh restaurant, though there are many other restaurants, hotels, and shops serving traditional food and seafood in the GS. The majority of seafood restaurant owners have fishery experience. The revenues of restaurant owners are higher than the revenues of fishing vessel owners. Restaurant workers earn about 30-50 NIS a day.

The GS has a Chamber of Commerce, Trade, Industry and Agriculture (COC), which is the legal representative of traders, exporters, fishery businesses, and other sectors. The COC represents, promotes and defends the interests of general assembly members. It provides service activities related to marine work and aquaculture, including registration services for licensing, advocacy services on tax issues, organizing trade shows, and building partnerships for business projects. The COC also provides specialized services, programs, and activities to improve the GS's business investment environment.

3.2.3 Academia

3.2.3.1 Al-Azhar University, Faculty of Agriculture and Environment

The Faculty of Agriculture and Environment at Al-Azhar University was founded in 1992, in part with the mission to develop a new generation of scholars and specialists in agricultural science to keep up with the needs of the various agricultural domains in the GS and serve Palestinian society. Its original mandate was to conduct studies about the fisheries sector, particularly economic and environmental studies, but only a small number of studies were conducted.

3.2.3.2 Islamic University, Department of Marine Science

The Department of Marine Science at the Islamic University includes a small center for the development of scientific research in marine science and environment. The mission of the center is to promote scientific research and increase knowledge and to raise community awareness about the preservation of the marine environment, declining fish stocks, and coastal area management. Due to budget limitations, the center has made only limited contributions to applied research related to marine life.

3.2.3.3 National Institute for Environment and Development (NIED)

NIED is a non-governmental organization established in 2015 and officially registered in 2018.³¹ It is considered a leading institution in strategic research and consultancy activities on Blue Economy development, from sustainable fisheries management to marine plastic challenges and solutions. NIED has established the Palestinian Maritime Knowledge Centre (PMKC). The institute has shown leadership in its engagement with environment and health-focused projects in parallel with social, economic, and managerial plans, projects, and programs. One of the PMKC's first and most significant projects was an initiative to clean and rehabilitate the Gaza Marina.

3.2.3.4 University College of Applied Science (UCAS)

UCAS is an academic institution for applied research and consultancy services for the agriculture and fisheries sectors. It conducts entrepreneurship projects in fish hatchery, fish farming, and feeders. UCAS considers the main constraints to fisheries and aquaculture in the GS to be a lack of laboratories in this field.

3.2.4 Stakeholder interlinkages

In summary, there are diverse stakeholders working in the management and development of the fisheries and aquaculture sector in the GS. Figure 1 summarizes the interlinkages of the stakeholders in a diagram.

The government ministries and fisheries-related groups are in charge of fish resource management. As described in the following chapters, some data and records do exist, including the number of registered vessels and amount of landed fish, but there is no fish resource management plan. It would be beneficial if both government and fish groups analyzed the existing data and jointly developed a management structure.

The Ministry of Transport is responsible for issuing fishing license to fishers, but there is no systematized information. Some vessels are non-operational due to physical disrepair, and some due to financial constraints. It would be ideal to have data on operational vessels, not only a past record of the registered vessels. People working in coastal fisheries are aware of a certain number of non-operational vessels, but there is no data on systematic them.

The Ministry of Labor is in charge of registering different cooperatives, unions, and groups. Once registered, the different groups are to begin working towards achieving their mission and objectives. However, there is a gap in follow-up after a group registers, as well as an overlap in activities, owing to the lack of coordination among different groups. These groups and stakeholders need to communicate more frequently after their registration.

There are no available data on fish disease, pathogens, natural disasters, or pollution shocks. When an issue is observed, several ministries and institutions take the necessary follow-up actions such as raising awareness of fish disease and control at the landing sites. However, such occasions rarely happen and are not systematized.

In chapter 5, the institutional framework for the management of the fisheries and aquaculture sector is analyzed in greater detail through the FPI scoring process.

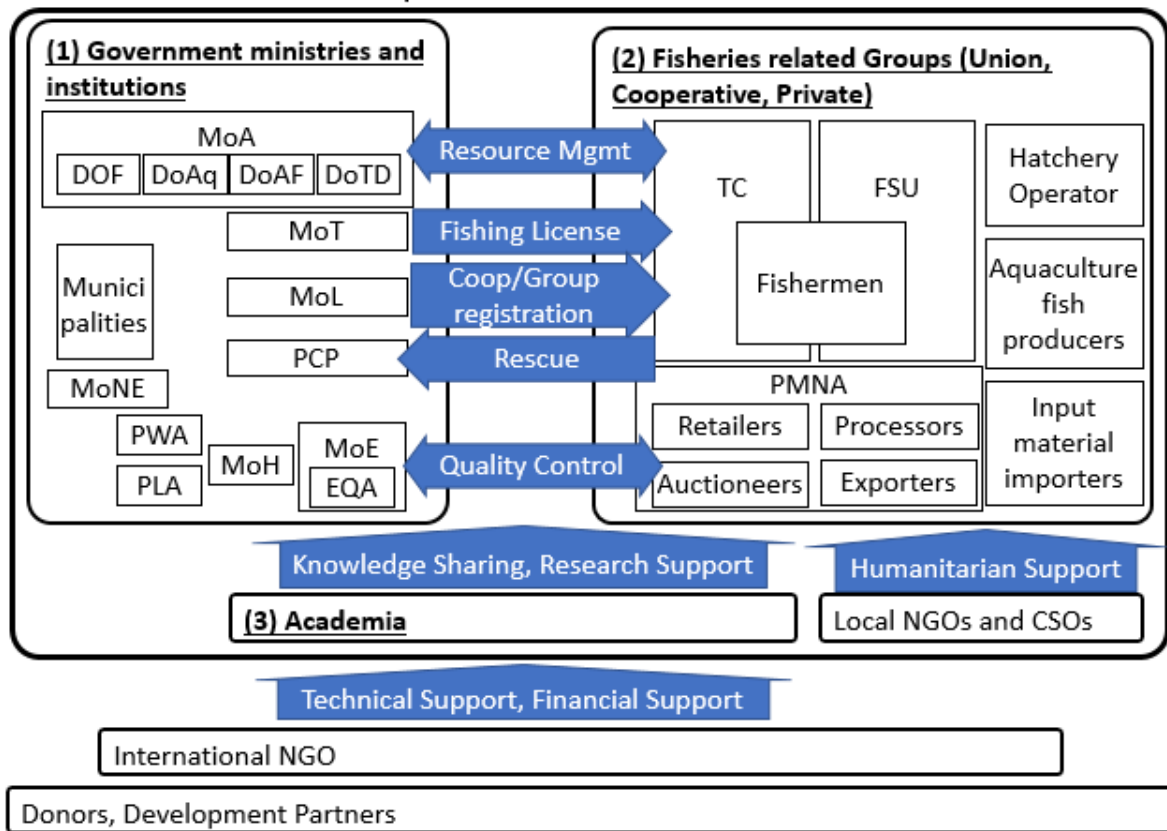


Figure 1. Diagram of the main stakeholders in the fisheries and aquaculture sector in the GS

3.3 Capture fisheries

In this chapter, an overview of the capture fisheries in the GS is presented. The focus is on the major fish landing sites in the GS (5.1), the various types of vessels used by the GS fishers (5.2), and the species and quantity of fish landed in the GS (5.3).

3.3.1 Landing sites

There are four fish-landing areas in the GS: Gaza City Port; Deir Albalah landing site; Khan Younis landing site; and Rafah landing site. Each is named after the municipality in which it is located. All four are managed by the Ministry of Transport (MOT), in collaboration with the Ministry of Agriculture (MOA) and the Palestinian Coastal Police (PCP). While Gaza City Port has solid facilities such as a harbor, the other three landing sites have limited facilities and landing zones in the coastal areas. A great deal of informal landing and transshipment is occurring because of the limited capacity and poor conditions of the existing landing sites. Among the total recorded fish catch³², 81.3 percent landed at Gaza City Port, 5.2 percent at the Deir Albalah, 7.3 percent at Khan Younis, and 6.2 percent at Rafah.

There are four auction markets in the GS, each next to one of the four landing areas. The auctioneers pay the annual rent of the auction market to the municipalities, after being selected through a bidding process supervised by the municipalities. The auctioneers have reasonably profitable revenues from trading and the auction.³³ A summary of the four landing areas in the GS is found in table 1.

There are only two ice plants that supply ice to fishers and traders. One is at Gaza City Port, operated by Al Tawfeek Cooperative (TC), and the other at the Rafah landing site. There are no ice plants available at the Khan Younis or Deir Albalah landing sites.

Table 1. Summary of four landing areas in the Gaza Strip in 2019

	Gaza City port	Deir Albalah landing site	Khan Younis landing site	Rafah landing site	Total
Fish landing (proportion)	2,488 tons (77.6 percent)	215 tons (6.7 percent)	296 tons (9.2 percent)	205 tons (6.4 percent)	About 3,200 ton
Number of vessels	692 (including all the 15 trawlers)	219	180	170	1,261
Number of fishers	1,914 (including 275 fishers in North Gaza)	716	764	557	3,951
Auction hall condition	Tiled	Sand	Sand	Sand	-
Auction hall rent paid to municipalities	2,122,000 NIS (US\$734,857)	90,000 NIS (US\$25,714)	270,000 NIS (US\$77,143)	430,000 NIS (US\$74,286)	2,912,000 NIS (US\$912,000)
Number of employees at auction halls	17	3	5	6	31

Source: Compiled by authors. Interview with DOF, FSU, TC, and auction hall users. Fish landings, number of vessels, and number of fishers are DOF data 2019.

3.3.1.1 Gaza City Port

The largest port in the GS, Gaza City Port, is located west of Gaza City in an area known as Al-Mina, near the Rimal district. Around 50 percent of the boats, including all trawlers, use the docking harbor. The harbor was once 8-10-meters in depth, but today it is shallower because of untreated sewage and run-off entering directly into the harbor. Gaza City Port previously functioned as a commercial port as well but now serves only as a fishery port.

The Al Tawfeek Cooperative (TC) operates at Gaza City Port. It has a four-ton capacity cold storage facility,³⁴ an ice factory, and a storeroom with some imported fishing gear. The TC has difficulty in getting spare parts. Some are bought from Israel and Egypt, but most are fitted from old engines.

3.3.1.2 Deir Albalah landing site

The Deir Albalah landing site is a small port with poor infrastructure. It is not accessible by car because the road is muddy, and the beach has many rocks and boulders that sometimes cause damage to the boats. There are no lights on site. The existing infrastructure includes the head office of the Fishers' Syndicate of the Union (FSU)³⁵ and the office of DOF, rehabilitated by Qatar Foundation in 2015; concrete storage provided by an Italian project; a small fuel station; a damaged cold store; a Palestinian Coastal Police (PCP) station; and an auction market on the street. There is also a tractor and fixed winches to pull and push boats on to the beach if need be.

3.3.1.3 Khan Younis landing site

The Khan Younis landing site is also small, with poor infrastructure. The existing infrastructure includes small stores to protect fishing gear; a damaged facility unit,³⁶ which used to include a DOF office; and auction hall, cold storage and workshop. There is also a tractor and fixed winches to pull and push boats on to the beach if needed.

3.3.1.4 Rafah landing site

The Rafah port is similarly small, with poor infrastructure. The existing infrastructure includes small stores to protect fishing gear; a damaged facility unit which used to include DOF offices; an auction hall, cold storage and workshop; and concrete storage, which was damaged during a conflict in 2008.

3.3.1.5 Informal landing sites

There are in addition a few informal landing sites³⁷ along the coast, including Bait Lahia, and Nusairat. Bait Lahia is north of Gaza, and fishers operating small vessels (Hasaka with oar) use this landing site because Gaza City Port does not accept such vessels. Some fishers land their fish at Nusairat because of limited space at the Deir Albalah landing site.

3.3.2 Fishing vessels

There are currently 1,261 registered fishing vessels in the GS, distributed in four ports. Gaza Port has the largest number of vessels, followed by Deir Albalah. There are mainly five types of fishing vessels: (i) trawlers, locally called Gar, (ii) purse seiners, locally called Shanshula, (iii) small canoes of Hasaka with motor, (iv) felucca, which accompany Shanshula,

and (v) Hasaka with oars. Table 2 provides the breakdown of the number of vessels at each port, and table 3 (the end of this chapter) offers a summary of the different type of vessels.

Table 2. Fishing Vessels by type and by landing areas in the GS

	Trawler (Gar)	Purse seiner (Shanshula)	Hasaka with Motor	Felucca	Hasaka with oars	Total
Gaza City Port	15	42	426	9	200	692
Deir Albalah	0	1	148	0	70	219
Khan Younis	0	4	108	18	50	180
Rafah	0	5	90	15	60	170
Total	15	52	772	42	380	1,261

Source: DOF data, 2018

Overall the total number of fishing vessels increased from 770 in 2003 to 1,261 in 2018 (figure 2). Vessels are made of wood or fiberglass. Originally, most of the vessels were made of wood, but recently they have started using fiberglass because there is a restriction on the usage of log wood. The total number of vessels peaked at 1,490 in 2012, when fishers could acquire cheap fuel from Egypt from about 2010 to 2013.

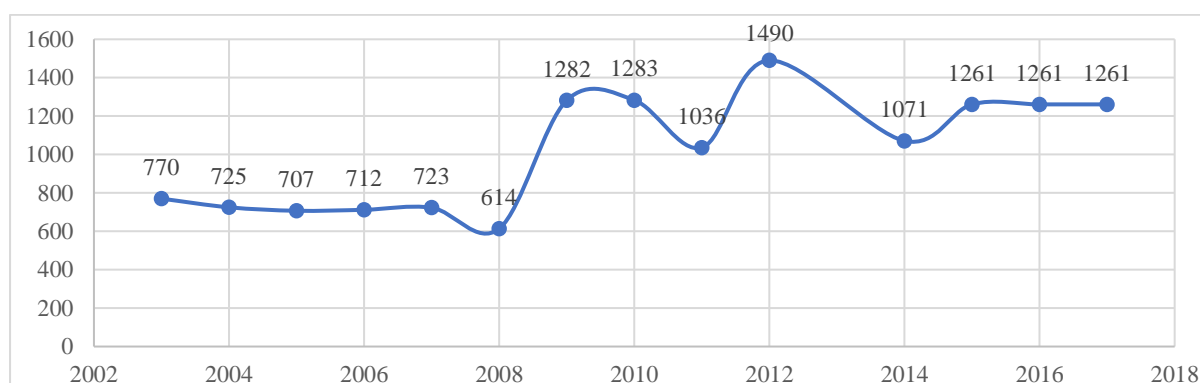


Figure 2. Number of vessels in the GS

Source: DOF data, 2018

Not all registered vessels are active because many owners cannot afford to maintain their vessels, do not renew their licenses or pay the license fees, cannot afford operating costs, or have concerns about security. For example, the total number of trawlers and Shanshula vessels in 2012 was 888 but only 218 were operating then (25 percent of the registered vessels were operational).³⁸ During the stakeholder consultation workshop in February 2020, the participants discussed the actual operational rate of the registered vessels, concluding that 11 trawlers among 15 were operational, and around 70 percent of registered Shanshulas and Hasakas were operational. Most vessels in the GS are old. The average usage period of each vessel is about twice longer than the ideal or typical usage period, as shown in table 3.

Large owners tend to have all three types of fishing vessels (trawler, Shanshula and Hasaka), while small owners typically have only Hasakas. By owning different types, large vessel owners (called Maggia in Arabic) can diversify their risks: Hasakas are used when the fishing zone is limited to the coastal area and trawlers or Shanshulas cannot be used. Within the fishing community, an informal system of social protection exists. During the low fishing season, some fishers who do not go out for fishing are supported by other fishers within the same family who go fishing.

Captains decide the fishers who can board and typically prioritize those who have no other source of livelihood, have burdensome financial obligations, and/or have a higher number of dependents.³⁹ Average daily wage per crew is around 60 NIS (US\$17) for trawlers, 40 NIS (US\$12) for Shanshula, and 25 NIS (US\$7) for Hasaka with motors. Fishers can barely eke out a living on such low wages, but it is better than nothing.

Winch and tractor are used for launching, landing, and beaching vessels. The cost of using this conventional equipment (including engine) is 3,000 NIS (US\$857) and NIS 1,000 NIS (\$285.7) for Shanshula and Hasaka with motors, respectively. Injuries can occur among the fishers due to the inefficiency of the equipment or of the vessel if it is damaged during landings.

Traditionally trawlers and Shanshulas do not fish near the coastline because the bottom of the vessels are easily damaged. This also frees up some fishing space for small vessels like Hasakas. However, when restrictions are imposed in the fishing zone, every type of vessels can be found fishing in the same areas. This sometime causes conflicts, especially between Shanshulas and Hasakas. Smaller mesh nets, sometimes as small as 5 mm mesh size, tend to be used when fishing near the coast is conducted.

3.3.2.1 Trawler (Gar)

Trawlers, called Gar locally, are the largest vessels in the GS. There are 15 trawlers in total in the GS, and all of them are harbored at Gaza City Port.

Almost all the trawlers are old, with an average age of 20-25 years, and about 10 trawlers use malfunctioning engines and gear. Trawlers are powered by 400-500 horsepower (HP) inboard engines, but because of limitations in the marketplace and a lack of imports, most trawlers do not use marine engines. Instead, they use trucks engines such as Volvo, Caterpillar or MAN. These truck engines are not made to resist sea water corrosion and therefore rust easily, causing general deterioration.

Trawl nets are used as gear, most of them small mesh nets of 30 mm. Because of this small mesh size, many juvenile fish are also caught, which contributes to the decline of fish stock. Also, the seabed of the GS coastal area has been greatly degraded by having trawlers dragging the bottom.

Trawler target shrimp, prawns, demersal and benthic fish, but many other species often get mixed with the intended catch. Every morning, trawlers come to the ports to land fish, re-supply fuel and change crews.⁴⁰

3.3.2.2 Purse Seiner (Shanshula)

Purse seiners, called Shanshula locally, are the second-largest vessels in the GS after trawlers. There are 52 Shanshulas in total in the GS, mostly harbored in Gaza City Port, followed by Rafah and Khan Younis.

As with trawlers, almost all Shanshulas are on average about 20 to 25 years old. They are typically powered by double-headed capstans of 200-400 HP inboard engines. Most old, wooden-made Shanshulas do not have enough power to retrieve the nets, and currently only 10 Shanshulas (20 percent) are considered to be in good condition.

Shanshulas rely on small vessels like feluccas to act as light boats for aggregating the sardines before the setting of the purse seine. This practice is conducted nightly when there is adequate moonlight, which typically is about 20 days per month. Today, some Shanshulas are equipped with lights powered either by solar energy or by diesel-based engines to attract target pelagic fish.

Shanshulas's target fisheries begin with sardines, but the season is limited to only 2-3 months in spring and autumn, respectively. Horse mackerel, shrimp, and Atlantic mackerel sometimes form part of the catch. Squid is also a small valuable bi-catch of the light attraction process. Daytime catches include ray, flying fish and bullet tunas. A small respite to the long periods of inactivity for purse seiners is the devil stingray season from March to April, when schools of migrating large rays pass by Gaza. These are sighted on the surface and caught by purse seine using a heavier net than is used for sardines.

3.3.2.3 Hasaka with motor

Hasaka with motor is the smallest engine-based vessel. There are 772 Hasakas with motors in the GS and more than half of them are harbored at Gaza City Port.

Hasakas are traditionally made from wood but more recently with fiberglass. In 2012, the Ministry of Transport (MOT) stopped offering licenses to Hasakas; officially, no Hasakas with motors have been registered since then. Most Hasakas are, on average, 15 to 20 years old. Hasakas with motors are powered by outboard engines of 10-20 HP, mostly Yamaha engines.

The vessels use different gear, including small-purse seine (using a small engine-driven winch), driftnets, gill nets, trammel nets, and long lines.

They also work as service providers for trawlers, transferring the harvest from the trawler to the port, and bringing fuel, equipment, and food. When used for purse seining, each boat is equipped with a petrol-driven winch to haul the rope off the bottom part of the net, and an echo sounder to detect the shoals of fish. When fishing at night, every Hasaka is connected to 2 to 4 other boats and anchored in the fishing area, using electrical lights powered by an engine-driven generator to attract the fish.

Hasakas use gill nets or driftnets to catch a wide range of fish, both pelagic and demersal. More advanced trammel nets consisting of 3 net panels are used to catch shrimp and a variety of fish.

3.3.2.4 Feluccas

A Felucca is a service boat for Shanshulas. Feluccas provide lights during the sardine season to attract fish. No new Feluccas have been built, and they are gradually disappearing from the fishery sector. There are only 42 Feluccas registered in the GS at present.

3.3.2.5 Hasaka with oars

Hasakas without motors are called Hasakas with oars, and these vessels are monitored separately. There are 380 Hasaka with oars in the GS. They are usually flat-bottomed, decked canoes that operate from the beach between the official landing sites of ports. The boat uses a small number of gill nets and beach seines. These vessels do not need licenses, according to MOT, because they provide low-income families with valuable subsistence.






3.3.2.6 Coastal fishing

Beach purse seine, locally called Jarafah, are pulled by fishers on the beach. A beach seine net is set from the beach by a small boat, usually a Hasaka with oars. It consists of two 50-100 meter ropes connected to a small trawl-shaped seine. Once set in a semi-circle from the beach, it is hauled by a group of ten people. The catch usually consists of a mix of smaller fish.

Hand-cast nets, locally called Shabaka, are circular nets with small weights distributed around their edge. They are used by fishers to catch mullets in shallow waters near the coast. Bottles or jars, or a plastic bottle with a lateral cut, are used by swimmers to attract small fry fish near the beach. This fishing method negatively affects many species of fish found during the spawning season near the beach. Poisons, the most threatening method of fishing for everyone involved, has severe effects on human health. The Law of 2005, Chapter 3, Article 24 prohibits the use of this method.

Fishing with a speargun is a technique used by many divers to catch fish as a hobby around the rock of Deir Albalah and Khan Younis. Adventurous fishers observe the weather and the pattern of waves to judge when to dive. According to the DOF, this method is legal if the fishers do not use oxygen tanks. Otherwise, the Law of 2005, Chapter 3, Article 24 prohibits the use of this method. Rod-fishing using Hasaka is enjoyed as a form of recreation by many residents as well.

Table 3. Summary of different types of vessels in the GS

	Trawler (Gar) 	Purse Seiner (Shanshula) 	Hasaka with Motor 	Felucca 	Hasaka with oars 
Total number in the GS	15	52	772	42	380
Size	12-24 meters	12-24 meters	7-9 meters	5-6 meters	3-4 meters
Material	Wood and fiberglass	Wood	Wood	Wood covered by fiberglass	Fiberglass
Engine	400-500 HP	200-400 HP	10-20 HP	Without engine	Without engine
Average number of crews	9-11 crewmembers	5-9 crewmen (depending on the vessel's size)	3-4 crewmembers	1-2 crewmembers	1-2 crewmembers
Gear	Trawling net	Purse seine net	Gillnets, trammel net, and purse seine, hooks	Support boat	Gillnet, trammel net, beach purse seine
Target fish	Demersal fish, prawn	Pelagic fish	Pelagic and demersal	Not applicable	Coastal demersal fish
Average usage period in the GS [Ideal usage period]	20-25 years [10 years]	20-25 years [10 years]	15-20 years [5-10 years]	15-20 years [5-10 years]	5-10 years [3 years]
Average days at sea	210 days	160 days	180 days	160 days	-
License fee (If the applicant is considered poor, they can receive 30 percent discount)	210 NIS/year	210 NIS/year	100 NIS/year	Free, it follows a Shanshula	Free
Average daily wage per crew	60 NIS (US\$17)	40 NIS (US\$12)	25 NIS (US\$7)	Mostly self-employed	Mostly self-employed
Average effort (days at sea)	212 days	155-159 days	155-178 days	Not applicable	No data

Source: Compiled by authors, FAO East Med Technical Documents 2018, Interview with DOF 2019.

3.3.3 Landed fish species and quantities

3.3.3.1 Overall landed fish in the Gaza Strip

The primary species landed in the GS are small pelagic fisheries of anchovies (*Engraulis spp.*) and sardines (*Sardina spp.*).⁴¹ Other large landed species are common pandora (*Pagellus erythrinus*) among demersal fisheries, swim crab (*Protuns spp.*) among crustacean, and squid (*Loligo spp.*) among cepharopod. Figure 3 shows the composition of species in the total amount of landed fish in the GS from 2013 to 2018. Table 4 gives the details of 2018 total landings.

Systematic fish stock assessment does not yet exist. In 2018 and 2019, respectively,⁴² the DOF and the FAO conducted stock assessments of the round sardinella (*Sardinella aurita*), among the pelagic fisheries, and the brushtooth lizardfish (*Saurida undosquamis*), among the demersal fisheries, in a joint effort.

The conclusion of these assessments is that these species are overexploited. Specifically, the stock of round sardinella (*Sardinella aurita*) in the GS is moderately overexploited, while the stock of brushtooth lizardfish (*Saurida undosquamis*) in the GS is highly overexploited.

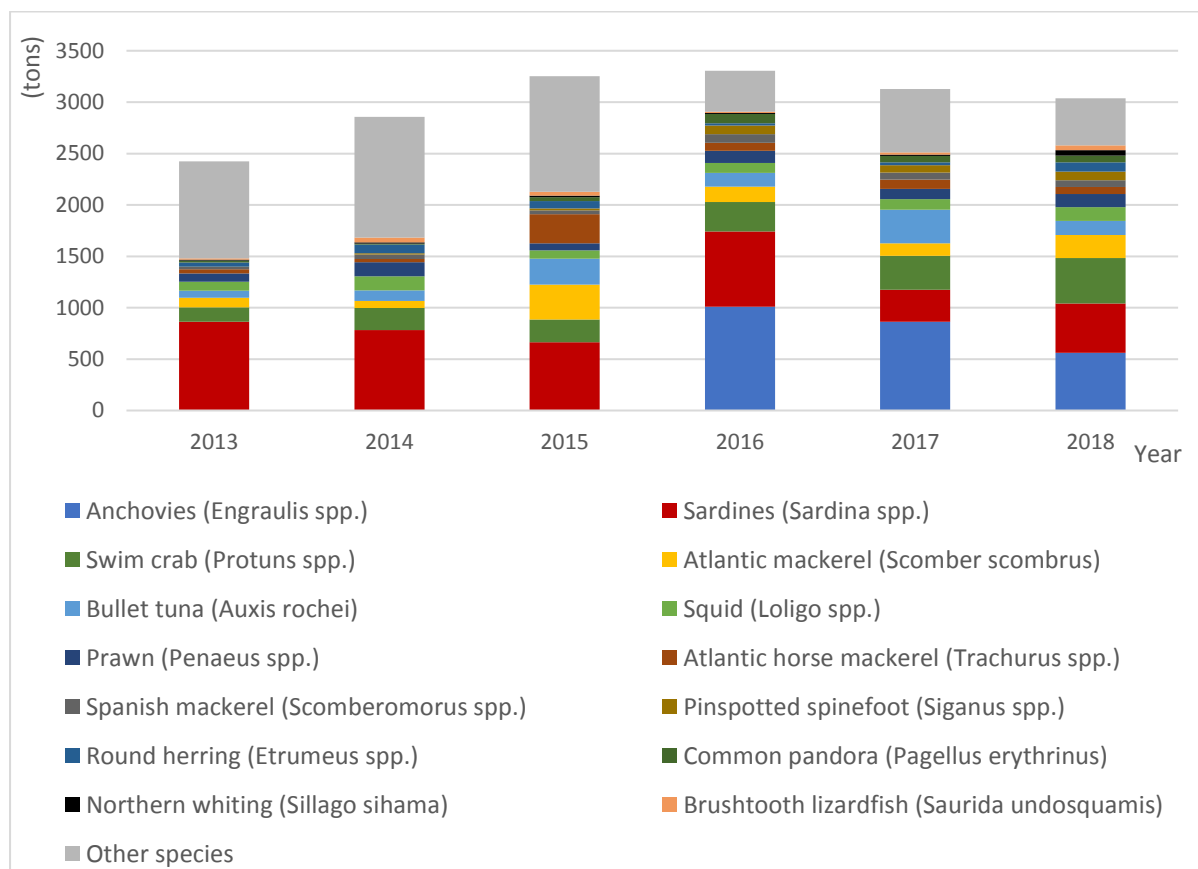


Figure 3. Species composition of landed fish in the GS from 2013 to 2018

Source. DOF data

Note. Species categorization is based on DOF data. Anchovies (*Engraulis spp.*) began to be recorded separately in 2016. Within DOF data, there is a category for “fingerlings” of juvenile fish, which comprise about 5-15 percent of total fish landed. Fisheries species within fingerlings are mixed, and other species are included here.

Table 4. Overall landed fish per species in the GS in 2018

	Species	Group	2018	
			Tons	Percent
1	Anchovies (<i>Engraulis spp.</i>)	Pelagic	562.2	18.5%
2	Sardines (<i>Sardina spp.</i>)	Pelagic	480.2	15.8%
3	Swim crab (<i>Protuns spp.</i>)	Crustacea	442.4	14.6%
4	Atlantic mackerel (<i>Scomber scombrus</i>)	Pelagic	221.7	7.3%
5	Bullet tuna (<i>Auxis rochei</i>)	Pelagic	137.4	4.5%
6	Squid (<i>Loligo spp.</i>)	Cephalopod	134.2	4.4%
7	Prawn (<i>Penaeus spp.</i>)	Crustacea	129.2	4.3%
8	Round herring (<i>Etrumeus spp.</i>)	Pelagic	91.6	3.0%
9	Pinspotted spinefoot (<i>Siganus spp.</i>)	Demersal	82.5	2.7%
10	Atlantic horse mackerel (<i>Trachurus spp.</i>)	Pelagic	68.9	2.3%
11	Common pandora (<i>Pagellus erythrinus</i>)	Demersal	66.9	2.2%
12	Spanish mackerel (<i>Scomberomorus spp.</i>)	Pelagic	64.2	2.1%
13	Northern whiting (<i>Sillago sihama</i>)	Pelagic	51.2	1.7%
14	Brushtooth lizardfish (<i>Saurida undosquamis</i>)	Demersal	46.9	1.5%
15	Other species	-	459.6	15.1%
	TOTAL	-	3,039.1	100.0%

Source. DOF data

The DOF collects data on landed fish by (i) trawling gear by trawlers, (ii) purse-seining gear by large-purse seiners (Shanshulas), (iii) purse-seining gear by Hasakas with motors, (iv) long-line gear by Hasakas with motors, (v) driftnet gear by Hasakas with motors, and (vi) others. The high fishing season is May, and the low season is November to March. There are no observers on the vessels, so the landed fish and estimated catch fish are not necessarily the same.

3.3.3.2 Landed fish by trawling gear by trawlers

Almost 40-50 percent of trawler catch are swim crab, and 20 percent are prawn.

Figure 4 shows landed fish by trawlers in 2018, and table 5 shows landed fish by trawlers in 2016, 2017 and 2018. Trawlers also catch squid, Spanish mackerel, common pandora, brushtooth lizardfish, and red mullets.

Prawn is the main target because of its high value. Most landed prawn are already packed in boxes on the trawlers. Upon arrival at Gaza City Port, they will be transported to the West Bank and some high-end restaurants in the GS. If the checkpoint is not open, landed prawns are kept at cold storage at TC or at traders.

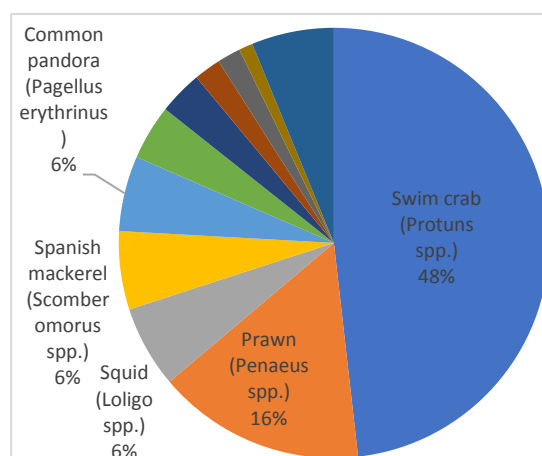


Figure 4. Landed fish by trawler in 2018 (kg)

Source: DOF data

Meanwhile, other landed catch, including swim crab, are mostly sold at local markets in the GS.

Table 5. Landed fish by trawler (kg)

Species	Group	2016	2017	2018
Swim crab (<i>Protuns spp.</i>)	Crustacea	271,190	279,388	392,754
Prawn (<i>Penaeus spp.</i>)	Crustacea	115,018	100,806	127,414
Squid (<i>Loligo spp.</i>)	Cephalopod	46,335	35,134	50,153
Spanish mackerel (<i>Scomberomorus spp.</i>)	Pelagic	48,015	47,139	47,963
Common pandora (<i>Pagellus erythrinus</i>)	Demersal	60,211	42,020	46,068
Brushtooth lizardfish (<i>Saurida undosquamis</i>)	Demersal	9,802	14,062	33,757
Red mullets (<i>Mullus spp.</i>)	Demersal	35,422	22,432	26,876
Northern whiting (<i>Sillago sihama</i>)	Pelagic	10,303	7,601	16,511
Yellowstripe barracuda (<i>Sphyraena Chrysotaenia</i>)	Pelagic	9,611	15,715	14,336
Cuttlefish (<i>Sepia spp.</i>)	Cephalopod	21,598	12,899	8,508
Other species	-	100,414	62,135	50,480
TOTAL	-	727,919	639,331	814,820

Source: DOF data

3.3.3.3 Landed fish by large-purse seining gear by Shanshulas

Large-purse seiners used by Shanshulas target small pelagic fish. Figure 5 and table 6 show landed fish by large-purse seining gear by Shanshulas in 2016, 2017 and 2018. The overall amount of landed fish by Shanshula has been decreasing. Anchovies and sardines are the main fisheries, as well as mackerel and herring. With anchovy spawning from spring to autumn and sardine from autumn to spring, Shanshulas can catch small pelagic fish year-round.

During the February 2020 workshop, participants raised concerns about the decline of the fish catch in past years and recognized both regional and local issues. Because small pelagic fish migrate in the Mediterranean Sea, it requires regional management, but there is not enough coordination in the region. There was also recognition of the lack of local coordination, as some Shanshulas use small mesh size nets.

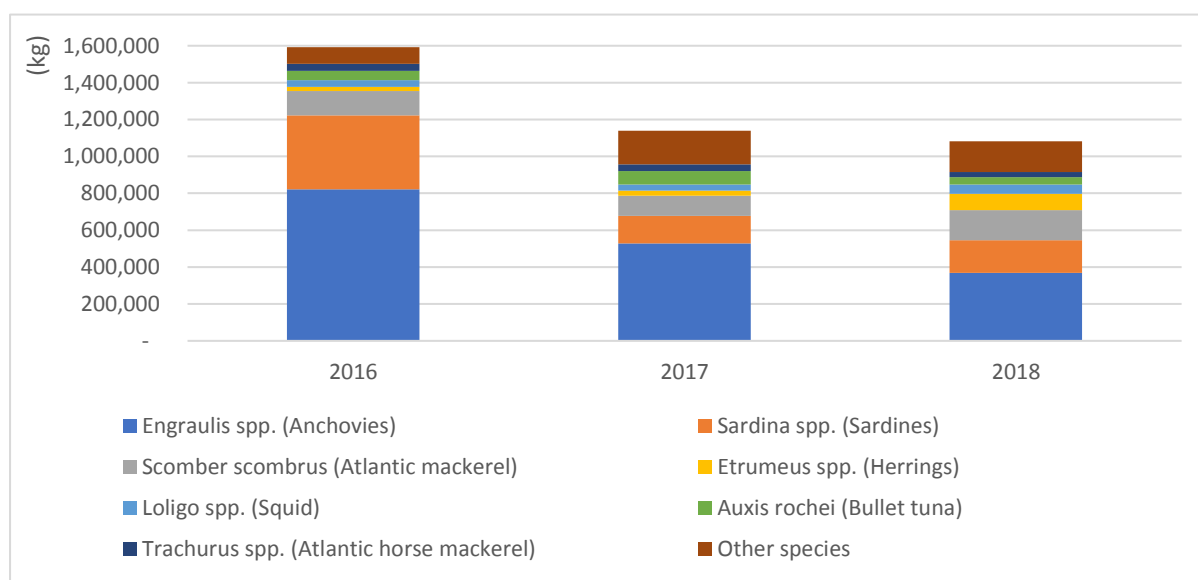


Figure 5. Landed fish by Shanshulas with large-purse seining gear (kg)

Source: DOF data

Table 6. Landed fish by Shanshulas with large-purse seining gear (kg)

Species	Group	2016	2017	2018
Anchovies (<i>Engraulis spp.</i>)	Pelagic	821,100	528,249	368,062
Sardines (<i>Sardina spp.</i>)	Pelagic	401,410	148,736	177,587
Atlantic mackerel (<i>Scomber scombrus</i>)	Pelagic	131,966	110,357	163,117
Round herring (<i>Etrumeus spp.</i>)	Pelagic	22,148	27,448	89,289
Squid (<i>Loligo spp.</i>)	Cephalopod	36,190	33,119	48,832
Bullet tuna (<i>Auxis rochei</i>)	Pelagic	51,165	73,291	39,828
Atlantic horse mackerel (<i>Trachurus spp.</i>)	Pelagic	37,100	35,592	29,294
Other species	-	90,334	182,135	165,896
TOTAL	-	1,591,413	1,138,927	1,081,905

Source: DOF data

3.3.3.4 Landed fish by Hasaka

Hasakas with motors use different fishing gear, depending on the fishing season. The DOF collects landed fish data determined by the three types of gear used by Hasakas: (i) small-purse seining (table 7), (ii) long line (table 8), and (iii) driftnet (table 9). While some Hasakas use only one type of gear, most Hasakas use multiple types. Although the target fisheries of small-purse seining Hasaka overlap with those of Shanshulas, the fishing zones are different because Hasakas fish closer to the coast. Long-line fishing by Hasaka targets demersal fish. Their fish catch total is smaller but has higher value, thus they are targeted for high-end markets, including restaurants in the GS.

Table 7. Landed fish by Hasaka with small-purse seining (kg)

Species	Group	2016	2017	2018
Anchovies (<i>Engraulis spp.</i>)	Pelagic	189,039	335,940	194,039
Sardines (<i>Sardina spp.</i>)	Pelagic	205,600	122,668	179,737
Bullet tuna (<i>Auxis rochei</i>)	Pelagic	76,154	242,107	86,897
Pinspotted spinefoot (<i>Siganus spp.</i>)	Pelagic	60,227	55,085	74,556
Atlantic mackerel (<i>Scomber scombrus</i>)	Pelagic	15,965	10,742	57,869
Squid (<i>Loligo spp.</i>)	Cephalopod	16,291	33,514	33,772
Northern whiting (<i>Sillago sihama</i>)	Pelagic	764	6,606	32,475
Atlantic horse mackerel (<i>Trachurus spp.</i>)	Pelagic	25,787	43,588	32,078
Mulletts (<i>Liza spp.</i>)	Pelagic	5,297	6,593	10,540
Other species	-	125,750	252,056	136,949
TOTAL	-	720,874	1,108,899	838,912

Source: DOF data

Table 8. Landed fish by Hasaka with long line (kg)

Species	Group	2016	2017	2018
Groupers (<i>Epinephelus spp.</i>)	Demersal	10,197	11,918	8,057
Seabream (<i>Pagellus erythrinus</i>)	Demersal	4,640	5,200	7,065
Shark (<i>Carcharhinus spp.</i>)	Chondrichthyes	4,805	11,353	3,319
Grey triggerfish (<i>Balistes capriscus</i>)	Demersal	1,452	1,577	2,636
Guitarfish ray (<i>Rhynchobatus spp.</i>)	Chondrichthyes	1,819	2,326	1,718
Seabream (<i>Pagellus erythrinus</i>)	Demersal	2,220	953	1,309
Common stingray (<i>Dasyatis spp.</i>)	Chondrichthyes	906	933	1,234

Species	Group	2016	2017	2018
Croaker (<i>Argyrosomus regius</i>)	Demersal	884	403	1,207
Seabream (<i>Diplodus spp.</i>)	Demersal	1,999	725	1,001
Bullet tuna (<i>Auxis rochei</i>)	Pelagic	820	1,029	979
Greater amberjack (<i>Seriola dumerili</i>)	Pelagic	2,800	2,319	831
Other species	-	1,518	743	764
TOTAL	-	34,060	39,479	30,120

Source: DOF data

Table 9. Landed fish by Hasaka with driftnet (kg)

Species	Group	2016	2017	2018
Sardines (<i>Sardina spp.</i>)	Pelagic	123,183	38,860	122,209
Swim crab (<i>Protuns spp.</i>)	Crustacea	7,530	9,995	20,399
Shark (<i>Carcharhinus spp.</i>)	Chondrichthyes	3,662	6,319	16,304
Yellowstripe barracuda (<i>Sphyræna Chrysotaenia</i>)	Pelagic	3,477	3,431	13,935
Spanish mackerel (<i>Scomberomorus spp.</i>)	Pelagic	19,497	14,095	12,499
Brushtooth lizardfish (<i>Saurida undosquamis</i>)	Demersal	1,498	4,385	11,460
Bullet tuna (<i>Auxis rochei</i>)	Pelagic	4,584	11,371	9,678
Common pandora (<i>Pagellus erythrinus</i>)	Demersal	21,109	10,800	9,581
Cuttlefish (<i>Sepia spp.</i>)	Cephalopod	13,009	12,889	7,443
Atlantic mackerel (<i>Scomber scombrus</i>)	Pelagic	6,260	6,509	6,512
Red mullets (<i>Mullus spp.</i>)	Demersal	541	1,833	2,961
Guitarfish ray (<i>Rhynchobatus spp.</i>)	Chondrichthyes	2,805	1,230	1,962
Mullets (<i>Liza spp.</i>)	Pelagic	46	221	1,763
Black wing flyingfish (<i>Hirundichthys rondeleti</i>)	Pelagic	15	30,839	1,552
Squid (<i>Loligo spp.</i>)	Cephalopod	601	37	1,484
Other species	-	23,657	9,983	7,656
TOTAL	-	231,474	162,797	247,398

Source: DOF data

3.4 Inland and marine cage aquaculture

Inland and marine cage aquaculture is a growing and promising sector in the GS. The development of aquaculture could fill the gaps in domestic fish production and demand while capture fisheries develops its management system. In 1994, the initial target species for inland aquaculture were tilapia, European bass, and grey mullet. In 2010, seabream and sea bass were introduced. Recently, marine cage aquaculture of seabream has been initiated as a pilot project by FAO. As figure 6 shows, production of farmed gilthead seabream has been constantly increasing, reaching 630 tons in 2018.

Inland tilapia fish farming has the longest history in the GS, and many small farmers still raise tilapia in small ponds and irrigation systems. In 1997, the DOF constructed a small-scale tilapia hatchery and has been producing tilapia fingerlings for sale. In 2005, Palestinian Agriculture Development Association (PARC), collaborating with the DOF, benefited from a training session on tilapia hatcheries in Egypt and established a new freshwater tilapia hatchery in the GS. The DOF distributed fingerlings to about 20 irrigation ponds, and this provides organic fertilizer for crop production.

FAO also supported the establishment of about 13 intensive fish-farming facilities and 300 irrigation-based fish farms. Many small farmers continue raising tilapia in small ponds and irrigation systems, and it is easy to obtain tilapia fingerling in the GS. European bass and grey mullet farming did not grow as much as tilapia, and current production of these fisheries are minimum.

Seabream and seabass species were introduced to the market in 2010, and seabream production is ongoing. A number of private firms started to raise gilthead seabream (*Sparus aurata*) and European seabass (*Dicentrarchus labrax*) in 2010, but most had to close their business in 2013 when they observed frequent blackouts yet could not afford to buy fuel for back-up generators.⁴³

Currently two firms are operational—Albahar in Gaza City, and Fish and Fresh in Rafah City—producing about 400 and 250 tons of seabream fingerlings, respectively. The cost of seabream fingerling production was about 30 NIS per kilogram, but it has fallen to around 22 NIS per kilogram owing to the drop in energy costs following the introduction of solar power systems.⁴⁴ Imported seabream fingerling used to cost around 2.4 NIS per gram, but now is available for around 1.3 NIS per gram, because of the existing hatcheries in the GS. Currently, around 1.2 million seabream fingerlings are produced a year. According to DOF data, seabream production has been increasing. About 40 percent of the production is exported to the West Bank.

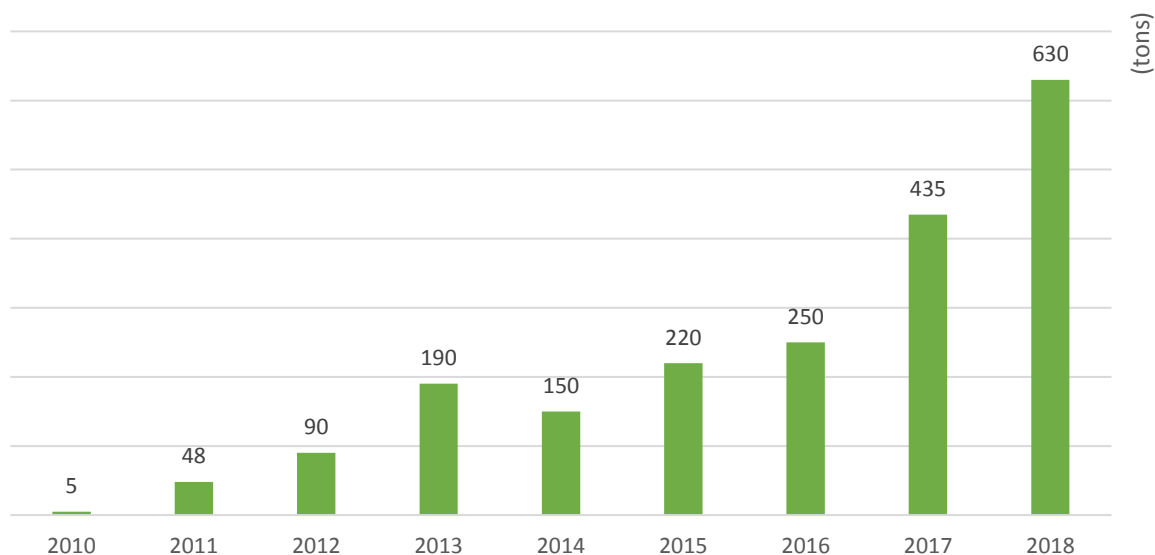
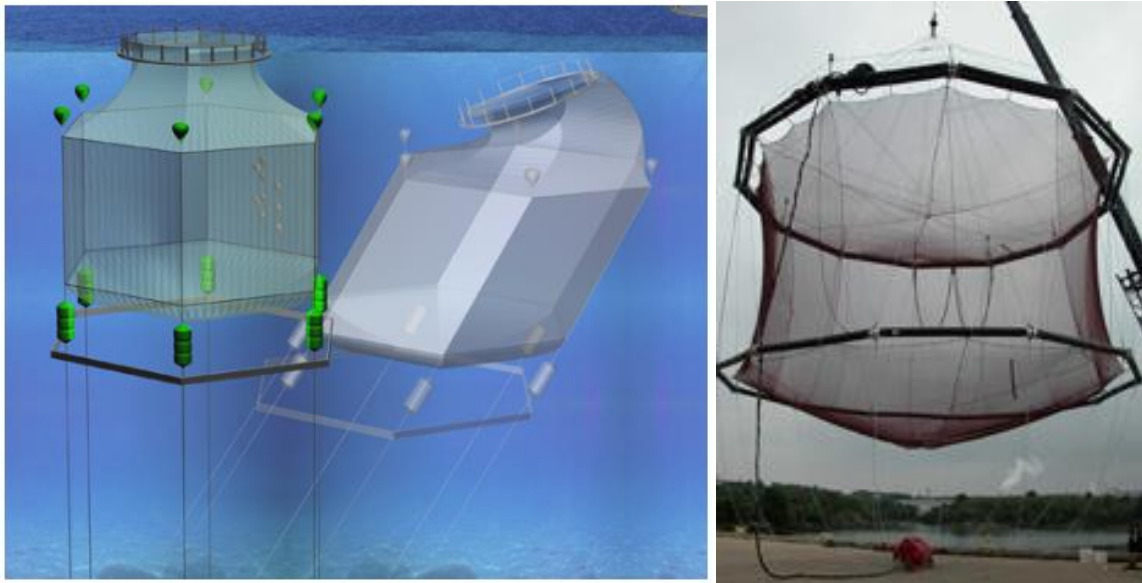


Figure 6. Farmed gilthead seabream production in the GS

Source: DOF, 2019.

Following the success of inland fish farming, the FAO has been pioneering a marine cage farming project in the GS, with the aim of strengthening the resilience and livelihoods of Gazan fishing communities. The project centers on the concept of an off-shore marine cage farm designed to deliver marine aquaculture technologies and capacity development to fishers, to operate the marine cage farm as a social business and promote access and links to markets. The pilot, installation of which began on April 6, 2020, is located approximately 3.5 NM off the southern border of Deir Albalah governorate. The establishment of this cage farming zone is intended to encourage the future expansion of the Gazan marine aquaculture sector.⁴⁵

Before the project was initiated, many studies were conducted including possible diseases and the weather patterns.⁴⁶ The Tension Leg Cage (TLC)⁴⁷ system is considered the most suitable system for the GS and will be utilized throughout the project. The project will also support capacity development and create many skilled jobs required for management and operations. The fingerlings of seabream will be secured from the local market. The farm location is identified in coordination with the Gaza Port Authority, DOF, and MOA. The project will also facilitate accessibility to trade seabream in the West Bank and external markets.



Design and Photo: Off-shore marine cage farm that is being piloted in GS waters
Source: FAO

Fish feed is still a constraint in expanding inland and marine cage culture in the GS. There are no fish feed factories in the GS. Owners of aquaculture businesses must therefore keep large feeder inventories in anticipation of an emergency, which costs them a great deal of money and space. While most feed for inland aquaculture and marine cage culture is imported, some GS farmers have started to develop alternatives to imported fish feed, including the Azolla plant, an aquatic fern that grows on water surfaces. Azolla plant fish feed promises to be a cost-cutting, environmentally friendly and economic feed.⁴⁸

Additionally, the GS is well-known for its citrus fruits and other crops, and there are fruit and vegetable wastes that can be used as fish feed. One study has found that orange peel can improve the nutrient absorptive ability of the intestine in Nile tilapia.⁴⁹ Another study concludes that potato peel feed is very nutritive and can help in the qualitative and quantitative growth of fish, and secondly, that orange peel feed resulted in brighter body scales.⁵⁰ Using citrus and vegetable peel and other plant residues can be tested as alternative fish feed in the GS.

3.5 Fish consumption and trade

Fish species are grouped into two categories: “high-value fish” and “public fish,” according to the convention of the DOF for trade purposes. High-value fish are those with a unit cost more than 20 NIS per kilogram, and public fish cost less than 20 NIS per kilogram. Public fish, such as sardines and anchovies, are typically consumed locally.

Local consumption of fish has been low but experienced a steady increase. An FAO brochure⁵¹ indicates that the average fish consumption in the GS is 3.5 kilogram per person per year. This is very low compared with neighboring countries where average consumption is around 15 kg per person per year. Figure 7 illustrates the evolution of implied fish consumption per capita in WB&G (separate data for the GS were not available).⁵² Note that although the figure indicates the average for the West Bank and GS population, much of the fish consumption in WB&G occurs in the GS.



Figure 7. Per-capita fish consumption in WB&G from 2005 and 2017 (kg/year)

Source: FAO Yearbook. Fishery and Aquaculture Statistics, 2018.

The increase in fish demand has been supported by expanded fish imports. As seen in figure 8, the amount of food fish consumed in WB&G has increased substantially, but much of it is represented by fish imports. According to the FAO brochure, annual fish consumption in the GS is currently approximately 20,000 tons. Traditional fishing produces 26 percent of locally consumed fish, with in-land aquaculture producing 3 percent. The deficit is supported by fish imports from outside the GS, which accounts for more than 66 percent of locally consumed fish. Seasonal demand (during Ramadan) for processed fish also appears to account for some fish imports, as domestic production of processed fish is limited.

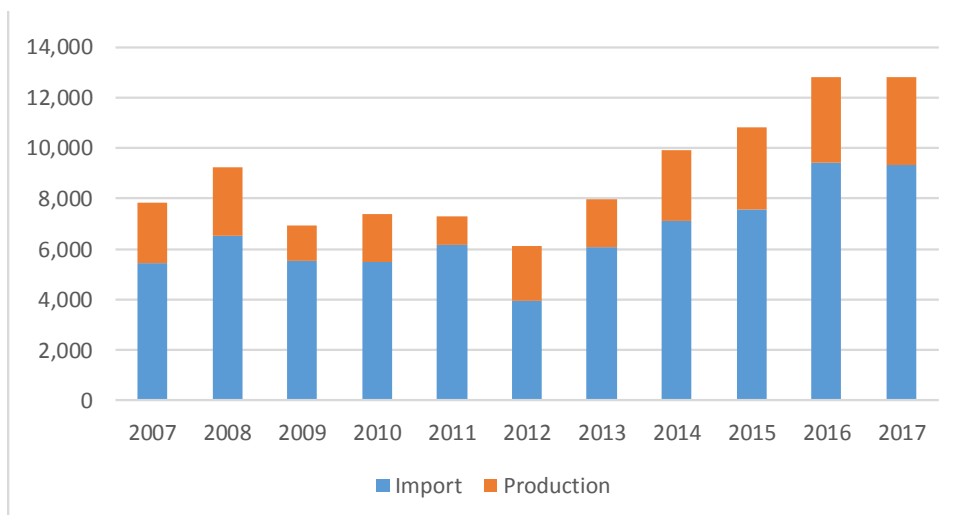


Figure 8. Sources of food fish supply in WB&G from 2007 and 2017 (tons)
Source: FAO Yearbook. Fishery and Aquaculture Statistics, 2018.

Fish exports from the GS have been increasing recently, mainly because aquaculture fish export has been increasing. There was no export from the GS between 2008 and 2013. Since the ceasefire in 2014, Gaza has restarted exporting fish but only to the West Bank. The amount of aquaculture fish production has been increasing, and the amount of its export is also increasing (figure 9).

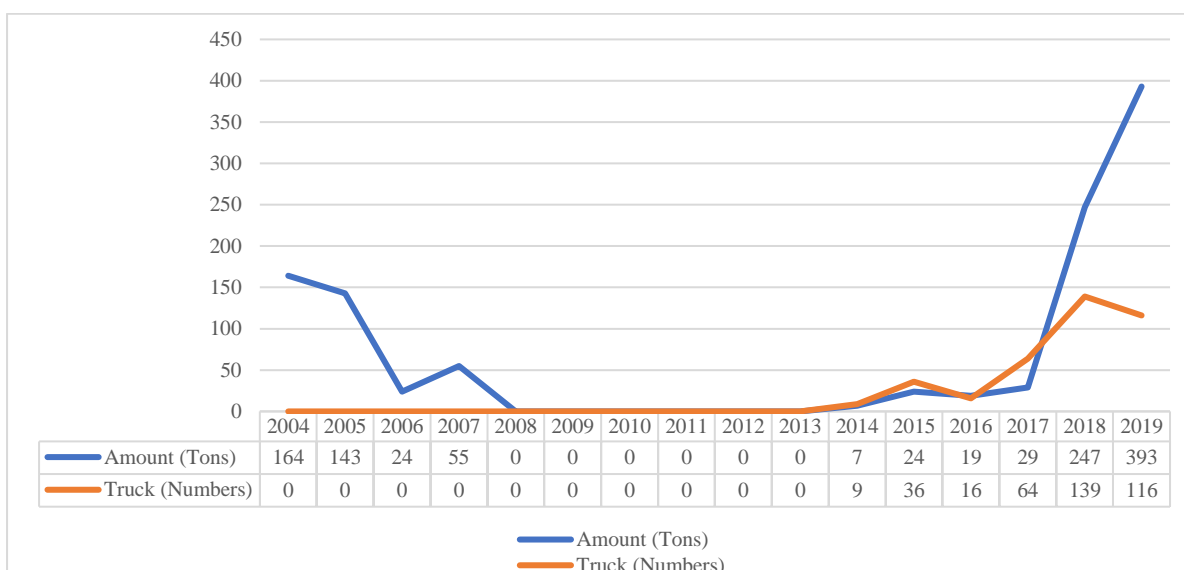


Figure 9. Fish exports from the GS from 2004 to 2019 (tons)
Source: DOF data.

High-value fish are mostly exported. This includes seabream, seabass, and octopus. There is no limit in the amount of high-value fish export, and exporters prefer to handle high-value fish. Meanwhile, the amount of public fish export is limited because they are considered to have high demand domestically in the GS.

Fish from the GS is exported to the West Bank only on Sundays and Wednesdays. There are four leading traders who export fish from the GS to the West Bank. They require pre-authorization permission from DOF to export fish. Other groups and people are also facilitating export promotion, but the exported amount is still limited. The exporters are required to (1)

submit an application to DOF with a small fee of 26 NIS (US\$7.40); (2) receive a permit issued by the General Administration of Marketing (GAA) of MOA following an internal assessment of the applicant; (3) have the fish in storage facilities inspected by the authority; (4) have the boxes sealed with red wax by GAA staff; and (5) transfer fish to the Kerem Shalom crossing. The volume of export by each exporter is limited to 1.5 tons per week, resulting in a total of 24 tons a month for the four exporters.

Exporting fish from the GS is more profitable than selling locally. The traders typically buy seabreams at 40 NIS in the GS and sell it at 60 NIS in the West Bank, making a 50 percent gross return (table 10). The traders have to cover the cost of the transaction (packaging and transportation), but they still consider it a profitable business. While most farmed fish is exported to the West Bank, most wild caught fish in the GS is sold on the local market.

There are major deficiencies in essential infrastructure for fish export, according to traders interviewed. In particular, they mentioned the lack of storage and collection centers, transportation, cold storage facilities on the border, distribution packing centers, and other export trade support. They added that they incur uncertainty and high costs because of externally-imposed border and road closures. These high transaction costs make WB&G fish and other agricultural output less competitive in the export markets, despite strong internal and external demand.

Table 10. Unit price of main exported fish in the West Bank and Gaza (WB&G)

Species	Gaza Strip (NIS per kg [a])	West Bank (NIS per kg [b])	Gross margin due to export (% [b-a/a])
High Value Fish List			
Gilthead Seabream (<i>Sparus aurata</i>)	40	60	50%
Pinspotted spinefoot (<i>Siganus spp.</i>)	15	40	166%
Prawn (<i>Penaeus spp.</i>)	65	100	54%
Public Fish List			
Swim crab (<i>Protuns spp.</i>)	6	12	100%
Bullet tuna (<i>Auxis rochei</i>)	6	13	117%

Source: Summaries by the authors from DOF data.

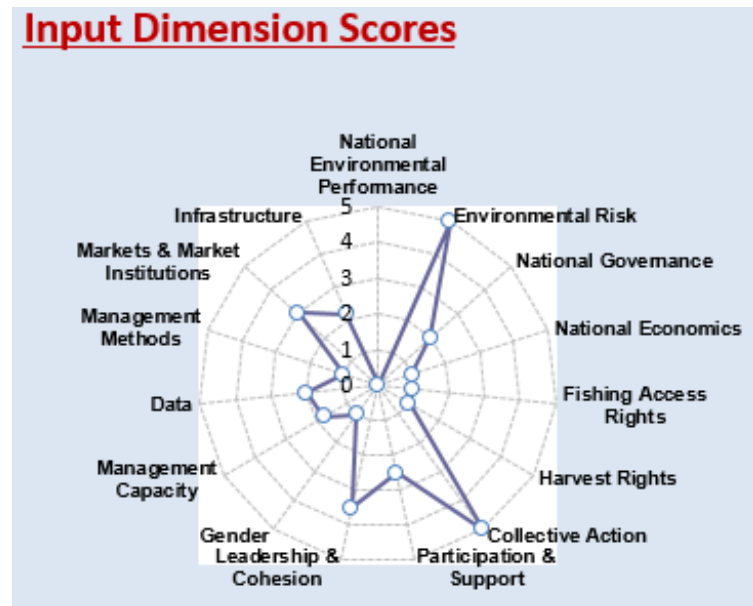
Note: Price changes by quantity, month and year. The above figures are monthly average prices per kg in 2018.

4. Fishery Performance Indicator (FPI) results

This chapter presents summary results of the Fishery Performance Indicator (FPI) scoring. Detailed scoring results can be found in annex 3. The FPI tool was to be applied to overall fisheries in the GS, as opposed to specific, individual Gazan fisheries, because the experts who were consulted initially considered that there were mixed fisheries on-going and it would be hard to distinguish different fisheries. As described in chapter 2, there are two categories of indicators in the FPIs: FPI input indicator and FPI output indicator.

4.1 FPI Input Results in the GS

The FPI input results have 5 components: (i) Macro factors (national environmental performance, environmental risk, national governance, national economics), (ii) Property rights and responsibility (fishing access rights, harvest rights), (iii) Co-management (collective action, participation and support, leadership and cohesion, gender, (iv) Management (management capacity, data, management methods, and (v) Post-harvest (markets and market institutions, infrastructure).



Among the macro factors, environmental risk (or exogenous environmental factors in table 11) had high scores, but the quality of response was low (all the data quality is scored C), because there was not enough data to support observations. These measures were queried during the workshop and follow-up meetings were organized to clarify and re-verify the scores. Stakeholders considered that there was no impact of disease and pathogens to harvest value.

The FPI scoring exercise faced one major challenge. First, there was no Environmental Performance Index (EPI) score for the West Bank and Gaza, so the score for environmental performance could not be calculated. In addition, there was no data on disease and pathogens of fisheries. As a result, even if they were affected by disease and pathogens, stakeholders could not have seen their harvest value affected by disease or pathogens. Stakeholders considered that there was no impact of natural disasters and catastrophes to harvest value, either. Stakeholders are aware of pollution in the ocean, as they have seen untreated water go directly to the ocean. However, they generally do not recognize that there is a linkage between pollution from untreated sewage and fish harvest value.

There is neither control of fishing access nor harvest rights, therefore the overall rating of property rights and responsibility had to be 1.0. The FPI inputs scoring includes subsequent analysis of fishing access and harvest rights from transferability, security, durability, flexibility and exclusivity perspectives. However, FPI inputs scoring in the GS could not continue because there is no fishing access or harvest rights management. It is recommended that some degree

of access and rights control and management be developed, based on consultations with stakeholders, including fishers, and that meaningful results from the FPI process be obtained.

Within the co-management rating, fishers recognize participation because they have regular meetings with sufficient stakeholder participation. However, the validity of this scoring is not clear. Out of the 480 members of the TC and the approximately 4,000 members of the FSU, some directors of TC and FSU were invited to the workshop. However, because of the limited time and scope during the FPI scoring exercise, not all the members were consulted and, it is not clear if all the members shared the same opinion as the TC and FSU directors. If a further study is to be allowed, it would be ideal to analyze gaps in collective actions.

Additionally, there are not many women in the fisheries sector and their participation is considered to be low. The consultation workshop in February 2020 intended to invite more women, but it achieved only limited participation from them. Consulting with more women and analyzing gender gaps more explicitly, including post-harvest business management aspects, would be useful in a potential future study.

Furthermore, there are more potential stakeholders to be invited in the fisheries and aquaculture sector, including youth who are currently unemployed but have skills. Further stakeholder consultations should invite them to seek where their skills can fit in the development of the fisheries and aquaculture sector. Some hatchery operators have hired trustworthy and skillful youth, and such lessons learned should be reflected in the development of fisheries and aquaculture in the West Bank and Gaza.

Management scores are very low as there is no systematic fisheries management or marine zoning in the GS. The Gazan fishing zone has been exogenously determined and has fluctuated over time changing yearly. In this context, it becomes challenging to develop clear fishing access rules, including clear demarcation of the fishing zone for different fishing vessels, and to effectively implement these rules. As a result, larger trawlers (Gar) and purse-seiner (Shanshula) vessels are observed fishing near the coast, and sometimes smaller Hasakas operators have raised concerns. Despite the challenges, it is still important to have a coordination mechanism across different fisher groups in the GS. Such grievances should be properly recorded and managed and should be reflected in the management system.

Within the post-harvest scores, fisheries sector stakeholders recognize that most landed fish is properly handled at auction market competitively. At the same time, they also recognize that the market's infrastructural facilities are ageing and are in critically need to be improved.

Table 11. Fishery Performance Indicator (FPI) Inputs Results Summary

Component	Dimension	Measure	Gaza Scores	
			Fishery	Summary
Macro Factors	General Environmental Performance	Environmental Performance Index (EPI)	NA	NA
	Exogenous Environmental Factors	Disease and Pathogens	5	5.0
		Natural Disasters and Catastrophes	5	
		Pollution Shocks and Accidents	5	
		Level of Chronic Pollution (Stock effects)	5	
		Level of Chronic Pollution (Consumption effects)	5	
	Governance	Governance Quality	3	2.0
		Governance Responsiveness	1	
	Economic Conditions	Index of Economic Freedom	NA	1.0
		Gross Domestic Product (GDP) per Capita	1	
Fishing Access	Proportion of Harvest Managed Under Limited Access	1	1.0	
	Transferability Index	NA		

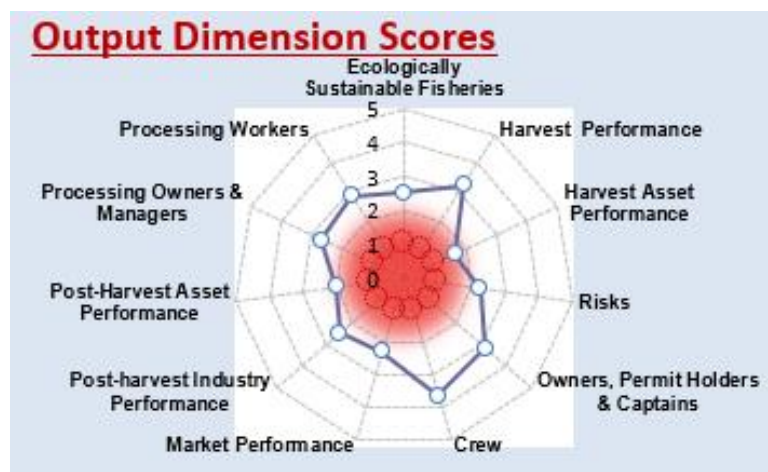
Component	Dimension	Measure	Gaza Scores	
			Fishery	Summary
Property Rights and Responsibility		Security Index	NA	1.0
		Durability Index	NA	
		Flexibility Index	NA	
		Exclusivity Index	NA	
	Harvest Rights	Proportion of Harvest Managed with Rights-based Management	1	
		Transferability Index	NA	
		Security Index	NA	
		Durability Index	NA	
		Flexibility Index	NA	
		Exclusivity Index	NA	
Co-Management	Collective Action	Proportion of Harvesters in Industry Organizations	5	5.0
		Harvester Organization Influence on Fishery Management and Access	5	
		Harvester Organization Influence on Business and Marketing	5	
	Participation	Days in Stakeholder Meetings	4	2.5
		Industry Financial Support for Management	1	
	Community	Leadership	3	3.5
		Social Cohesion	4	
	Gender	Business Management Influence	1	1.0
		Resource Management Influence	1	
		Labor Participation in Harvest Sector	1	
		Labor Participation in Post-Harvest Sector	1	
	Management	Management Inputs	Management Expenditure to Value of Harvest	2
Enforcement Capability			1	
Management Jurisdiction			2	
Level of Subsidies			2	
Data		Data Availability	2	2.0
		Data Analysis	2	
Management Methods		Marine Protected Areas (MPAs) and Sanctuaries	1	1.0
		Spatial Management	1	
		Fishing Mortality Limits	1	
Post-harvest	Markets and Market Institutions	Landings Pricing System	4	3.0
		Availability of Ex-vessel Price and Quantity Information	2	
		Number of Buyers	5	
		Degree of Vertical Integration	4	
		Level of Tariffs	1	
		Level of Non-tariff Barriers	2	
	Infrastructure	International Shipping Service	1	2.2
		Road Quality Index	1	
		Technology Adoption	3	
		Extension Service	3	
		Reliability of Utilities/Electricity Supply	2	
Access to Ice and Refrigeration	3			

Source: Summary figures of Annex 3. Detailed FPI Input results

4.2 FPI Output Results in the GS

FPI output results have three components: (i) Ecologically sustainable fisheries performance or stock performance, (ii) Harvest sector performance, and (iii) Post-harvest performance.

Fishers, auction managers, processors, and transporters operating in the GS are all from the GS, and the resident ownership is scored high. There



are no migrant fishers, and those fishers in the GS limited fishing zone are all from the Gazan coast.

The ecologically sustainable fisheries performance or stock performance score summary is relatively low (2.4). The fish stock assessment has not been conducted in a systematic way. Existing limited fish stock results show moderate or high overexploitation of resources. Workshop participants also recommended that systematic fish stock assessments and fisheries management plans based on the assessment results be put in place. Currently, the fishers are allowed to land any species without any quantity limit.

Among harvest sector performance scores, harvest asset performance score is low at 1.7. There is no data on maximum sustainable yield in the GS. Most fishing vessels are old and have not been replaced or updated in years. Price and revenue volatility are observed mainly because the fishing zone fluctuates exogenously. Vessel owners, captains and crews are cooperating with one another. Vessel owners and captains tend to live close to the coastline and are respected by local community members. Close collaboration was observed among family members. The degree of integration of non-family members in the capture fisheries is not clear, and further analysis is required to determine to what extent non-family members can be integrated in the fisheries sector.

There is no third-party harvest certification system in the GS. Captured fish go to market without verification of their origin or their quality. There is no clear record of amount of captured fish because there is no observer on the vessels and the DOF data are only recorded at the landing sites. Some observations noted that there is a gap between captured fish and landed fish, and further analysis is necessary to understand the actual captured amount and species.

Annual earnings are not reflected in the renewal of harvest asset, and fishers keep using old vessels and gear. Revenues are shared among three parties: vessel owners, captains and crews.

Overall post-harvest performance scores are low. There are extremely limited marketing options: sell either to local consumers or restaurants in the GS, or transport to the West Bank. As of now, only a few operators have permits and can transport fish from Gaza to the West Bank. Maintaining a satisfactory quality of fish is the main constraint for the transporters and transport business operators. The Ministry of Agriculture’s records of revenues generated from fish exported from the GS to the West Bank show an increasing trend, mainly because of an increase in aquaculture fish production. However, it is hard to differentiate between captured fish and aquaculture fish transported out of the GS.

Table 12. Summary of Fishery Performance Indicator (FPI) Output Results

Component	Dimension	Sustainable Category	Measure	Gaza Scores	
				Score	Summary
Ecologically Sustainable Fisheries	Fish Stock Health and Environmental Performance	Ecology	Proportion of Harvest with Third-Party Certification	1	2.4
		Ecology	Percentage of Stocks Overfished	3	
		Ecology	Overfishing or Rebuilding	2	
		Ecology	Regulatory Mortality	3	
		Ecology	Selectivity	1	
		Ecology	Illegal, Unregulated or Unreported Landings	4	
		Ecology	Status of Critical Habitat	3	
Harvest Sector Performance	Harvest Performance	Economics	Landings Level	1	3.3
		Economics	Excess Capacity	2	
		Economics	Season Length	5	
		Community	Harvest Safety	5	
		Economics	Ratio of Asset Value to Gross Earnings	1	

Component	Dimension	Sustainable Category	Measure	Gaza Scores	
				Score	Summary
	Harvest Asset Performance	Economics	Total Revenue versus Historic High	4	1.7
		Economics	Asset (Permit, Quota) Value versus Historic High	1	
		Economics	Borrowing Rate Relative to Risk-free Rate	1	
		Economics	Source of Capital	2	
	Risk	Economics	Functionality of Harvest Capital	1	2.3
		Economics	Annual Total Revenue Volatility	3	
		Economics	Annual Landings Volatility	3	
		Economics	Intra-annual Landings Volatility	1	
		Economics	Annual Price Volatility	2	
		Economics	Intra-annual Price Volatility	1	
	Owners, Permit Holders and Captains (those holding the right or ability to access)	Economics	Spatial Price Volatility	5	3.2
		Community	Contestability and Legal Challenges	1	
		Community	Earnings Compared to National Average Earnings	3	
		Community	Fishery Wages Compared to Non-fishery Wages	3	
		Community	Education Access	2	
	Crew (Those depending on others for access)	Community	Access to Health Care	3	3.6
		Community	Social Standing of Boat Owners and Permit Holders	3	
		Community	Proportion of Nonresident Employment	5	
		Community	Earnings Compared to National Average Earnings	3	
		Community	Fishery Wages Compared to Non-fishery Wages	3	
		Community	Education Access	2	
Community		Access to Health Care	3		
Post Harvest Performance	Market Performance	Community	Social Standing of Crew	3	2.3
		Community	Proportion of Nonresident Employment	5	
		Community	Crew Experience	5	
		Community	Age Structure of Harvesters	5	
		Economics	Ex-Vessel Price versus Historic High	3	
		Economics	Final Market Use	5	
	Post-harvest, Processing and Support Industry Performance	Economics	International Trade	2	2.5
		Economics	Final Market Wealth	1	
		Economics	Wholesale Price Relative to Similar Products	3	
		Economics	Capacity of Firms to Export to the US and EU	1	
		Economics	Ex-Vessel to Wholesale Marketing Margins	1	
	Post-Harvest Asset Performance	Community	Sanitation	2	2.0
		Community	Regional Support Businesses	3	
		Economics	Borrowing Rate Relative to Risk-free Rate	2	
	Processing Owners and Managers	Economics	Source of Capital	2	2.7
		Economics	Age of Facilities	2	
		Community	Earnings Compared to National Average Earnings	2	
		Community	Manager Wages Compared to Non-fishery Wages	2	
		Community	Education Access	2	
		Community	Access to Health Care	2	
	Processing Workers	Community	Social Standing of Processing Managers	3	2.9
Community		Nonresident Ownership of Processing Capacity	5		
Community		Earnings Compared to National Average Earnings	2		
Community		Worker Wages Compared to Non-fishery Wages	2		
Community		Social Standing of Processing Workers	2		
Community		Education Access	2		
Community	Access to Health Care	2			
Community	Proportion of Nonresident Employment	5			
Community	Worker Experience	5			

Source: Summary figures of Annex 3. Detailed FPI Output results

5. Summary and conclusion

This report presented a rapid diagnosis of the fisheries and aquaculture sector in the Gaza Strip (GS). Chapters 3 investigated different aspects of the sector, while chapter 4 set out in summary form the results of applying the Fishery Performance Indicators (FPIs) tool. Through the analysis and exercises, six important points have emerged. It would be desirable if these points are followed up and further investigated.

1. Although policy and legal frameworks for fisheries and aquaculture management exist, they are not leading to systematic implementation of management measures in the GS.

As summarized in chapter 3, relevant laws and policy documents have been developed in the past. However, many factors are keeping them from being updated and implemented toward effective fisheries management in the GS. Foremost among these factors is that the official frameworks were developed at the Palestinian Authority (PA) level, which means that there are political and logistical difficulties in their implementation. Practical difficulties of effective management of capture fisheries are also related to the exogenously-determined and fluctuating fishing zone in which the GS residents are allowed to fish. The ever-changing fishing zone makes it extremely difficult to understand and monitor the fish stocks available for fishing in the GS and, as a result, to determine appropriate catch levels or access rules for various types of fishing vessels each year. It also poses a serious threat to safety at sea.

Despite these challenges, implementing management measures to address the observed issues remains an important goal. The assessment of selected stocks shows an indication of moderate to high overexploitation of marine capture fisheries. Without effective control of access to fishing, the “tragedy of the commons” problem appears to have emerged. As a result, potential resource rents are likely being dissipated.

The overall marine ecosystem of the GS has been degraded as well. The discharge of untreated or partially treated sewage into the GS seawater from wastewater treatment plants is a serious problem that is affecting the entire marine environment and public health. This discharge creates health hazards, destroys marine habitats, and poses severe threats to marine life such as fish, zooplankton, phytoplankton and macroalgae. The dumping of solid wastes in the coastal and marine environments also harms the marine ecosystem. Fishers have frequently collected solid waste in their fishing nets. Large quantities of solid waste can pose direct threats to marine species and their habitats.

In the post-harvest segment as well, there seems a substantial loss in both the quantity and quality of fish because of inadequate handling techniques and knowledge, poorly equipped landing and processing facilities, a critical lack of storage, and fragmented cold chains. Ports are not equipped with sanitary handling facilities or refrigerated warehouses. Because so many fishers lack refrigeration and processing techniques, they are forced to sell their fish at lower prices. If captured and harvested fish were better handled, fishers could likely sell them at better prices. This would bring greater income-earning capacity to those already working in the sector, as well as create new job opportunities in the sector.

Given the political and logistical challenges, solutions to these issues will require innovations combined with a great deal of flexibility. The consultation workshop in February 2020

provided an opportunity to have horizontal and vertical dialogues across stakeholders, and it is desirable that such dialogues should continue to catalyze much-needed innovations.

2. On the capture fisheries side, the existing participatory platforms represent an opportunity to develop and implement an effective bottom-up management system.

As detailed in chapter 3, the fishing industry is relatively well organized in the GS, with fishers being well represented by cooperatives and other organizations (TC, FSU and others). This can mean an advantage in catalyzing innovations in how things are done in the fishing and post-harvest segments. While there are migrant fish that require coordinated management at the regional level, coastal fish species can be managed through local initiatives. It would require stronger coordination among the different stakeholders identified in chapter 4, including between various associations. Currently, there is not enough communication and consultation; various stakeholders tend to take their respective actions separately without first developing a holistic view of the sector. The participatory setup, if better coordinated, would facilitate the resolution of the disputes and conflicts that are sometimes observed in the GS among fishers with differently sized vessel. Such conflict resolution mechanisms, with grievances properly recorded and managed, can and should be reflected in a local fisheries management system.

3. On the aquaculture side, entrepreneurship seems to exist or is emerging, indicating another promising condition for innovations.

Another area of possible innovations is aquaculture. The total amount of fish harvested from inland and marine cage aquaculture has increased recently. It is still a nascent industry, but it seems to have great potential for growth, with job creation possibilities. Aquaculture operators in the GS face various technical and market constraints, but some innovative operators have been testing new technologies and developing new ways of doing aquaculture, which itself indicates the promising business potential of the industry.

Innovation is most evident in the development of alternative aquaculture feeds, for example, feed derived from Azolla plant and potato peels. To further catalyze this emerging entrepreneurship and grow this industry, two kinds of interventions are essential. First, productive innovations need to be appropriately supported and rewarded to encourage further innovations. Thus, enabling conditions for the innovators, after investigating the kind of constraints they face, is one possible area of effective investment. Second, uncontrolled expansion of aquaculture could lead to various unexpected and undesirable outcomes. Therefore, safeguarding against negative impacts – including the management of pathogens and fish diseases, water quality, interactions between farmed and wild fish species, and impacts on the environment in general – must be pursued.

4. FPIs were selected as the tool for rapid sector assessment in this report, but the tool faced constraints in ready applicability to the GS fisheries.

As detailed in chapter 9, the two major constraints on the application of the FPIs tool to Gazan fisheries was that, first, no score exists for the Environmental Performance Index (EPI) in the GS, and secondly, no effective fisheries management exists in the GS, barring subsequent deeper analysis. Thus, in hindsight, other methods could have been chosen for the sector assessment. However, the process of compiling background information was useful, and the FPI application itself also generated a substantial amount of useful information. There likely will be some improvements in the fisheries management regime in the GS, possibly with future

engagements by the World Bank or partner organizations. When improvements in the “input” side of the fisheries are achieved, the FPI exercise should be repeated to evaluate the evolution of the performance, that is, on the “output” side.

5. Although this report provides some key background information about the Gazan fisheries sector, many questions are still unanswered, warranting further efforts in data and information collection and analysis.

Examples of unanswered questions include:

- As became clear during the FPI exercise, residents are concerned about waste and pollution in the marine ecosystem, but there is no scientific data or analysis to back up their anecdotal observations or to trace the impact on fish resources.
- Fishing vessels are old and some are inoperable. The reasons that were identified are that owners cannot afford to maintain their vessels, or do not renew their licenses or pay license fees, or cannot afford the operating costs, or have concerns about security. Uncertainty about the operating environment – for example, the boundaries of the fishing zone, and future availability of fish resources – as well as safety at sea also likely affects decision-making about investing in fishing vessels. Deeper analysis of their decision problem might shed light on appropriate interventions to enhance the productivity of the fishing industry that are compatible with improved management geared towards productive and sustainable fisheries.
- Not much is known about local fish consumption. Are consumer preferences shifting, given that the catch of “public fish” (sardines and anchovies) seems to be declining (figure 3)? What kind of fish and fish products are imported from outside the GS?
- On a related note, the trend of increasing fish consumption implies increasing food fish imports. What is the trend’s impact on the trade balance? Is the growing local aquaculture production expected to directly fill the gap between domestic food fish consumption and production? Or is it expected to raise foreign currencies to support the import of fish and other food commodities?

6. With the coordinated collaboration of the Gazan fishing community, business community, research community, and public, necessary knowledge could be generated and disseminated, and innovations could be catalyzed.

In chapter 3, the academic research community is explicitly identified as an important stakeholder group in the GS fisheries and aquaculture sector. Local research institutions are best situated to generate locally-specific, practical knowledge, and their participation should be encouraged in the effort of making the fisheries and aquaculture sector productive and sustainable. It was learned that Gazan fishing and aquaculture operators are “desperate” to acquire new knowledge and techniques. They suffer from a lack of exchange of ideas and experiences with the outside world, which affects the quality of research, data, training in fishing skills, health and safety procedures, and ports and ship management skills.

The first step towards facilitating practical knowledge creation and dissemination is to identify practical policy research questions in a participatory manner, working across stakeholder groups. Clearly, in order to achieve this, the resources of the research community must be improved.

Annex 1. Map of the West Bank and Gaza

IBRD 33512R1



Annex 2. Participant List for the February 2020 Workshop

	Name	Title	Agency
1	Khalid Qahman	Assistant Chairman	Environment Quality affair
2	Tarik Saqer	Deputy to the Minister of Agriculture in Gaza Strip	Ministry of Agriculture (MOA)
3	Eyad Atalah	Biologist and fishery expert	MOA
4	Abdal naser madi	General Directorate of Fisheries (DOF) employee, Former head of the Department - Fishery expert	MOA
5	Mahmoud Aldadah	Member of PAEEP Environment Specialist	MOA
6	Jehad Salah	Director of Services	MOA
7	Mohamed Aboutair	Director of MOA profession Biology	MOA
8	Ashraf Murtaja	The seaport management services	Ministry of Transport (MOT)
9	Yakob Alghetary	General Directorate of North of Gaza	Ministry of Labor (MOL)
10	Mohammed Hammo	Director of the Seaports Authority	Seaports Authority
11	Ahmed Abu Rass	Deputy to the mayor of Gaza	Municipality of Gaza
12	Haya Alaga	Head of External Relations Division	Municipality of Khan Younis
13	KhalidOUN Abo Saleem	Head of Media Affairs	Bank of Palestine (BOP)
14	Nezar Ayyash	Chairman, Fishers' Syndicate of the Union (FSU)	Fishers' Syndicate of the Union (FSU)
15	Fedaa Alamodi	Member of FSU	FSU
16	Abed Almuti Alhabeel	Head of the BOD	Al Tawfeek Cooperative (TC)
17	Ahmed al ijla	Project coordinator	TC
18	Hisham Baker	Executive manager	TC
19	Nabil Aqra	Member of the Al Tawfeek Cooperative	TC
20	Hisham Wafi	Executive Director	Palestinian Marine Navigators Association (PMNA)
21	Rafiq Arqoob	Member of PMNA	PMNA
22	Hani Atalah	Auctioneer	Chamber of Commerce Gaza
23	Mahmoud Abd Rabu	Fish farms specialist	Albahar farmer
24	Soha Barhoum	Engineering	Fish Fresh Hatchery
25	Akram Madi	Marine Engineers	Fish Fresh
26	Moneer Abu Hassira	Owner of Abu Hasera Fish Restaurant and fish trader	Exporter and sea food Abu Hassira Restaurant
27	Mustafa Kullab	Engineer	Private sector
28	Hiba Nashwan	Researcher in Economics	IUG
29	Mazen Abualtayef	Professor in environment	IUG
30	Ayman Fteiha	Representative of EU – Gaza	EU
31	Hussam Manaa	Senior Programme Manager Gaza	SDC
32	Amal Abu Moalik	Coordinator of projects on the Embassy of Japan	JICA
33	Salem AL-Wahaidi	Project Manager	Qatar Charity
34	Tarik Shatat	Project Manager	UNDP
35	Hekmat El-khairy	Program Assistant	UNDP
36	Rafael De La Sota	Field Office manager	FAO
37	Masoud keshta	Deputy project manager	FAO

	Name	Title	Agency
38	Hanaa salah	Monitoring & Evaluation	FAO
39	Prathapa Chandra	Consultant	FAO
40	Anas Musalm	FSS Coordinator	FAO
41	Wael Aldaya	Consultant	
42	Lama Alafifi	Consultant Assistant	
43	Fatma Aldrainli	Consultant Assistant	
44	Jaser Abu Mous	Consultant Assistant	
45	Randa Faisal	Consultant	
46	Akram El-Satarri	Interpreter, Consultant	
47	Emad Alrayyes	Interpreter, Consultant	
48	Zeyad Abu-Hassanein	Senior Environment Specialist	The World Bank
The participants below participated through video conferencing from Jerusalem because the checkpoint to Gaza was closed			
49	Sachiko Kondo	Natural Resources Management Specialist	The World Bank
50	Darshani De Silva	Senior Environment Specialist	The World Bank
51	Emeran Serge M. Menang Evouna	Senior Environment Specialist	The World Bank
52	Areej Mamon Faidi Madi	Team Assistant	The World Bank
53	Fifi Z. Antar	Program Assistant	The World Bank
54	Ivo Imparato	Sustainable Development Program Leader	The World Bank
55	Lia Sieghart	Practice Manager	The World Bank

Annex 3. Detailed FPI results

Detailed FPI Inputs Results

Component	Dimension	Metric	Score System	Additional Explanation	Gaza Score	Gaza Quality	Notes	Data Source
Macro Factors	General Environmental Performance	Environmental Performance Index (EPI)	<ul style="list-style-type: none"> • 5: EPI of 82-100; • 4: 73-82; • 3: 66-73; • 2: 51-66; • 1: 1-51. 	The Environmental Performance Index (EPI) considers factors such as disease, water quality, air pollution, biodiversity, natural resources and climate change. The EPI ranges from 1-100. Score is by 2016 EPI quintile.	NA	C	EPI investigators at Yale University confirmed that the West Bank and Gaza are among the ~40 regions with no scores.	http://epi.yale.edu/
	Exogenous Environmental Factors	Disease and Pathogens	<ul style="list-style-type: none"> • 5: Harvest value unaffected by disease; • 4: Harvest value reduced by less than 10 percent; • 3: Harvest value reduced by 10-30 percent; • 2: Harvest value reduced by more than 30 percent; • 1: Harvest value almost completely eliminated by disease. 	Extent to which harvest value is affected by exogenous disease, pathogens, toxic algae or similar factors (for example, lobster shell disease or red tides).	5	C	The majority of stakeholders including TC, FSU and the DOF, agree that the harvest is not affected by disease. However, the scientific research in this area is very limited.	Workshop discussions on 26-2-2020 and interviews with DOF, TC, FSU and environment specialists.
		Natural Disasters and Catastrophes	<ul style="list-style-type: none"> • 5: Harvest value unaffected by disaster; • 4: Harvest value reduced by less than 10 percent; • 3: Harvest value reduced by 10-30 percent; • 2: Harvest value reduced by more than 30 percent; • 1: Harvest value almost completely eliminated by disaster. 	Extent to which harvest value is affected by natural disasters such as earthquakes, volcanoes, hurricanes, tsunamis, or typhoons. Harvest can be affected through stock effects or through damage to harvest capacity. Gradual effects of climate change (for example, shifts in temperature or salinity) are not included here.	5	C	The majority of stakeholders observed that Gaza has not experienced a natural disaster in more than 70 years, and did not think disease was an issue.	Workshop discussions on 26-2-2020 and interviews with DOF, TC, FSU and environment specialists.
		Pollution Shocks and Accidents	<ul style="list-style-type: none"> • 5: Harvest value unaffected by shocks; • 4: Harvest value reduced by less than 10 percent; • 3: Harvest value reduced by 10-30 percent; • 2: Harvest value reduced by more than 30 percent; • 1: Harvest value almost completely closed by shocks. 	Extent to which harvest value in the reference year is affected by pollution shocks such as an oil spill, industrial accident, or piracy. These are one-time events; chronic pollution is addressed in the next two questions.	5	C	The sensitivity of the Gazan fishing zone to oil spills and industrial accidents can be considered as even lower than that of Israel, where the chance is already low. Therefore, the harvest value is not affected by pollution shocks.	Workshop discussions on 26-2-2020 and interviews with DOF, TC, FSU and environment specialists.
		Level of Chronic Pollution (Stock effects)	<ul style="list-style-type: none"> • 5: Not detectable; • 4: Minimal detectable levels; • 3: High levels detected; • 2: Pollution affects stock growth; • 1: Pollution leads to severe stock decline. 	Extent to which chronic pollution, such as from industrial or agricultural runoff, affects the stock. Chronic pollution can be either always present, or frequently recurring, such as after each moderate rainfall.	5	C	Although rain water flows and water for agricultural flow into the sea, it does not affect marine life. In the coming months, these problems will likely be on their way to being solved because of the initiation of a set of projects related to the sewage network and rain water drainage. However, the potential impact of chronic pollution on fish stock has	Workshop discussions on 26-2-2020 and interviews with DOF, TC, FSU and environment specialists.

Component	Dimension	Metric	Score System	Additional Explanation	Gaza Score	Gaza Quality	Notes	Data Source	
							not yet been addressed by academic researchers.		
		Level of Chronic Pollution (consumption effects)	<ul style="list-style-type: none"> • 5: No consumption is affected; • 4: Consumption is minimally affected; • 3: Official consumption advisories; • 2: Temporarily ban harvest for consumption; • 1: Completely closed for consumption. 	Extent to which chronic pollution limits consumption. Chronic pollution can be either always present or frequently recurring, such as after each moderate rainfall.	5	B	It is not known whether the consumption of fish is affected by chronic pollution because people do not know whether or not the fish is polluted. The environmentalists mentioned that the majority of landed fish are migratory.	Workshop discussions on 26-2-2020 and interviews with DOF, TC, FSU and environment specialists.	
	Governance	Governance Quality	<ul style="list-style-type: none"> • 5: Above 0.92 (highest-performing 2010 quintile); • 4: 0.10 to 0.92; • 3: -0.43 to 0.10; • 2: -0.81 to -0.43; • 1: Below -0.81 (lowest-performing 2010 quintile). 	Average of four indicators in the World Bank's Governance Indicators, each scored [-2.5,2.5] <ul style="list-style-type: none"> • Government Effectiveness • Regulatory Quality • Rule of Law • Control of Corruption 	3	A	The average of West Bank and Gaza scores in 2018 is -0.34. <ul style="list-style-type: none"> • Government Effectiveness [-0.76 in 2018] • Regulatory Quality [0.05 in 2018] • Rule of Law [-0.48 in 2018] • Control of Corruption [-0.20 in 2018] 	http://info.worldbank.org/governance/wgi/index.aspx#reports (click on table view, then select country, then select most recent year of data available)	
		Governance Responsive	<ul style="list-style-type: none"> • 5: Above 0.96 (highest-performing 2010 quintile); • 4: 0.41 to 0.96 • 3: -0.24 to 0.41; • 2: -0.82 to -0.24 • 1: Below -0.82 (lowest-performing 2010 quintile) 	Average of two indicators in the World Bank's Governance Indicators, each scored [-2.5,2.5] <ul style="list-style-type: none"> • Voice and Accountability • Political Stability 	1	A	The average of West Bank and Gaza scores in 2018 is -1.32. <ul style="list-style-type: none"> • Voice and Accountability [-0.90 in 2018] • Political Stability [-1.74 in 2018] 	http://info.worldbank.org/governance/wgi/index.aspx#reports (click on table view, then select country, then select most recent year of data available)	
		Economic Conditions	Index of Economic Freedom	<ul style="list-style-type: none"> • 5: 69.2-100 • 4: 62.5-69.1 • 3: 57.1-62.4 • 2: 50.5-57.0 • 1: 1-50.5 	Country's score from the Heritage Foundation's Index of Economic Freedom (IEF).	NA	C	Checking with Index of Economic Freedom (IEF) database manager regarding scores in Gaza.	http://www.heritage.org/index/default
			Gross Domestic Product (GDP) Per Capita	<ul style="list-style-type: none"> • 5: Greater than 30,000USD; • 4: Greater than 12,400USD; • 3: Greater than 6,000USD; • 2: Greater than 2,500USD; • 1: Less than 2,500USD. 	Country's per capita GDP on a purchasing power parity basis. Dollars are 2010USD.	1	A	GDP per capita in the Gaza Strip was US\$1847.6 in 2018.	http://data.worldbank.org/indicator/NY.GDP.PCAP.CD
Property Rights and Responsibility	Fishing Access Rights	Proportion of Harvest Managed Under Limited Access	<ul style="list-style-type: none"> • 5: Virtually all; • 4: 70-95 percent; • 3: 35-70 percent; • 2: 5-35 percent; • 1: Virtually none. 	The proportion of total harvest that is under limited-access fishing regulation. This can include both regulatory and <i>de facto</i> access rights. Fisheries where there is a gatekeeper regulatory institution—such as a beach management unit or a chief fisherman whom entrants must talk to or buy a permit from prior to gaining access—count as limited access for the purposes of this measure.	1	A	DOF has verified that access control is not limited. FSU, TC and DOF confirm that they do not have formal harvest rights.	Ministry of Transport (MOT), DOF, TC, FSU.	
		Transferability Index	<ul style="list-style-type: none"> • 5: Very Strong: Fully transferable through well-established, efficient market institutions; 	Not available if there is no limited access, but it can be scored if there is even a nominal system for granting access rights.	NA	B	Stakeholders confirm that they do not have "limited access" because any licensed fisher is	MOT, DOF, TC, FSU.	

Component	Dimension	Metric	Score System	Additional Explanation	Gaza Score	Gaza Quality	Notes	Data Source
			<ul style="list-style-type: none"> • 4: Strong: Fully transferable, but institutions are poor or illiquid; • 3: Moderate: Transferable, but with severe restrictions on who can hold, or how much; • 2: Weak: Transferable only under highly restricted and limited conditions; • 1: Access rights not transferable. 				permitted to do fishing at any time and in any place.	
		Security Index	<ul style="list-style-type: none"> • 5: Very Strong: Access rights are completely respected by the government; • 4: Strong: Rights are mostly respected by the government, and generally survive changes in government administration; • 3: Moderate: Rights are at risk of retraction with changes in administration; • 2: Weak: Rights are highly threatened or there is high political uncertainty; • 1: None: Access rights are not protected. 	Extent to which the government reduces or threatens to change access rights. Even if no limited access, it can be scored to reflect the extent of other restrictions that ensure the security of access rights (though probably low).	NA	B	Not available because there is no access right control.	MOT, DOF, TC, FSU
		Durability Index	<ul style="list-style-type: none"> • 5: Very Strong: > 10 years to perpetuity; • 4: Strong: 6 to 10 years; • 3: Moderate: 1 to 5 years; • 2: Weak: Seasonal; • 1: None: None/daily. 	Duration of the property right. Even if there is no limited access, it can be scored to reflect harvesters' expectations of continued access. If the access rights are renewable with reapplication and the harvesters expect to be able to continue to access, then score based on these expectations.	NA	B	Not available because there is no access right control. DOF confirms that the access right is not controlled. However, since the establishment of TC in the 1970s, and the establishment of FSU in 2004, the fisheries have had full access to harvest.	MOT, DOF, TC, FSU
		Flexibility Index	<ul style="list-style-type: none"> • 5: Very Strong: All decisions on time of harvest, gear used, and handling practices are in the owner's control; • 4: Strong: Minimal restrictions on time of harvest and technology; • 3: Moderate: Modest restrictions on time of harvest and technology; • 2: Weak: Significant restrictions on time of harvest and technology; • 1: Time of harvest, gear used, and handling practices are not in the owner's control. 	Ability of right holders to be flexible in the timing and production technology employed. Low scores will reflect restrictions that force inefficiencies. Even without limited access, there may still be scorable restrictions (gear, seasons, areas) that limit access flexibility.	NA	B	Not available because there is no access right control. DOF FSU, TC, and fishers confirm that there are minimal restrictions on the technology-employed limits to their harvest accessibility.	MOT, DOF, TC, FSU
		Exclusivity Index	<ul style="list-style-type: none"> • 5: Very Strong: All decisions and access to the property are controlled by the rights owner. There is a limited amount of access rights granted and no intrusion from those without rights, such as recreational or bycatch fisheries; • 4: Strong: Little intrusion on resource by those without rights, and there is a limited amount of access rights granted; • 3: Moderate: Modest intrusion on resource 	The ability of rights holders to exclude those without the right from affecting the resource or market. Can still be scored to capture the extent of <i>de facto</i> intrusion if access is not limited. This measure is meant to measure both illegal intrusion by outsiders through illegal fishing, bycatch, or subsistence and recreational fishing (see manual for exactly when subsistence/recreational fisheries affect this score). It is also meant to capture whether	NA	B	Not available because there is no access right control. DOF, FSU, TC, and fishers agree that all fishers have fishing licenses and are registered with the FSU, but that there is a very small group of unlicensed fishers infringing on their rights, especially in fishing areas near the coastline. However, there are no measures in place to prevent them from fishing.	MOT, DOF, TC, FSU

Component	Dimension	Metric	Score System	Additional Explanation	Gaza Score	Gaza Quality	Notes	Data Source
			<p>by those without rights. There is some effort to restrict the amount of access rights distributed;</p> <ul style="list-style-type: none"> • 2: Weak: Significant intrusion on resource by those without rights or little limit on the amount of access rights distributed; • 1: None: Completely unrestricted, open access, despite putative right. No limit on the amount of access rights distributed. 	access rights are distributed with or without limits. If a management authority controls access yet chooses not to limit the number of harvesters or frequently increases the number permitted (thereby diluting existing access rights), then the exclusivity score should be very low.				
	Harvest Rights	Proportion of Harvest Managed with Rights-based Management	<ul style="list-style-type: none"> • 5: Virtually all; • 4: 70-95 percent; • 3: 35-70 percent; • 2: 5-35 percent; • 1: Virtually none. 	The proportion of total harvest that is under rights-based fisheries management. Harvest rights include those for some fixed quantity or fish (for example, a quota), or a fixed share of landings in an area (for example, a Territorial Use Right for Fishing (TURF) that gives 100 percent of landings in an area). A TURF does not give harvest rights unless the species harvested are sedentary, or their movement is completely contained within the territory. Rights can be held by individuals or communities and can include <i>de facto</i> and <i>de jure</i> rights. (Input rights, such as trap tags, are strong access rights, but not harvest rights included in this section.)	1	A	FSU, TC, DOF, and fishers confirm that fishers fish at any land or zone related to any port, from Rafah in the south to Gaza in the north, with no restrictions.	MOT, DOF, TC, FSU
		Transferability Index	<ul style="list-style-type: none"> • 5: Very Strong: Fully transferable through well-established, efficient market institutions; • 4: Strong: Fully transferable, but institutions are poor or illiquid; • 3: Moderate: Transferable, but with severe restrictions on who can hold, or how much; • 2: Weak: Transferable only under highly restricted and limited condition; • 1: Harvest rights not transferable. 	Not available if there is no harvest right.	NA	A	FSU, DOF, and TC confirm that they do not have "limited access" because all licensed fishers have an eligible permit to do fishing at any time and in any place.	MOT, DOF, TC, FSU
		Security Index	<ul style="list-style-type: none"> • 5: Very Strong: Harvest rights are completely respected by the government; • 4: Strong: Rights are mostly respected by the government and generally survive changes in government administration; • 3: Moderate: Rights are at risk of retraction with changes in administration; • 2: Weak: Rights are highly threatened or there is high political uncertainty; • 1: None: Harvest rights are not protected. 	Extent to which the government threatens to reduce or eliminate harvest rights. Not available if there is no harvest right.	NA	A	FSU, DOF, and TC confirm that access rights are not controlled.	MOT, DOF, TC, FSU

Component	Dimension	Metric	Score System	Additional Explanation	Gaza Score	Gaza Quality	Notes	Data Source
		Durability Index	<ul style="list-style-type: none"> • 5: Very Strong: > 10 years to perpetuity; • 4: Strong: 6 to 10 years; • 3: Moderate: 1 to 5 years; • 2: Weak: Seasonal; • 1: None: None/daily. 	Duration of the harvest rights. Not available if there is no harvest right. If the harvest rights are renewable with reapplication, and the harvesters expect to be able to continue to harvest the same percentage, then the score based on these expectations.	NA	A	DOF and MOT confirm that the access right is not controlled; however, since the establishment of TC in the 1970s, and the establishment of FSU in 2004, the fisheries have had full access to harvest and no threats from government, as confirmed by FSU and TC.	MOT, DOF, TC, FSU
		Flexibility Index	<ul style="list-style-type: none"> • 5: Very Strong: All decisions on time of harvest, gear used and handling practices are in the owner's control; • 4: Strong: Minimal restrictions on time of harvest and technology; • 3: Moderate: Modest restrictions on time of harvest and technology; • 2: Weak: Significant restrictions on time of harvest and technology; • 1: Time of harvest, gear used and handling practices are not in the owner's control. 	Ability of right holders to be flexible in the timing and production technology employed. NA if there is no harvest right.	NA	A	DOF, MOT, FSU, TC, and fishers confirm that there are minimal restrictions on the technology-employed limits to their harvest accessibility. However, MOT mentions that the Palestinian Coastal Police (PCP) sometimes close the ports because of the danger of high waves in winter time and security issues.	MOT, DOF, TC, FSU
		Exclusivity Index	<ul style="list-style-type: none"> • 5: Very Strong: Management prevents harvest in excess of rights allocation; no intrusion by outsiders; • 4: Strong: Management allows little harvest in excess of allocation; little intrusion by those without rights; • 3: Moderate: Modest harvest in excess of rights allocation; modest intrusion on resource by those without rights; • 2: Weak: Harvest in excess of rights allocation significantly affects resource or markets; significant intrusion on resource by those without rights; • 1: None: Completely unrestricted open access, despite putative right. 	Ability of right holders to exclude those who do not have the right from affecting the resource or market. This includes intrusion by competing resource users, such as recreational or bycatch fisheries, and dilution or a lack of enforcement that leads to excess harvesting by licensed harvesters. (See manual for exactly when recreational/subsistence users affect this score.) If a management authority chooses to dilute existing harvest rights by frequently increasing allocations, then the exclusivity score should be very low. Not available if there is no harvest right.	NA	A	DOF, FSU, TC, and fishers agree that all fishers have fishing licenses and are registered with the FSU, DOF, and MOT, but that there is a very small group of unlicensed fishers infringing on their rights, especially in fishing areas near the coastline. However, there are no measures in place to prevent them from fishing.	MOT, DOF, TC, FSU
Co-Management	Collective Action	Proportion of Harvesters in Industry Organizations	<ul style="list-style-type: none"> • 5: Virtually all; • 4: 70-95 percent; • 3: 35-70 percent; • 2: 5-35 percent; • 1: Virtually none. 	The proportion of harvest where the primary harvesters consider themselves to be members of organized associations. This captures whether the harvesters are organized to influence outcomes, and thus can include organization along company lines in industrialized fisheries.	5	A	According to FSU, all fisheries are registered with FSU, DOF, and MOT. Only the owners of large vessels such as Shanshula and trawlers are members of the TC.	MOT, DOF, TC, FSU
		Harvester Organization Influence on	<ul style="list-style-type: none"> • 5: Harvester organizations effectively determine allocation of resources; • 4: Harvester organizations have significant influence in determining allocation; 	Subjective measure of how much influence harvesting organizations have, either directly or through political collective action, on management and access to the fishery.	5	A	TC and FSU have significant influence on access to fishing area and they influence government policies if any. Fisheries use their family networks, the collective voice, political affiliations, and social media to pressurize.	MOT, DOF, TC, FSU

Component	Dimension	Metric	Score System	Additional Explanation	Gaza Score	Gaza Quality	Notes	Data Source
		Management and Access	<ul style="list-style-type: none"> • 3: Harvester organizations are politically active, but not controlling; • 2: Harvester organizations conduct social or informal monitoring of participation and allocation; • 1: Harvester organizations make no active effort or have no capacity to influence management. 					
		Harvester Organization Influence on Business and Marketing	<ul style="list-style-type: none"> • 5: Harvesting organizations cooperatively determine marketing and operational details; • 4: Extensive joint marketing; • 3: Large subgroups facilitating marketing; joint purchasing; • 2: Small subgroups cooperating in purchasing or operations; • 1: No active effort or capacity to influence business operations. 	Subjective measure of how much influence harvesting organizations have, either directly or through political collective action, on business operations and marketing in the fishery.	5	A	TC provides the fisheries with ice and many other supplies such as nets and other equipment. TC provides export facilities through the packinghouse. Both FSU and TC protect the transparency of the auction market. However, the middleman (the auctioneer) plays a significant role in settling the price among buyers and sellers because he plays a dual role as both middleman and buyer. In addition, the auctioneer provides buyers and sellers with short-term credit extending for more than one week.	Interviews with FSU and TC
	Participation	Days in Stakeholder Meetings	<ul style="list-style-type: none"> • 5: More than 24 days per year; • 4: 12-24; • 3: 6-11; • 2: 1-5; • 1: None. 	Days in stakeholder meetings per year spent by a participant in the fishery who is active in management. Note that these are days with meetings, not full-time equivalent (FTE) days. Include meetings of councils with public participation.	4	C	TC includes 480 members drawn from the owners of fishing vessels. The FSU represents the interests of about 4000 registered fishers, including workers and vessel owners. FSU and TC confirm that they have irregular meetings with DOF and that they participate in different committees such as the Committee of International Projects. They are also part of the Committee of Marine Cage Investment. However, these meetings are not institutionalized and are heavily based on personal relationships. FSU and TC also have irregular meetings with other ministries such as MONE and MOT. These meetings, similarly, are not institutionalized and tend to be based on personal relationships. FSU and TC also have irregular meetings with other ministries such as MONE and MOT.	MOT, DOF, TC, FSU, Ministry of National Economy (MONE)
		Industry Financial Support for Management	<ul style="list-style-type: none"> • 5: Virtually all; • 4: 50-95 percent; • 3: 5-50 percent; • 2: 1-5 percent; • 1: None. 	Proportion of the fishery management budget paid for by the harvesting or processing sector.	1	A	The membership fees paid by fishers to the TC and FSU are not sufficient and represent less than 5 percent of the total budget. Both TC and FSU depend on projects funded by donors. DOF, Municipalities, or any ministries have no budget for fisheries. The assigned budget for DOF for 2019 is about US\$250,000 and is not yet paid.	MOT, DOF, TC, FSU, municipalities

Component	Dimension	Metric	Score System	Additional Explanation	Gaza Score	Gaza Quality	Notes	Data Source
	Community	Leadership	<ul style="list-style-type: none"> • 5: Widely recognized individual leader, or a small group of individual leaders, who provide vision for management and are able to attract stakeholders to buy into that vision. • 3: <i>Ex officio</i> leadership stations that maintain management institutions but are not currently providing strong vision. • 1: No recognized leader providing vision for fishery stakeholders. 	Subjective measure of whether the fishing community has strong leadership capable of envisioning and implementing effective management. (This role may be provided by processors.) Bins 2 and 4 may be scored as midpoints between descriptions.	3	C	The members of FSU and TC are well recognized and well-known as referees in their community. In particular, the board of directors command special respect from the community and the government. The leaders of FSU and TC show a clear vision of how the fishery sector should be managed. The leaders are also working hard to achieve the needs of their respective institutions and members.	Interviews with FSU and TC
		Social Cohesion	<ul style="list-style-type: none"> • 5: 6 points • 4: 5 points • 3: 3-4 points • 2: 1-2 points • 1: 0 points 	Measure of whether the resource users are socially connected and interact regularly in fishing and non-fishing spheres. Score one point for each of the following: <ul style="list-style-type: none"> • Common locations exist for gathering and meeting on a regular basis for non-fishery business, culture or commerce • Presence of shared social norms that facilitate transactional trust • Presence of shared public institutions (government, schools, markets) • Absence of large differences in social status or castes that hinder interaction • Absence of major religious differences and/or conflict • Absence of cultural, ethnic or tribal differences that obstruct interaction. 	4	A	The ports facilities as well as the properties of fisheries belong to the shared management of MOT, DOF, the auctioneer, FSU and TC. There are (i) common locations for gathering and meeting on a regular basis for non-fishery business, culture or commerce (ii) presence of shared social norms that facilitate transactional trust, (iii) presence of shared public institutions as some ceremonies, festivals, and public gatherings are arranged in the Port of Gaza, for instance, (iv) absence of large differences in social status or caste that hamper interaction, and (v) little presence of family differences that obstruct interaction. There are security issue differences that obstruct interaction.	MOT, DOF, TC, FSU, municipalities
	Gender	Business Management Influence	<ul style="list-style-type: none"> • 5: Business management is dominated by women. • 3: Business management is balanced between women and men. • 1: Business management is dominated by men. 	Extent of women's influence (not just participation) in the management of harvesting and post-harvest businesses, including decision-making, ownership and financing. This will not typically include development project staff or other "outsiders." Bins 2 and 4 may be scored as midpoints between descriptions.	1	A	Men dominate both pre- and post-harvest activities, despite the availability of women at the management level of TC and FSU. DOF has thus far hired no women at the management level.	MOT, DOF, TC, FSU, municipalities, fishers
		Resource Management Influence	<ul style="list-style-type: none"> • 5: Resource management is dominated by women. • 3: Resource management is balanced between women and men. • 1: Resource management dominated by men. 	Extent of women's influence (not just participation) in the management of the resources, including scientific resource decisions, and resource access and allocation decisions. This will not typically include development project staff or other "outsiders." Bins 2 and 4 may be scored as midpoints between descriptions.	1	A	FSU, TC, and DOF confirm that men dominate resources.	MOT, DOF, TC, FSU, municipalities, fishers
		Labor Participation	<ul style="list-style-type: none"> • 5: 80-100 percent are women; • 4: 60-80 percent are women; • 3: 40-60 percent are women; 	Proportion of those involved in the harvest sector labor pool, either as captains or crew, who are women.	1	A	The Data of DOF, TC, and FSU shows that there is very limited number of women as a labor in fisheries.	MOT, DOF, TC, FSU, municipalities, fishers

Component	Dimension	Metric	Score System	Additional Explanation	Gaza Score	Gaza Quality	Notes	Data Source
		Harvest Sector	<ul style="list-style-type: none"> • 2: 20-40 percent are women; • 1: Less than 20 percent are women. 					
		Labor Participation in Post-Harvest Sector	<ul style="list-style-type: none"> • 5: 80-100 percent are women; • 4: 60-80 percent are women; • 3: 40-60 percent are women; • 2: 20-40 percent are women; • 1: Less than 20 percent are women. 	Proportion of those involved in the post-harvest sector labor pool – as buyers, sellers, managers or workers – who are women.	1	A	FSU, TC, and DOF confirm that men dominate resources.	MOT, DOF, TC, FSU, municipalities, fishers
Management	Management Inputs	Management Expenditure Compared to Value of Harvest	<ul style="list-style-type: none"> • 5: Less than 5 percent of ex-vessel harvest value; • 4: 5-25 percent; • 3: 25-50 percent; • 2: 50-100 percent; • 1: More than the ex-vessel harvest value. 	Government, industry and aid agency expenditures on fishery management activities, including research, enforcement, and management capacity development (but not infrastructure) relative to the ex-vessel value of the harvest.	2	C	About 70 percent of management expenditures and of DOF, FSU, and TC projects are funded by aid agencies.	MOT, DOF, TC, FSU, municipalities, fishers
		Enforcement Capability	<ul style="list-style-type: none"> • 5: Strong capacity to enforce regulations for the entire coastline, both nearshore and offshore; • 4: Capacity to enforce regulations for nearshore, but limited offshore; • 3: Capacity to enforce nearshore in most of the ports, very limited capacity offshore; • 2: Capacity to enforce only in major ports, minimal effective capacity offshore; • 1: No capacity to enforce. 	Enforcement capacity includes that of the government, fishing organizations, or any other groups that can effectively enforce management.	1	A	DOF and MOT have no capacity to enforce regulations because they have a conflict of interest with FSU and TC.	MOT, DOF, TC, FSU, municipalities, fishers
		Management Jurisdiction	<ul style="list-style-type: none"> • 5: Stock's life cycle is within a single management jurisdiction, or multiple jurisdictions have an effective, formal system for joint management throughout the range; • 4: An effective coordination institution facilitates joint management throughout the region of primary importance; • 3: There is a coordination structure, but it does not have binding authority; • 2: Informal institutions coordinate management; • 1: Jurisdictions effectively manage the same stock independently. 	Extent to which the life cycle or range of a stock can be managed under a single coordinated plan, or to which ineffective management in one jurisdiction can undermine efforts in another.	2	A	DOF, FSU, and TC confirm the absence of a coordinated management plan and the presence of informal institutions have their influence intervention such as political parties.	MOT, DOF, TC, FSU, municipalities, fishers
		Level of Subsidies	<ul style="list-style-type: none"> • 5: No subsidies; • 4: 1 subsidy category; • 3: 2 subsidy categories; • 2: 3 subsidy categories; • 1: 4 subsidy categories. 	Score one point each for these four key categories of "bad" subsidies: (1) fuel subsidies, (2) fish access payment subsidies; (3) capital or capital loan subsidies; and (4) price support (through inputs or direct payments).	2	A	The donors provide cash for work program, subsidies to maintain vessels, and buy nets, gear and other equipment. Banks provide special borrowing rate of 2.7 percent.	DOF data, FSU and TC

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	Data	Data Availability	<ul style="list-style-type: none"> • 5: Annual (or other appropriate period) sampling for stock assessment, landings and economic data available; • 4: Consistently collected and comprehensive landings and price data is available; • 3: Limited reliable landings or price data available; data irregularly collected or based on large samples; • 2: Available data is based on small samples, or missing data significantly impedes making inferences that are needed for management; • 1: No data is centrally collected. 	Extent to which biological and economic data are available.	2	A	The economic and biological data is irregularly collected, is inaccurate, has no clear methodology or criteria, comes from several sources, and is not audited by a third party. The landing by value and volume is estimated (not accurately) for limited variables such as landings, # vessels, and # of fishers. Biological data is not available, and very limited data is published for public annually. The MOT has outdated data on vessels and their condition.	DOF and MOT
		Data Analysis	<ul style="list-style-type: none"> • 5: Biological and economic data is used in prospective analysis of management; • 4: Biological data dominates simple prospective analysis; • 3: Biological or economic data is used to track performance retrospectively; • 2: Data is used inconsistently or irregularly; • 1: No data analysis conducted in management process. 	Extent to which biological and economic data are used by management.	2	A	The DOF, FSU, TC, MOT collect data inconsistently and only for project purposes, not for correction or developing policies or following up. There is a dearth of human resources to do such analysis.	MOT, DOF, TC, FSU, municipalities, fishers
	Management Methods	MPAs and Sanctuaries	<ul style="list-style-type: none"> • 5: More than 25 percent; • 4: 10-25 percent; • 3: 5-10 percent; • 2: Less than 5 percent; • 1: None. 	Percentage of area used in species life cycle where fishing is closed or highly restricted. Include total area under rolling or seasonal closures.	1	A	There are no Marine Protected Areas (MPAs) in the Gaza Strip.	DOF and MOT
		Spatial Management	<ul style="list-style-type: none"> • 5: 75-100 percent; • 4: 50-75 percent; • 3: 25-50 percent; • 2: Less than 25 percent; • 1: None. 	Proportion of fishing grounds that are managed through either direct control in the form of Territorial Use Rights for Fishing (TURFs) or designated community management, or through indirect control by limiting access points (launch or landing sites).	1	A	Territorial Use Rights for Fishing (TURFs) are not applicable in the GS. DOF and MOT currently have no control on the fishing area.	DOF and MOT
		Fishing Mortality Limits	<ul style="list-style-type: none"> • 5: Hard Total Allowable Catch (TAC) established against which nearly all fishing mortality is counted; • 4: Hard TAC established, but there are sources of unaccounted mortality totaling less than 10 percent; or TAC is adjusted from biological guidelines to compensate for sources of greater unaccounted mortality; • 3: There is a guideline mortality level that 	Extent to which fishing mortality is an explicit instrument of management.	1	A	TC, FSU, and fisheries confirm that Total Allowable Catch (TAC) is not enforced by DOF. Fishery does not have an explicit mortality target.	DOF, FSU and TC

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			is generally met; hard TAC is exceeded 10-50 percent by unaccounted mortality; <ul style="list-style-type: none"> • 2: Frequently exceeded guideline; hard TAC is exceeded by more than 50 percent; • 1: Fishery does not have an explicitly mortality target. 					
Post-Harvest	Markets and Market Institutions	Landings Pricing System	<ul style="list-style-type: none"> • 5: Virtually all; • 4: 70-95 percent; • 3: 35-70 percent; • 2: 5-35 percent; • 1: Virtually none. 	Proportion of the harvest sold through transparent, daily, competitive, pricing mechanisms, such as an auction or a centralized ex-vessel, to wholesale market where sellers interact with many buyers and prices are public information.	4	A	More than 90 percent of the landings are displayed in the auction market, together with the announcement of the price. There is a transparent pricing system applied by the auctioneer in the presence of buyers and sellers. However, DOF does not publish prices for the general public outside the market.	DOF, FSU and TC
		Availability of Ex-Vessel Price and Quantity Information	<ul style="list-style-type: none"> • 5: Complete, accurate price and quantity information is available to market participants in real time; • 4: Reliable price and quantity information is available prior to the next market clearing; • 3: Price information is available, but there is no timely quantity information; • 2: Price and quantity information are inaccurate, lagging, or available to only a few; • 1: No information available. 	Scores the ability of the market to provide timely information to harvesters to which they can react by changing what they land or when they land.	2	A	The information is not displayed daily and in a timely manner, and DOF recently published monthly data for researchers and national and international agencies with permission from the MOA or the directorate of DOF. However, the fishers, on a daily basis, exchange information based on their communication with the Auctioneer directly. Data are not collected on Fridays, weekends, or public holidays.	MOT, DOF, TC, FSU, municipalities, fishers
		Number of Buyers	<ul style="list-style-type: none"> • 5: Highly competitive range of buyers; • 4: 4-6 buyers; • 3: 2-3 competing buyers; • 2: A small number of coordinating buyers; • 1: There is only one buyer. 	Typical number of buyers of ex-vessel product are accessible to a seller in a given market. If there are many landing sites, this is the buyer's per landing site. If harvesters are generally indentured to a single buyer through credit relationships, then there is one buyer.	5	A	All ports have an auction market in which auctioneer displays the landings. More than 150, 20, 40, and 40 buyers and sellers attending the auction of Gaza, Dier Albalah, Khan Younis, and Rafah, respectively.	Auctioneer, Field visit, MOT, DOF, TC, FSU, municipalities, fishers
		Degree of Vertical Integration	<ul style="list-style-type: none"> • 5: Virtually all; • 4: 70-95 percent; • 3: 35-70 percent; • 2: 5-35 percent; • 1: Virtually none. 	Proportion of harvest where the primary harvester and primary processor/distributor are the same firm. The role of vertical integration here is to ensure harvest and delivery of fish under a common management system, thereby increasing efficiency and reducing transactional costs.	4	A	The majority of landings from the vessels their owners are presented in TC and FSU. The post-harvesting is also owned by the families of fishers. Transportation for instance is owned by the relatives of the owners of vessels. This means that the fisheries value chain is dominated by a handful of families in the GS.	DOF, MOT, FSU and TC
		Level of Tariffs	<ul style="list-style-type: none"> • 5: Virtually none; • 4: 0.5-2.5 percent; • 3: 2.5-5 percent; • 2: 5-10 percent; • 1: Over 10 percent 	Official tariff rates are charged for exports and for imports into consumption markets.	1	C	The Ministry of National Economy (MONE) is asking importers to pay a 14 percent official tariff. MOA is asking exporters to pay 26 NIS (US\$7.42) for each shipping, regardless of its quantity.	WTO database: http://tariffdata.wto.org/ReportersAndProducts.aspx

Component	Dimension	Metric	Score System	Additional Explanation	Gaza Score	Gaza Quality	Notes	Data Source
		Level of Non-tariff Barriers	<ul style="list-style-type: none"> • 5: Are not used to limit international trade; • 4: Have very limited impact on international trade; • 3: Act to impede some international trade; • 2: Act to impede a majority of potential international trade; • 1: Act to effectively impede a significant amount of international trade 	Nontariff barriers include quantity restrictions (import quotas), regulatory restrictions, investment restrictions, customs restrictions and direct government intervention.	2	A	There are major restrictions on exports by the Government of Israel, and direct intervention by MOA in the quantity of exported and imported fish. The government also imposes quantity limitations on export.	Exporters, DOF, TC, FSU.
	Infrastructure	International Shipping Service	<ul style="list-style-type: none"> • 5: Ocean/air shipping services are readily available at lower than average rates; • 4: Ocean/air shipping services are readily available at average rates; • 3: Ocean/air shipping services are readily available at higher than average rates; • 2: Ocean/air shipping services are available but irregular; • 1: International shipping is not available at reasonable rates. 	The quality of the international shipping service is sufficiently high to access global high-value markets such as the US or EU (regardless of whether the product is currently exported). Average of the two measures (one for ocean shipping and the other for air shipping).	1	A	There is a restriction on shipping from the Gaza Strip to the outside world.	Exporters, DOF, TC, FSU.
		Road Quality Index	<ul style="list-style-type: none"> • 5: High-quality paved roads and extensive highways; • 4: Primarily two-lane paved roads and moderate highways; • 3: Primarily two-lane paved roads and minimal highways; • 2: Paved two-lane roads and well-graded gravel roads; • 1: Poorly maintained gravel or dirt roads. 	Travel time-weighted average road quality between the fishery's primary port and the most practical export shipping port for exported product. For non-exported product, measure road quality between the primary port and the major consumption center.	1	A	The road from the port is muddy and dirty at all ports, particularly in the winter season. The road to the local market is low quality and crowded. In the GS, only one highway is available.	MOT
		Technology Adoption	<ul style="list-style-type: none"> • 5: Cell phones/fish finders/computers/processing/production technology are readily available; • 4: Cell phones/fish finders, etc. are common, but some of the other technology is not always available; • 3: Cell phones/fish finders, etc. are common, but some of the other technology is difficult to obtain; • 2: Cell phones are common, but most other technology is prohibitive; • 1: Very little advanced technology is available to the industry. 	Average level of technology employed in the fishery.	3	A	Only a limited number of vessels (trawlers and Shanshula) use cell phones or echo sound. Mobile network coverage is limited to only 3 to 6 miles, depending on the mobile company. Jawal Company is active on 3 miles while Oreedo is active on 6 miles. Other technologies such as GPS and VHF are available on the black market but their cost is typically very high.	Fishers, TC and FSU.
		Extension Service	<ul style="list-style-type: none"> • 5: Broad extension service with field offices and close linkage with the research community; • 4: Extension service with moderate field coverage and adequate linkage with the 	Degree to which the government or NGOs help harvesters improve fishing techniques or improve management through extension activities.	3	A	After 2007, there have been very limited extension services offered by authorities. The donors, such as ILO and FAO, play a significant role in conducting pilot training sessions in different areas of the fisheries. The linkages	Experts, academia, DOF, FSU, TC, and MOT.

Component	Dimension	Metric	Score System	Additional Explanation	Gaza Score	Gaza Quality	Notes	Data Source
			research community; <ul style="list-style-type: none"> • 3: Extension service, but with weak links to the research community; • 2: Minimal, poorly supported extension service; • 1: No extension service. 				with the research community and academia is weak because of the highly bureaucratic mechanisms enforced by MOA on access to data.	
		Reliability of Utilities/Electricity	<ul style="list-style-type: none"> • 5: Reliable electrical grid provides power in sufficient quantity to prevent product loss; • 4: Processors can rely on the grid, but they maintain backup generators; • 3: Supply chains rely on their own generation capacity; • 2: Supply chains sometimes lose product due to condition or irregular fuel supply for generators; • 1: Reliable generators or fuel supply are not available. 	Extent to which utilities and electricity are reliable.	2	A	Fluctuations in grid power and generator voltage due to blackouts. The TC cannot afford the cost of running the generators for ice production because that consumes about 87.50 NIS/hour (US\$25). Solar energy is not feeding all the production lines.	TC and exporters.
		Access to Ice and Refrigeration	<ul style="list-style-type: none"> • 5: Ice is available in various forms and in sufficient capacity to support fresh icing of all fish that needs to be iced; • 4: Ice is available in various forms, but quantity limitations prevent applying it to the entire catch throughout the supply chain; • 3: Ice is available in limited forms and quantities, and thus applied only to the most valuable portions of the catch; • 2: Ice is available but capacity is constrained; ice is often reused, or used through to the melting stage; • 1: Ice quantities are extremely limited. 	Extent to which ice and/or refrigeration are available.	3	A	Because of power cuts, ice is available only by TC in Gaza Port and by another association in Rafah landing site. The production line sometimes malfunctions. Ice is available only for high-value species and for export. In summer time, fishers suffer from an insufficient supply of ice.	TC and fishers, FSU, and DOF.

Detail FPI Outputs Results

Component	Dimension	Category	Metric	Score System	Additional Explanation	Gaza Score	Gaza Quality	Notes	Data Source
Stock Performance	Ecologically Sustainable Fisheries	Ecology	Percentage of Stocks Overfished	<ul style="list-style-type: none"> • 5: No stocks are overfished; • 4: 1-25 percent of stocks are overfished; • 3: 26-50 percent overfished; • 2: 51-75 percent overfished; • 1: 76-100 percent overfished. 	Percentage of commercial stocks within the management authority's jurisdiction that are considered to be overfished or to be experiencing overfishing, or whose stock status is generally unknown. (Degree of overfishing and current trend are the	3	C	The majority of species are seriously overfished and research on three species indicate that the overfishing of their stock ranges from moderate and high. For example, the stock of <i>Saurida undosquamis</i> is highly overexploited, the stock of <i>Sardinella aurita</i> is moderately overexploited, and the	General Directorate of Fisheries (DOF) of the Ministry of Agriculture (MOA), and Stock Assessment Forms for <i>Sardinella aurita</i> , <i>Upeneus moluccensis</i> .

Component	Dimension	Category	Metric	Score System	Additional Explanation	Gaza Score	Gaza Quality	Notes	Data Source
					next questions.) Single stock fisheries will be scored 1 or 5.			stock of <i>Upeneus moluccensis</i> is highly overfished. The overfishing is due to the high fishing effort (# vessels and # of fishers in a limited area with average 6 nm).	Reference years: 2013-2014-2016 Reporting year: 2017 (Small Pelagics sp.) in GSA 27 (WB&G). Assessment of <i>Saurida undosquamis</i> in GSA 27 (WB&G).
		Ecology	Degree of Overfishing-Stock Status	<ul style="list-style-type: none"> • 5: Stock is not overfished or is rebuilt; biomass level divided by biomass required for maximum sustainable yield ($B/BMSY \geq 1$); • 4: Stock is mildly overfished ; $0.75 \leq B/BMSY < 1$; • 3: Stock is moderately overfished; $0.5 \leq B/BMSY < 0.75$ • 2: Stock is seriously overfished; $0.25 \leq B/BMSY < 0.5$; • 1: Stock is severely overfished and in danger of collapse; $0.25 > B/BMSY$. 	Current status of stock. For multispecies fisheries, do a value-weighted average of the top-three stocks. Two alternate scoring systems are offered. The first is for fisheries where stock levels are not known with any precision. The second is for fisheries where scientific stock assessments are being conducted and measures of B (biomass level) and BMSY (biomass level required to obtain maximum sustainable yield) are available.	3	C	There is no regular fish stock assessment. Relatively low biomass for <i>Sardinella aurita</i> : Values equal to or lower than the 33rd percentile of biomass index in the time series (OL). Other species are not determined; DOF therefore surmised that the stock is moderately overfished.	Stock Assessment Form for <i>Sardinella aurita</i> (Small Pelagics sp.) in GSA 27 (WB&G).
		Ecology	Stock Declining, Stable or Rebuilding - Stock Dynamics	<p>Add or subtract from previous metric according to:</p> <ul style="list-style-type: none"> • +2: Stock is rapidly rebuilding • +1: Stock is rebuilding • +0: Stock is stable • -1: Stock is declining • -2: Stock is rapidly declining 	Extent to which current effort levels affect stock status. For multispecies fisheries, do a value-weighted average of the top-three stocks. This measure is scored by taking the fishery's score in the previous question and adding or subtracting points, depending on whether the fishery is rebuilding or declining. The maximum score for this measure is 5, and the minimum score is 1. If the fishery scored a 5 in the previous question, then the score here is automatically a 5. If the fishery scored less than 5 in the previous measure, then take the fishery's score from the previous measure and add or subtract as noted.	2	C	No research on the stock assessment handle this metric. However, academic experts mentioned that some species have disappeared entirely from landings, including Gray mullet and Tilapia, and Lading Sarina spp. numbers are declining with no explanation. In addition, no studies are available on whether the overall stock is declining or rapidly rebuilding.	FAO, DOF, Al Tawfeek Cooperative (TC), Fishers' Syndicate of the Union (FSU).
		Ecology	Regulatory Mortality	<ul style="list-style-type: none"> • 5: No regulatory mortality of the target species; • 4: Regulatory mortality is less than 5 percent of total catch; • 3: 5-25 percent; • 2: 25-50 percent; • 1: For every 100lb of fish caught, more than 50lb are discarded. 	Ratio of estimated regulatory mortality to actual landings of the target species. Regulatory mortality is defined as fish loss that is induced by regulations, for example, size restrictions.	3	C	There is a shortage of information to make a judgment for all species. In Overfishing status, the report of the Stock Assessment form for <i>Sardinella aurita</i> mentioned that the Fishing mortality or effort above the value of the agreed fishing mortality or effort-based Reference Point. DOF mentioned	FAO, DOF, TC, FSU.

Component	Dimension	Category	Metric	Score System	Additional Explanation	Gaza Score	Gaza Quality	Notes	Data Source
Harvest Sector	Harvest Performance							that despite having no research, the regular mortality is nevertheless expected to be 3.	
		Ecology	Selectivity	<ul style="list-style-type: none"> • 5: There is virtually no non-target catch; • 4: Less than 5 percent of catch is of non-target species; • 3: 5-25 percent of catch is of non-target species; • 2: 25-50 percent of catch is of non-target species; • 1: For every 100lb of fish caught, more than 50lb are non-target species. 	Percentage of the total catch that is made up of non-target species. Note that non-target species are distinct from multispecies fisheries in that a catch of non-target species does not increase the value of fishing or impose costs on the target fishery.	1	A	The fishers can land any species without determination of the quantity of landings. According to DOF, FSU, and TC, the fishing effort is characterized as non-target species.	Interview with DOF members and workshop discussions February 2, 2020.
		Ecology	Illegal, Unregulated or Unreported Landings	<ul style="list-style-type: none"> • 5: There is virtually no IUU catch; • 4: Less than 5 percent of catch is IUU; • 3: 5-25 percent; • 2: 25-50 percent; • 1: For every 100lb of fish caught, more than 50lb are IUU. 	Proportion of landings from the managed stock that uses illegal gear, illegal areas, illegal methods, and so on, or that goes unreported or falls outside of the regulatory structure. See manual for how to deal with incursions from the recreational sector.	4	B	Less than 5 percent of catch is IUU, meaning “not reported, unregulated, unreported” particularly by those who fish close to the coastline, and those who fish using Hasaka with oar. In the workshop discussions, the FSU and TC confirmed that there were no monitoring systems available on the boats during catch and landing.	Interview with DOF members.
		Ecology	Status of Critical Habitat	<ul style="list-style-type: none"> • 5: Critical habitat is healthy and not threatened; • 4: Less than 25 percent is degraded or dysfunctional; • 3: 25-75 percent is degraded or dysfunctional; • 2: More than 75 percent of critical habitat is destroyed; • 1: Nearly all critical habitat is damaged or dysfunctional. 	Proportion of critical habitat that is damaged or dysfunctional. Critical habitat is defined as that which plays a significant role in the life cycle of the fish. Proportion damaged is based on area, and from all sources of damage, including fishing damage, pollution and development.	3	C	DOF confirms that there is no special management and protection area for threatened or endangered species. DOF confirms that leaving aside sewage problems, fishing activity can degrade or render dysfunctional the critical habitat by less than 25 percent. However, this conclusion is not supported by scientific research or evidence.	Interview with DOF members.
		Ecology	Proportion of Harvest with a 3 rd Party Certification	<ul style="list-style-type: none"> • 5: 76-100 percent of landings are certified; • 4: 51-75 percent of landings are certified; • 3: 26-50 percent of landings are certified; • 2: 1-25 percent of landings are certified; • 1: No landings have third party certification. 	The proportion of harvest (quantity) brought in under one of the recognized third-party programs that certify ecological sustainability, such as the Marine Stewardship Council (MSC) certification. See manual for how to deal with other certifications or fishery improvement programs.	1	A	There is no third-party certification in the Gaza Strip.	Interview with DOF members.
Harvest Sector	Harvest Performance	Economic	Landings Level	<ul style="list-style-type: none"> • 5: Harvest is less than the MSY (because the stock is above MSY level) required to increase profit; 	Average annual harvest over the last three years. Note that this measure refers to MSY (maximum sustainable	1	C	Although there is no estimates of MSY in Gaza, it is important to mention that DOF agreed that fishing activities are	Interview with DOF members.

Component	Dimension	Category	Metric	Score System	Additional Explanation	Gaza Score	Gaza Quality	Notes	Data Source
Performance				<ul style="list-style-type: none"> • 4: Harvest is approximately at MSY; • 3: Harvest is reduced to promote recovery; • 2: Harvest is constraining stock recovery; • 1: Harvest is causing overfishing (because the stock is below MSY and declining). 	yield). However, for many fisheries, the lack of stock assessments and reliable data means that these estimates are unattainable. In such fisheries, the score is based on discerning the goal of management and harvesters when deciding how much to land.			leading to overfishing. The DOF has no policy regarding how much to land.	
		Economics	Excess Capacity	<ul style="list-style-type: none"> • 5: Within 5 percent of days required; no evidence of excess capacity • 4: 90-95 percent; • 3: 75-90 percent; • 2: 50-75 percent; • 1: Less than 50 percent, of days required; excess capacity imposes heavy costs on the fishery. 	In the absence of a fishery-specific measure of what constitutes overfishing, use the estimated standardized vessel-days required to catch the maximum sustainable yield (MSY) compared to the number of standardized vessel-days available. Days are considered not to be restricted by trip limits.	2	C	No calculation for # Vessel-days required to catch MSY/# Vessel-days. Interviews with the MOT show that about 60 percent of the currently available vessels can achieve the same daily fishing effort. However, this assumption is related only to the limited fishing zone. When the fishing zone is extended more than 15 miles, there is a greater need for larger vessels such as trawlers and Shanshula than for smaller vessels, meaning that more smaller vessels are landed in the port than needed. MOT also explained that the currently available larger vessels urgently need maintenance and marine equipment.	Interviews with DOF, FSU, TC, MOT members.
		Economics	Season Length	<ul style="list-style-type: none"> • 5: Virtually no regulatory closures; • 4: 90-99 percent; • 3: 50-90 percent; • 2: 10-50 percent; • 1: Less than 10 percent. 	Ratio of number of days on which fishing occurs to the number of days the species is available in economically feasible quantities. This is primarily a measure of the extent of derby (including short regulatory seasons to limit total activity), not a lack of biological availability or closures to prevent within-season growth overfishing.	5	A	There are no regulatory closures. When there is an attack airstrike, fishers cannot go fishing. This happens on about 10 days of the year, which is around 1 percent within the last three years.	Interview with FSU, TC, DOF and fishers.
		Economics	Harvest Safety	<ul style="list-style-type: none"> • 5: Fewer than 0.1 deaths per thousand person seasons; • 4: Fewer than 0.5 deaths; • 3: Fewer than 1; • 2: Fewer than 5; • 1: More than 5 deaths per thousand-person fishing season. 	Number of on-the-job deaths per thousand-person fishing season among harvesters (captain or crew). We consider there to be one season per year but do not annualize mortality if the fishing season is less than a year.	5	A	At least one crewmembers died per year and 10 were injured due to accidents on the job. During the final month, one fisher died from an electric shock while fishing.	Interview with FSU, TC, DOF, MOH and fishers.
		Harvest Asset Performance	Economics	Ratio of Asset Value to Gross Earnings	<ul style="list-style-type: none"> • 5: 10 or higher; • 4: 7.5-10; • 3: 5-7.5; 	Extent to which fishery wealth is accumulated in access capital (for example, quotas, permits or vessels). Ratio of average price of capital and	1	A	Large-scaled vessels such as trawlers and large-purse seiners each cost about US\$108,000 and US\$75,000, respectively, and have an average of 9

Component	Dimension	Category	Metric	Score System	Additional Explanation	Gaza Score	Gaza Quality	Notes	Data Source
				<ul style="list-style-type: none"> • 2: 2.5-5; • 1: Below 2.5. 	licenses required to access the fishery over the last five years, to average annual gross earnings for a similarly scaled access right in the same period. Typically, this is a 1 if vessels or quotas not limited by regulation. Same-business or same-family sales are excluded where they can be identified. See 'Historical Data' tab.			crewmembers. Small-scaled vessels such as Hasakas with Motor, Hasakas with Oar, and Feluccas cost less than US\$10,000 each, and have an average of 4 crewmembers. The annual revenue per crewmember is on average US\$5,362. The annual salary of crewmembers of trawlers and Shanshula is US\$30,370, and US\$8,684, respectively, according to the EastMed report. However, in interviews with crewmembers of trawlers and Shanshula, they stated that their annual salary was about US\$5,142 (monthly NIS1500 or US\$428). By contrast, crewmembers of Hasakas with Motor and Hasakas with Oar earned less than US\$3000. Because of the relatively low revenue from fishery, wealth is not accumulated.	
		Economic s	Total Revenue Compared to Historic High	<ul style="list-style-type: none"> • 5: Above 95 percent; • 4: 85-95 percent; • 3: 70-85 percent; • 2: 50-70 percent; • 1: Below 50 percent 	The indicator is the ratio of total real revenue (in local currency) to the average of the three-highest total real revenues in the past 10 years. Adjust it by the local Consumer Price Index (CPI) if inflation was significant. See 'Historical Data' Tab.	4	A	Total revenue in 2018 was US\$12,437,101. The average of the three-highest revenues for the last 7 years is US\$13,073,450. No available data for 10 years.	Data from MOA and DOF.
		Economic s	Asset (Permit, Quota, and so on) Value Compared to Historic High	<ul style="list-style-type: none"> • 5: Above 95 percent; • 4: 85-95 percent; • 3: 70-85 percent; • 2: 50-70 percent; • 1: Below 50 percent . 	The indicator is the ratio of the current value of the harvest asset (permit, quotas, vessel, and so on) to the average of the three-highest asset values in the past 10 years. Adjust by local CPI if inflation was significant. Typically, this is a 1 if wealth is not accumulating in vessels, permits or quotas. See 'Historical Data' tab.	1	A	No historical data for asset values and no time series analysis. The DOF, TC, FSU and economic experts estimate that wealth is not being accumulated.	DOF, TC, FSU and economic expert.
		Economic s	Borrowing Rate Compared to Risk-free Rate	<ul style="list-style-type: none"> • 5: Less than 1.75; compare 30-year conforming mortgage; • 4: Less than 2.5; compare personal bank loan; • 3: Less than 4; compare good credit card rates; • 2: Less than 7; compare bad credit card rates; • 1: Greater than 7; usury. 	Average ratio of the interest rate on loans made to harvesters in the industry to risk-free rates over the last three years. If businesses can access international credit markets, then the international risk-free rate (US 10-Year Treasury Bill) is an appropriate comparison; otherwise, use local risk free rate. See 'Historical Data' tab.	1	A	No risk-free rate is available for Gaza and West Bank. However, the fishers rarely obtain credit from banks because they would need to provide collateral. Bank of Palestine has provided loans with lower interest rate with 2.6 percent. In 2017, Bank of Palestine stopped lending to fisheries because of the high default risk.	Data from DOF, fishers, and TC.

Component	Dimension	Category	Metric	Score System	Additional Explanation	Gaza Score	Gaza Quality	Notes	Data Source
		Economic s	Source of Capital	<ul style="list-style-type: none"> • 5: Unsecured business loans from banks or venture capital; • 4: Secured business loans from banks or public stock offerings; investment from elsewhere in supply chain; • 3: Loans from banks secured by personal (not business) assets, government subsidized private lending, government-run loan programs, or international aid agencies; secured loans from elsewhere in supply chain; • 2: Micro-lending, family, and community-based lending; loans from supply chain significantly reduce margins • 1: No capital available; exploitative relationship from elsewhere in supply chain. 	Points to be assigned based on the category of lenders or investors that are most typically used by harvesters in the fishery. Second scoring method offered if the supply chain (for example, traders, processors, exporters) is the primary source of capital.	2	A	Banks in the GS typically provide limited loans with complicated approval procedures and collateral to fisheries, especially since 2017 because of the salary cut. Before 2017, Bank of Palestine generally requested collateral from TC to support fisheries with less expensive loans not exceeding US\$3000 a year for one beneficiary, with 2.6 percent.	Data from TC and BOP.
		Economic s	Functionality of Harvest Capital	<ul style="list-style-type: none"> • 5: The harvest capital is new; • 4: Capital is older but well maintained, for example, freshly painted; • 3: Capital is moderately well maintained; • 2: Maintenance is poor; • 1: Serious concerns about seaworthiness or safety throughout fishery. 	Average age of key durable harvesting capital units (vessels, weirs). Ages are not assigned to the scores due to differences in expected useful life, but buildings and industrial vessels have an expected life of roughly 20 years.	1	A	More than 90 percent of vessels are outdated and more than 25 years old, for example, trawlers and Shanshula that were locally produced before 2000. The majority of Hasakas and Hasakas with Motor were built around 2007.	Data from MOT, MOA DOF in the GS, Observation in the coast, Interviews from fishers.
	Risks	Economic s	Annual Total Revenue Volatility	<ul style="list-style-type: none"> • 5: Less than 0.15 • 4: 0.15-0.22; • 3: 0.22-0.40; • 2: 0.40-1; • 1: Greater than 1. 	Ratio of the standard deviation of the first differences of annual total revenue to the mean of total revenue over the last 10 years. Best guess may be calculated based on shorter time series if data is not available. See 'Volatility' Tab.	3	A	The highest annual revenue in the past 10 years was (US\$15,121,506) in 2016 and the lowest was (US\$6,080,965) in 2011. The average revenue for the same period was (US\$10,881,097). The volatility is 0.29 according to Excel calculations.	Data from MOA, DOF, TC, and FSU.
		Economic s	Annual Landings Volatility	<ul style="list-style-type: none"> • 5: Less than 0.15 • 4: 0.15-0.22; • 3: 0.22-0.40; • 2: 0.40-1; • 1: Greater than 1. 	Ratio of the standard deviation of the first differences of annual total landings to the mean of total landings over the last 10 years. Best guess may be calculated based on shorter time series if data is not available. See 'Volatility' tab.	3	A	The highest landing in the past 10 years was 3,305.74 tons in 2016 and the lowest was 1,467.80 tons in 2011. The average landing in the past 10 years was 2,507.36 tons. The volatility is 0.33, according to Excel calculations.	Data from MOA DOF in the GS, focus group discussion.

Component	Dimension	Category	Metric	Score System	Additional Explanation	Gaza Score	Gaza Quality	Notes	Data Source
		Economic s	Intra-annual Landings Volatility	<ul style="list-style-type: none"> • 5: Less than 0.15 • 4: 0.15-0.22; • 3: 0.22-0.40; • 2: 0.40-1; • 1: Greater than 1. 	Ratio of the standard deviation of the weekly/monthly total landings over the last three years to the mean of total landings. Observations of zero landings are included if there is biological availability. If the biological season is so short that there is no meaningful variation on the monthly level, this measure can be recorded as NA. Best guess may be calculated based on shorter time series if data is not available. See 'Volatility' tab.	1	A	The highest landing was 502.676 tons in April 2017 and the lowest was 47.171 tons in February 2017. Average monthly landings was 264.889 tons for three years.	Data from MOA, DOF in the GS, focus group discussion.
		Economic s	Annual Price Volatility	<ul style="list-style-type: none"> • 5: Less than 0.13; • 4: 0.13-0.20; • 3: 0.20-0.30; • 2: 0.30-0.85; • 1: Greater than 0.85. 	Ratio of the standard deviation of the first differences of annual ex-vessel prices to the mean of ex-vessel price over the last 10 years. Best guess may be calculated based on shorter time series if data is not available. See 'Volatility' tab.	2	A	The highest price was 25.07 NIS (US\$7.16) in 2009 and the lowest price was 19.47 NIS (US\$5.56) in 2011. The average is 22.8 NIS (US\$6.51).	Data from DOF in the GS, focus group discussion.
		Economic s	Intra-annual Price Volatility	<ul style="list-style-type: none"> • 5: Less than 0.13; • 4: 0.13-0.20; • 3: 0.20-0.30; • 2: 0.30-0.85; • 1: Greater than 0.85. 	Ratio of the standard deviation of average monthly ex-vessel prices over the last three years, to the mean ex-vessel price. Observations of zero landings are included if there is biological availability. If the biological season is so short that there is not meaningful variation at a monthly level, this measure can be NA. Best guess may be calculated based on shorter time series if data is not available. See 'Volatility' tab.	1	A	No monthly data base price is available. However, in the experience of DOF and of the auctioneer, the price is highly volatile during the year. In April 2019, for instance, the price of Sardina spp. is 15 NIS (US\$4.28) and from December to February, about 22 NIS (US\$6.28). The price averages 17 NIS (US\$4.85).	Monthly data of DOF 2017.
		Economic s	Spatial Price Volatility	<ul style="list-style-type: none"> • 5: Less than 0.13; • 4: 0.13-0.20; • 3: 0.20-0.30; • 2: 0.30-0.85; • 1: Greater than 0.85. 	Ratio of the standard deviation across data collection regions of average annual ex-vessel price to the mean of ex-vessel price across data collection regions. Measure should be averaged over the last three years. Best guess may be calculated based on shorter time series if data is not available. See 'Volatility' tab.	5	A	No available data on the price based on port. The auctioneers and DOF mentioned that the volatility of the price among ports is less than 10 percent. For instance, the price of Saredina spp.in Khan Younis is 16 NIS (US\$4.57) and in Gaza is 17 NIS (US\$4.85).	Data from Auction, and DOF in the GS, focus group discussion.
		Community	Contestability and Legal Challenges	<ul style="list-style-type: none"> • 5: No significant legal challenges, civil actions, or protests regarding the fishery management system; • 4: Minor legal challenges slow down management's implementation of fishing regulations; 	This captures the degree to which political activity limits the ability to implement effective fishing regulations.	1	A	The situation in the GS is volatile due to political instability. There are two authorities regulating the GS, each with a different mandate, despite having a clear legal structure, and laws for fisheries have yet to be enforced.	Interviews with fishers, TC, FSU, and DOF.

Component	Dimension	Category	Metric	Score System	Additional Explanation	Gaza Score	Gaza Quality	Notes	Data Source
				<ul style="list-style-type: none"> • 3: Legal challenges, civil actions, or protests impede some management measures; • 2: Legal challenges, civil actions, or protests suspend major elements of the management system; • 1: Legal challenges, civil actions, or protests suspend or prohibit implementation of key management reforms and regulations. 					
	Owners, Permit Holders and Captains (Those holding the right or ability to access)	Community	Owner/Permit Holder/Captain earnings Compared to Regional Average earnings	<ul style="list-style-type: none"> • 5: More than 50 percent above the regional average; • 4: Between 10 and 50 percent above the regional average; • 3: Within 10 percent of the regional average; • 2: Between 50 and 90 percent of the regional average; • 1: Less than 50 percent of the regional average. 	Ratio of annual earnings per owner/captain to the regional average earnings. In many cases, the captain is also an owner of a vessel or permit, but in other cases, captains are considered as crew. The owners are defined as those who hold the ability to access, including rights and capital. Note that this is earnings from all sources, not just fishing.	3	A	In addition to the captain's contribution as an owner, the captain earns about double what ordinary crew receive. (Captains on average get paid in the range of 40-60 NIS (US\$11.45-17.14/day) while crewmembers range from 20 NIS to 30 NIS (US\$5.7-8.5). Revenues are shared equally on three parts: owners, captains and crews. As a result, the captain may earn about 40-60 NIS daily, depending on the size of the vessel. This daily wage is similar to the average wages available in the region. It is sometimes above the regional average and sometimes below it, depending on the season.	DOF, TC, and FSU.
		Community	Owner/Permit Holder/Captain Wages Compared to Non-fishery Wages	<ul style="list-style-type: none"> • 5: More than 50 percent above the alternative wage; • 4: Between 10 and 50 percent above the alternative wage; • 3: Within 10 percent of the alternative wage; • 2: Between 50 and 90 percent of the alternative wage; • 1: Less than 50 percent of the alternative wage. 	Ratio of captain's average daily wage in this fishery to the average daily wage in the owner/captain's alternate occupations within their economic sphere. The comparison is made to jobs in the village that the owner/captain would qualify for if all economic activity were within the village, but the comparison is made to jobs within the nation if the owner/captain participates in national markets as a consumer, and labor markets are fluid. Meant to capture the average personal opportunity cost of participating in fishery.	3	A	The wages or revenues of captains are approximately similar to average wages in the GS – namely, about NIS 1500, US\$428. It is important to mention that it is hard for fishers to switch to other sectors.	DOF, TC, and FSU.
		Community	Education Access	<ul style="list-style-type: none"> • 5: Higher education is accessible; • 4: High school level education or advanced technical training is accessible; • 3: Middle school level education or 	Measure is based on the highest level of education that is accessible to (available and affordable) the families (that is, the children) of permit holders and captains. Not based on the actual	2	A	Most captains have preliminary and secondary school education and have been involved in simple technical training through the International Labour Organization (ILO).	DOF study, DOF, TC, FSU and fishers.

Component	Dimension	Category	Metric	Score System	Additional Explanation	Gaza Score	Gaza Quality	Notes	Data Source
				simple technical training is accessible; • 2: Basic literacy and numeracy training is accessible; • 1: Formal education is not accessible.	educational attainment levels of current captains and owners.				
		Community	Access to Health Care	• 5: Global standard treatment for illness is accessible; • 4: Licensed doctors provide trauma, surgical and drug treatments; • 3: Nurses or medical practitioners provide emergency and routine drug treatments; • 2: Basic and simple drug treatment is accessible; • 1: Basic medical or drug treatment is not accessible.	Measure is based on the quality of health care that is accessible to (available and affordable) the owners/permit holders and their families.	3	B	Basic treatment or first aid kits are not available in the vessels or at ports. However, the fishers and their families get treatment at the nearest hospital where certified doctors and medical treatment are available.	DOF, MOT, TC, FSU and fishers.
		Community	Social Standing of Boat Owners and Permit Holders	• 5: Among the most respected in the community, comparable with civic and religious leaders and professionals, such as doctors and lawyers; • 4: Comparable to management and white collar jobs; • 3: Comparable to skilled labor jobs; • 2: Comparable to unskilled blue collar or service jobs; • 1: Among the least respected, such as slaves or indentured servants	Measure is based on the social standing of owners/permit holders/captains within the community where they spend the majority of their time.	3	A	The boat owners command significant respect from their community.	DOF, TC, FSU and fishers.
		Community	Proportion of Nonresident Employment	• 5: 95-100 percent local; • 4: 70-95 percent local; • 3: 35-70 percent local; • 2: 5-35 percent local; • 1: Virtually no local captains/permit holders.	Proportion of owners/permit holders/captains who are local. "Local" is defined as coming from, and spending their earnings within, the local fishing community. Nationals who are transient nonresidents, or regarded as outsiders in the fishing community, are not considered to be local.	5	A	All of captains/ owners are local, live very close to the coastline, and spend their revenues locally.	DOF, TC, FSU and fishers.
		Crew (Those depending on others for access)	Community	Earnings Compared to Regional Average earnings	• 5: More than 50 percent above the regional average; • 4: Between 10 and 50 percent above regional average; • 3: Within 10 percent of the regional average; • 2: Between 50 and 90 percent of the regional average;	Ratio of annual earnings per crewmembers to the regional average earnings. In many cases, the captain is also an owner of a vessel or permit, but in other cases, captains are considered as crew. Crew is defined as those who depend on others for access. Note that this is earnings from all sources, not just fishing.	3	A	The annual earning per crewmember was US\$5,362 (US\$446 monthly) in 2017, which is similar to the average earnings received in other lines of work with a similar skillset. The monthly regional average revenues is about 1502 NIS (US\$429) average monthly as in 2017.

Component	Dimension	Category	Metric	Score System	Additional Explanation	Gaza Score	Gaza Quality	Notes	Data Source
				<ul style="list-style-type: none"> • 1: Less than 50 percent of the regional average. 					
		Community	Crew Wages Compared to Non-fishery Wages	<ul style="list-style-type: none"> • 5: More than 50 percent above the alternative wage; • 4: Between 10 and 50 percent above the alternative wage; • 3: Within 10 percent of the alternative wage; • 2: Between 50 and 90 percent of the alternative wage; • 1: Less than 50 percent of the alternative wage. 	Ratio of crew's average daily wage in this fishery to the average daily wage in the crew's alternate occupations within their economic sphere. The comparison is to jobs in the village that the crew would qualify for if all economic activity were within the village, but to jobs within the nation if the crew participates in national markets as a consumer and labor markets are fluid. Meant to capture the average personal opportunity cost of participating in fishery.	3	A	The daily wage for crewmembers is about 30 NIS (US\$8.6), which is similar to the alternative within their economic sphere in the GS.	DOF, TC, FSU and fishers.
		Community	Education Access	<ul style="list-style-type: none"> • 5: Higher education is accessible; • 4: High school level education or advanced technical training is accessible; • 3: Middle school level education or simple technical training is accessible; • 2: Basic literacy and numeracy training is accessible; • 1: Formal education is not accessible. 	Measure is based on the highest level of education that is accessible (available and affordable) to the families (that is, the children) of crew. Not based on the actual educational attainment levels of current crewmembers.	2	A	The majority of crewmembers have less than high school. They have participated in some training on technical issues.	DOF, TC, FSU and fishers.
		Community	Access to Health Care	<ul style="list-style-type: none"> • 5: Global standard treatment for illness is accessible; • 4: Licensed doctors provide trauma, surgical and drug treatments; • 3: Nurses or medical practitioners provide emergency and routine drug treatments; • 2: Basic and simple drug treatment is accessible; • 1: Medical or drug treatment is not accessible. 	Measure is based on the quality of health care that is accessible to (available and affordable) the crew and their families.	3	B	Basic treatment or first aid kits are not available in the vessels or at ports. However, the fishers and their families receive treatment at the nearest hospital where certified doctors and medical treatment are available.	Field work in all ports.
		Community	Social Standing of Crew	<ul style="list-style-type: none"> • 5: Among the most respected in the community, comparable with civic and religious leaders and professionals, such as doctors and lawyers; • 4: Comparable to management and white collar jobs; • 3: Comparable to skilled labor jobs; • 2: Comparable to unskilled blue collar or service jobs; 	Measure is based on the social standing of crewmembers within the community where they spend the majority of their time.	3	A	Crewmembers receive respect as skilled labor.	DOF, TC, FSU, and field work.

Component	Dimension	Category	Metric	Score System	Additional Explanation	Gaza Score	Gaza Quality	Notes	Data Source
				<ul style="list-style-type: none"> • 1: Among the least respected, such as slaves or indentured servants 					
		Community	Proportion of Nonresident Employment	<ul style="list-style-type: none"> • 5: 95-100 percent local; • 4: 70-95 percent local; • 3: 35-70 percent local; • 2: 5-35 percent local; • 1: Virtually no local crew. 	Proportion of crewmembers who are local. "Local" is defined as coming from, and spending their earnings within, the local fishing community. Nationals who are transient nonresidents, or regarded as outsiders in the fishing community, are not considered to be local.	5	A	All the fishers are from the GS and live in areas very close to the coastline, and can easily move from one port to another with no restriction. Fishers' homes are located directly on the shores of the Gaza Sea.	DOF, TC, FSU, and field work.
		Community	Crew Experience	<ul style="list-style-type: none"> • 5: More than 10 years (skilled career crew); • 4: 5-10 years; • 3: 3-5 years; • 2: 1-3 years; • 1: 0 full years of experience (mostly new crew each season). 	Average years of experience of crewmembers.	5	A	The majority of fishers have more than 10 years' experience. The majority join the fisheries when they are young as a family tradition.	DOF, TC, FSU, and field work.
		Community	Age Structure of Harvesters	<ul style="list-style-type: none"> • 5: All working ages are well represented; • 4: Slightly skewed toward younger or older; • 3: Skewed toward younger or older; • 2: Almost entirely younger or older, but within working age; • 1: Harvesters primarily younger or older than working age. 	Age range of captains and their crews.	5	A	The majority of captains and their crew are relatively young, with an average age in the 40s for captains and 20s for crew. All crew and captains are in the working age population. Very few crew or captains are in their 50s.	DOF, TC, FSU, and field work.
Post-Harvest Performance	Market Performance	Economics	Ex-Vessel Price Compared to Historic High	<ul style="list-style-type: none"> • 5: Above 95 percent; • 4: 85-95 percent; • 3: 70-85 percent; • 2: 50-70 percent; • 1: Below 50 percent. 	The indicator is the ratio of current ex-vessel prices to the average of the three highest annual ex-vessel prices in the past 10 years. Adjust by the local CPI if inflation was significant. See 'Historical Data' tab.	3	A	The price of <i>Sardinella aurita</i> between 2009 and 2019 was 16, 14, 14, 14, 16, 17, 15, 17, 20, 18, 15, NIS/kg, respectively. The average of the three highest annual prices is 18.33 NIS/kg (US\$5.23).	DOF data.
		Economics	Final Market Use	<ul style="list-style-type: none"> • 5: Premium human consumption (premium quality and products); • 4: High-value human consumption; • 3: Moderate-value human consumption; • 2: Low-value human consumption; • 1: Fish meal/animal feed/bait or non-consumptive. 	The measure indicates the final market use of the top-three species. Where a supply chain is diverse, score each and weight it by value. Premium products are typically distinct to species, or species and source.	5	A	Almost all auctioned fish goes toward human consumption in the local market.	Interviews with Fishers, TC, retailers, auctioneer, FSU and DOF data.
		Economics	International Trade	<ul style="list-style-type: none"> • 5: 90-100 percent export; • 4: 60-90 percent export; • 3: 30-60 percent export; • 2: 2-30 percent export; • 1: Virtually no export. 	Percentage of the fishery's value that comes from fish exported to higher value international markets for consumption.	2	A	DOF export data shows that less than 10 percent is traded with West Bank. In 2018, 251 tons were exported out of 3038 tons, which represents 8.2 percent.	DOF and confirmed by inland farmers and exporters.

Component	Dimension	Category	Metric	Score System	Additional Explanation	Gaza Score	Gaza Quality	Notes	Data Source
		Economic s	Final Market Wealth	<ul style="list-style-type: none"> • 5: Greater than 35,000USD; • 4: Greater than 25,000USD; • 3: Greater than 12,500USD; • 2: Greater than 5,000USD; • 1: Less than 5,000USD. 	Average per capita GDP of the consumer of a fishery's primary final product. If multiple important products, weight them by value.	1	A	Per capita GDP for fisheries is <0.01 percent. The GDP per capita is US\$1507.70 for the GS.	Palestinian Central Bureau of Statistics (PCBS) and FAO consultants, a sub-regional analysis of the socio-economic situation of Eastern Mediterranean fisheries
		Economic s	Wholesale Price Compared to Similar Products	<ul style="list-style-type: none"> • 5: More than twice global average; • 4: 120-200 percent of global average; • 3: Within 20 percent of global average; • 2: 50-80 percent of global average; • 1: Less than 50 percent of the global average. 	Ratio of average price of wholesale fish product from the fishery, to the global average price for similar species. Convert the price of fish to global currency for comparison (that is, make sure both prices are in USD when composing the ratio).	3	C	Average price for wholesale fish product from the fishery is about 20 NIS per kg (US\$5.7). Exporter and DOF explained that the price of fish in Gaza is greater than the average global price because the cost of landings is high.	DOF and the auctioneer.
		Economic s	Capacity of Firms to Export to the US and EU	<ul style="list-style-type: none"> • 5: Over 90 percent meet US and EU health and labeling standards • 4: 50-90 percent; • 3: Less than 50 percent; • 2: A small amount of product meets US/EU standards; • 1: Banned in the US or EU, or cost of compliance with US/EU standards is prohibitive. 	Percentage of a country's fish exports that meet US or EU health and labeling standards. This is usually a country-level measure, though individual high-value fisheries sometimes develop their own supply chains; measure refers to all processing capacity for export, including export to regional markets.	1	A	No export to the outside world. Fishers traded fish in the West Bank only. No export to the EU or the US.	DOF and exporters.
		Economic s	Ex-Vessel to Wholesale Marketing Margins	<ul style="list-style-type: none"> • 5: More than 200 percent increase in value; • 4: 100-200 percent; • 3: 50-100 percent; • 2: 10-50 percent; • 1: Less than 10 percent increase in value. 	Increase in the value of processed wholesale product from unprocessed ex-vessel product. [(Wholesale \$/lb.) - Ex Vessel \$/lb.]/(Ex Vessel \$/lb.)	1	A	No processing on Sardinella aurita or any species because it goes directly to auction and then to the wholesale market and finally to the retailers. The price may change about 10 percent only following the auction. For Sardinella aurita, the wholesale price is 20 NIS (US\$5.71) per kg and the ex-vessel price is 18 NIS (US\$5.14) per kg.	DOF data.
	Post-harvest, Processing and Support Industry Performance	Economic s	Processing Yield	<ul style="list-style-type: none"> • 5: At the feasible frontier; • 4: Within 5 percent of the feasible frontier; • 3: Within 10 percent; • 2: Within 25 percent; • 1: Less than 75 percent of maximum yield. 	Ratio of actual processing yield (kilos/pounds) to the maximum processing yield technically achievable.	1	A	Zero percent of product is lost during processing as fisheries don't have processing unit. Less than 0.01 percent of the landings go to be salted. Less than 1 percent got damaged or rotten if the fish is not sold directly and the vessels or the sellers don't use ice namely on summer time.	DOF, FSU, TC.
Economic s		Shrink	<ul style="list-style-type: none"> • 5: Less than 5 percent; • 4: 5-10 percent; 	Percentage of fishery product weight that is lost due to handling, spoilage, or	5	A	According to DOF less than 0.01 percent of product is lost during	DOF, FSU, TC.	

Component	Dimension	Category	Metric	Score System	Additional Explanation	Gaza Score	Gaza Quality	Notes	Data Source
				<ul style="list-style-type: none"> • 3: 10-25 percent; • 2: 25-50 percent; • 1: More than 50 percent. 	theft. This is very likely to be an estimate.			handling. Less than 0.01 percent of product get spoiled. 0 percent of product is lost by theft.	
		Economic s	Capacity Utilization Rate	<ul style="list-style-type: none"> • 5: Virtually year-round; • 4: 75-95 percent of days; • 3: 50-75 percent; • 2: 20-50 percent; • 1: Less than 20 percent. 	Days open for processing each year. Such days would not normally include religious or civic holidays, or weekly rest days. This should be full-time employment days; when the plant is open but only operating at 10 percent capacity, then this only counts as 1/10 of a day.	3	A	There are 2 ice plants (one in Gaza City Port and the other at the Rafah landing site) and many restaurants. There is usually a power cut every 8 hours. They therefore function only 66 percent of days, despite having solar energy.	DOF, FSU, TC.
		Economic s	Product Improvement	<ul style="list-style-type: none"> • 5: 75-100 percent of landings are enhanced; • 4: 50-75 percent; • 3: 25-50 percent; • 2: 1-25 percent; • 1: No landings have enhancements. 	Proportion of harvest meat by weight that goes into certified, branded, fresh premium, portioned, live or value-added products.	1	A	No landing or harvest meat goes into higher-value certified or branded products.	DOF
		Community	Sanitation	<ul style="list-style-type: none"> • 5: Sanitation in landing and processing areas meets global health standards; • 4: Basic treatment, but it falls short of global standards; • 3: Human waste is adequately handled, but fish waste presents sanitation issues; • 2: Functional toilets are available, but fish or fish handlers are exposed to untreated sewage; • 1: Functional toilets are not available in landing or processing areas. 	This measures the sanitation conditions in the landing and processing areas, scored relative to global standards, not local standards. Pit latrines or toilets that are not improved, do not have proper drainage/sewage treatment, and do not allow for proper hand-washing do not count as functional toilets.	2	A	There are 4 landing sites in the GS, and all of them have unattended and uncleaned toilet facilities. The water treatment condition is very bad.	MOT, DOF, TC, FSU.
		Economic s	Regional Support Businesses	<ul style="list-style-type: none"> • 5: All types of support are plentiful; • 4: Some types of support are capacity constrained or unavailable; • 3: Most types of support are capacity constrained or unavailable; • 2: Support is limited to variable inputs; • 1: Industry support is not locally available. 	Support businesses are those that provide critical inputs (for example, food, ice, gear, or boat maintenance) or post-harvest functions (for example, brokering or logistics).	3	A	Al Tawfeek Cooperative (TC) runs an ice factory in Gaza Port with an optimal capacity of 20 tons per day and provides it to fishers. The ice factory is malfunctioning and currently produces 5 tons per day, despite a market demand of 12 tons per day. TC fill this gap in the summer by outsourcing ice production from ice cream factories. The Rafah landing site has an ice machine, while other ports have no ice services.	TC and FSU.
		Post-Harvest Asset	Economic s	Borrowing Rate Compared to	<ul style="list-style-type: none"> • 5: Less than 1.75; cf. 30-year conforming mortgage; • 4: Less than 2.5; cf. personal bank 	Average ratio between the interest rate on loans made in the processing industry to risk-free rates over the last	2	A	According to Bank of Palestine, 2.6 percent with collateral and with average \$3000 for only one year and

Component	Dimension	Category	Metric	Score System	Additional Explanation	Gaza Score	Gaza Quality	Notes	Data Source
	Performance		Risk-free Rate	<ul style="list-style-type: none"> loan; • 3: Less than 4; cf. good credit card rates; • 2: Less than 7; cf. bad credit card rates; • 1: Greater than 7; usury. 	three years. If businesses can access international credit markets, then the international risk-free rate (US 10 year Treasury Bill) is an appropriate comparison; otherwise, use the local risk-free rate.			limited number of fishers. Bank of Palestine has stopped this service in 2017.	
		Economics	Source of Capital	<ul style="list-style-type: none"> • 5: Unsecured business loans from banks/venture capital; • 4: Secured business loans from banks/public stock offerings; investment from elsewhere in the supply chain; • 3: Loans from banks secured by personal (not business);assets/government subsidized private lending/government-run loan programs/international aid agencies; secured loans from elsewhere in the supply chain; • 2: Microlending/family/community-based lending; loans from supply chain significantly reduce margins • 1: Mafia activity/no capital available; exploitative relationship from elsewhere in supply chain. 	Points to be assigned based on the category of lenders or investors that is most typically used in the processing sector. Second scoring method offered if the supply chain (for example, processors further up the supply chain, parent company, exporters) is the primary source of capital.	2	A	Currently only 6 fishers (including the owner of a trawler and Shanshula) have active personal microcredit accounts, all from Bank of Palestine, with collateral. No other bank provides credit. The primary source of capital is family savings.	Interviews with fishers, TC and FSU.
		Economics	Age of Facilities	<ul style="list-style-type: none"> • 5: In the 1st quarter of its expected life; less than 7 years for a building; • 4: In the 2nd quarter of expected life; 7-15 years for a building; • 3: In the 3rd quarter of expected life; 16-20 years for a building; • 2: In the 4th quarter of expected life; 21-25 years for a building; • 1: Exceeded its expected life; greater than 25 years;. 	Average age of the key durable processing capital units (for example plants and catcher-processor vessels).	2	A	Post-harvest facilities such as the ice plant are 20 years old. Packing house for export is more than 20 years old.	Interviews with TC and FSU.
	Processing Owners and Managers	Community	Earnings Compared to Regional Average Earnings	<ul style="list-style-type: none"> • 5: More than 50 percent above the regional average; • 4: Between 10 and 50 percent above regional average; • 3: Within 10 percent above the regional average; • 2: Between 50 and 90 percent of the regional average; • 1: Less than 50 percent of the regional average. 	Ratio of annual earnings per owner/manager to the regional average earnings. This measure can include wealth accumulated by traders/middlemen if they represent an important part of the supply chain. Note that this is earnings from all sources, not just fishing.	2	A	The annual revenue per owner is approximately US\$421 (NIS 1229 NIS monthly). This is not including the annual wage of a captain as owner. Owners' average earning is 81 percent of the national average income.	PCBS, DOF data, interview with the TC, and investors.

Component	Dimension	Category	Metric	Score System	Additional Explanation	Gaza Score	Gaza Quality	Notes	Data Source
		Community	Manager Wages Compared to Non-fishery Wages	<ul style="list-style-type: none"> • 5: More than 50 percent above the alternative wage; • 4: Between 10 and 50 percent above alternative wage; • 3: Within 10 percent above the alternative wage; • 2: Between 50 and 90 percent of the alternative wage; • 1: Less than 50 percent of the alternative wage. 	Ratio of owner/manager's average daily wage in this fishery to the average daily wage in the owner/manager's alternate occupations within their economic sphere. The comparison is to jobs in the village that the owner/manager would qualify for if all economic activity were within the village, but to jobs within the nation if the owner/manager participates in national markets as a consumer and labor markets are fluid. Meant to capture the average personal opportunity cost of participating in fishery.	2	A	A processing facility owner earns 35 NIS per day, while the alternative would be in construction, where someone with similar skills and experience would earn about 40 NIS daily. In general, the revenue of owners in fisheries is less than alternative wage. Only the owners of restaurants earn slightly above the alternative wage.	Interview with TC and the owners of vessels. DOF also confirmed this result.
		Community	Access to Education	<ul style="list-style-type: none"> • 5: Higher education is accessible; • 4: High school level education or advanced technical training is accessible; • 3: Middle school level education or simple technical training is accessible; • 2: Basic literacy and numeracy training is accessible; • 1: Formal education or training is not accessible. 	Measure is based on the highest level of education that is accessible to (available and affordable) the families (that is, the children) of processing facility owners and managers. Not based on the actual educational attainment levels of current processing facility owners/managers.	2	A	Owners typically have less than high school level of education. TC data shows that owners of vessels have less than 12 years of schooling (less than completion of high school).	DOF, TC, FSU and interview with the processing facility owner.
		Community	Access to Health Care	<ul style="list-style-type: none"> • 5: Global standard treatment for illness is accessible; • 4: Licensed doctors provide trauma, surgical and drug treatments; • 3: Nurses or medical practitioners provide emergency and routine drug treatments; • 2: Basic and simple drug treatment is accessible; • 1: Medical or drug treatment is not accessible. 	Measure is based on the quality of health care that is accessible to (available and affordable) processing facility owners/managers and their families.	2	A	Owners have access to health care. The ports have no health services facilities.	DOF, TC, FSU, and interview with the processing facility owner.
		Community	Social Standing of Processing Managers	<ul style="list-style-type: none"> • 5: Among the most respected in the community, comparable to civic and religious leaders and professionals, such as doctors and lawyers; • 4: Comparable to management and white-collar jobs; • 3: Comparable to skilled labor jobs; • 2: Comparable to unskilled blue-collar or service jobs; • 1: Among the least respected, such as slaves or indentured servants. 	Measure is based on the social standing of processing facility owners/managers within the community where they spend the majority of their time.	3	A	The social status of a processing facility manager is similar to that of the owners of trawlers and members of TC and FSU. The fisheries group have similar respect from their community.	DOF, TC, FSU and interview with the processing facility owner.

Component	Dimension	Category	Metric	Score System	Additional Explanation	Gaza Score	Gaza Quality	Notes	Data Source
		Community	Nonresident Ownership of Processing Capacity	<ul style="list-style-type: none"> • 5: 95-100 percent local; • 4: 70-95 percent local; • 3: 35-70 percent local; • 2: 5-35 percent local; • 1: Virtually no local processing ownership. 	Proportion of processing facility owners/managers who are local. "Local" is defined as coming from, and spending their earnings within, the local fishing community. Nationals who are transient nonresidents, or considered outsiders in the fishing community, are not local.	5	A	All processing facility owners or managers live nearby the coastline and spend their earnings locally.	DOF data, interview with the processing facility owner.
	Processing Workers	Community	Earnings Compared to Regional Average earnings	<ul style="list-style-type: none"> • 5: More than 50 percent above the regional average; • 4: Between 10 and 50 percent above regional average; • 3: Within 10 percent above the regional average; • 2: Between 50 and 90 percent of the regional average; • 1: Less than 50 percent of the regional average. 	Ratio of annual earnings per processing facility worker to the regional average earnings. Note that this is earnings from all sources and not just fishing.	2	A	Workers at processing facility earn monthly 900 NIS (US\$257) or less (NIS 10,800, \$3,085 annual). The average monthly income is 1502 NIS (US\$257) (NIS 18,024, US\$5149 annual) in the region. Workers at processing facilities earn about 60 percent of regional earnings.	PCBS, DOF data, processing facility owner.
		Community	Worker Wages Compared to Non-fishery Wages	<ul style="list-style-type: none"> • 5: More than 50 percent above the regional average; • 4: Between 10 and 50 percent above regional average; • 3: Within 10 percent above the regional average; • 2: Between 50 and 90 percent of the regional average; • 1: Less than 50 percent of the regional average. 	Ratio of processing facility worker's average daily wage in this fishery to the average daily wage in the worker's alternate occupations within their economic sphere. The comparison is to jobs in the village that the worker would qualify for if all economic activity were within the village, but to jobs within the nation if the worker participates in national markets as a consumer, and labor markets are fluid. Meant to capture the average personal opportunity cost of participating in fishery.	2	A	Workers at processing facilities earn about 35 NIS a day. The alternative would be in construction, where a comparable worker would earn about 40 NIS a day, which is very close to the fisheries wage scale. The PCBS stated that the average daily wage is 20 NIS in agriculture and in fisheries, and 40 NIS in construction.	PCBS, DOF data, processing facility owner.
		Community	Education Access	<ul style="list-style-type: none"> • 5: Higher education is accessible; • 4: High school level education or advanced technical training is accessible; • 3: Middle school level education or simple technical training is accessible; • 2: Basic literacy and numeracy training is accessible; • 1: Formal education is not accessible. 	Measure is based on the highest level of education that is accessible to (available and affordable) the families (that is, the children) of processing facility workers. Not based on the actual educational attainment levels of current processing facility workers.	2	A	The majority of workers at processing facilities have an education level less than high school. According to the PCBS, workers in agriculture and the fisheries are among the least educated people.	PCBS, DOF, TC, FSU, processing facility owner.
		Community	Access to Health Care	<ul style="list-style-type: none"> • 5: Global standard treatment for illness is accessible; • 4: Licensed doctors provide trauma, surgical and drug treatments; 	Measure is based on the quality of health care that is accessible to (available and affordable) processing facility workers and their families.	2	A	Workers at processing facilities have basic health care.	DOF, FSU, TC, processing facility owner.

Component	Dimension	Category	Metric	Score System	Additional Explanation	Gaza Score	Gaza Quality	Notes	Data Source
				<ul style="list-style-type: none"> • 3: Nurses or medical practitioners provide emergency and routine drug treatments; • 2: Basic and simple drug treatment is accessible; • 1: Medical or drug treatment is not accessible. 					
		Community	Social Standing of Processing Facility Workers	<ul style="list-style-type: none"> • 5: Among the most respected in the community, comparable to civic and religious leaders and professionals such as doctors and lawyers; • 4: Comparable to management and white collar jobs; • 3: Comparable to skilled labor jobs; • 2: Comparable to unskilled blue collar or service jobs; • 1: Among the least respected, such as slaves or indentured servants. 	Measure is based on the social standing of workers within the community where they spend the majority of their time.	2	A	Workers at processing facilities have a level of respect from their community that is similar to that of an unskilled worker.	DOF, FSU, TC, processing facility owner.
		Community	Proportion of Nonresident Employment	<ul style="list-style-type: none"> • 5: 95-100 percent local; • 4: 70-95 percent local; • 3: 35-70 percent local; • 2: 5-35 percent local; • 1: Virtually no local workers. 	Proportion of processing facility workers who are local. "Local" is defined as coming from, and spending their earnings within, the local fishing community. Nationals who are transient nonresidents, or regarded as outsiders in the fishing community, are not considered to be local.	5	A	The majority of workers at processing facilities come from families that live very close to the coastline, less than 3 km away.	DOF, FSU, TC, processing facility owner.
		Community	Worker Experience	<ul style="list-style-type: none"> • 5: More than 10 years (skilled career workers); • 4: 5-10 years; • 3: 3-5 years; • 2: 1-3 years; • 1: 0 full years of experience (mostly new workers each season). 	Average years of experience of processing workers.	5	A	The average experience of fisheries workers is more than 10 years because the occupation is passed on from generation to generation within the family, starting from an early age.	DOF, FSU, TC, processing facility owner.

ENDNOTES

¹ Housed at the World Bank, PROBLUE is a newly minted multi-donor trust fund “that supports the development of integrated, sustainable and healthy marine and coastal resources.” For more information about the fund, see <https://www.worldbank.org/en/programs/problue#1>.

² Source: FAO presentation at consultation workshop in February 2020.

³ Lia Carol Sieghart, Joseph Allen Mizener, Jeffrey Alexander Gibson, *Capturing Opportunities for Integrated Coastal Zone Management and the Blue Economy in Middle East and North Africa (MENA)*, MENA Knowledge and Learning, Quick Notes Series, Number 172 (Washington, DC.: World Bank Group, 2019) <https://hubs.worldbank.org/docs/ImageBank/Pages/DocProfile.aspx?nodeid=30754792>.

⁴ The fishing zone north of the Gaza Strip and Gaza City is limited to 6 NM, while the fishing zone in the cities of Deir Albalah and Khan Yunis can be up to 15 NM.

⁵ About eight people work as supporting members at the shore for each vessel. Average family size is 6.3 people. Source: FAO consultant mission report, “To assess the current situation of the fisheries sector in West Bank and Gaza Strip and identify feasible opportunities for FAO interventions to support the sector at the technical and institutional levels.”, September 2011.

⁶ Palestinian Central Bureau of Statistics (PCBS) data (Ramallah, West Bank, 2017) <http://www.pcbs.gov.ps/Portals/Rainbow/Documents/Fish-2017-E-5.html>.

⁷ The number of vessels in 2019 is based on data from the General Directorate of Fisheries (DOF) of the Ministry of Agriculture (MOA). The PCBS data is current up to 2017.

⁸ The poverty analysis was undertaken by PCBS. See *Poverty Profile in Palestine 2017* (PCBS) http://213.6.8.54/Document/pdf/txt_e_poverty2017.pdf?date=16_4_2018_2.

⁹ World Bank, *Assistance Strategy for the West Bank and Gaza, FY18-21* (Washington, DC.: World Bank Group, 2017) <http://documents.worldbank.org/curated/en/339871512568083583/pdf/AS-1113-West-Bank-Gaza-Final-to-SECPO-11142017.pdf>.

¹⁰ For more information about this collaborative project, see <http://www.faoeastmed.org/index.html>.

¹¹ For a more in-depth discussion of the FPI tool and a detailed example of its application, see James L. Anderson et al, *The Fishery Performance Indicators: A Management Tool for Triple Bottom Line Outcomes* (PLoS ONE 10(5): e0122809, 2015) <https://doi.org/10.1371/journal.pone.0122809>.

¹² Fishery Performance Indicators in Guinea, September 2017. <http://pubdocs.worldbank.org/en/164491585772690178/pdf/Fishery-Performance-Indicators-in-Guinea.pdf>.

¹³ Fishery Performance Indicators in Guinea Bissau, September 2017. <http://pubdocs.worldbank.org/en/843601585839200162/pdf/Fishery-Performance-Indicators-in-Guinea-Bissau.pdf>.

¹⁴ The Fishery Performance Indicators: A management tool for triple bottom line outcomes, Research Articles, World Bank.

<http://documents.worldbank.org/curated/en/101051468187471291/pdf/102488-JRN-Box394835B-PUBLIC-The-Fishery-Performance-Indicators.pdf>

¹⁵ See the map in annex 1.

¹⁶ Palestinian Authority, *National Policy Agenda, 2017-2022: Putting Citizens First* (Ramallah, 2016) https://eeas.europa.eu/sites/eeas/files/npa_english_final_approved_20_2_2017_printed.pdf.

¹⁷ Palestinian Authority, *The National Early Recovery and Reconstruction Plan for Gaza* (Ramallah, 2014). This Plan was developed with the aim of transitioning from relief efforts to longer-term development strategies in four sectors – social, infrastructure, economic, and governance. https://reliefweb.int/sites/reliefweb.int/files/resources/National%20Early%20Recovery%20and%20Reconstruction%20Plan%20for%20Gaza%202014-2017_FINAL%20%20%20.pdf.

¹⁸ Ministry of Agriculture, Palestinian Authority, *National Agricultural Sector Strategy 2017-2022: Resilience and Sustainable Development* (Ramallah, 2016) http://www.jacs.ps/documentsShow.aspx?ATT_ID=31791.

¹⁹ The Fisheries Organizing Law of 2005 defines the roles and responsibilities of the General Directorate of Fisheries (DOF) of the Ministry of Agriculture (MOA) as follows: to (i) Supervise the implementation of programs and public policy and the organization of work and management; (ii) Propose the fees required for the issuance of licenses, permits, conditions, and regulations and to submit them to the Minister for approval by the Council of Ministries; (iii) Supervise the implementation of agreements and contracts concluded by the Minister; (iv) Consider the best available scientific evidence to assess the current state of fisheries; (v) Collect data, gather information, and conduct research to achieve the objectives of the system; (vi) Promote awareness of fishing and fishing sector workers; (vii) Determine the general conditions to be observed when building vessels and equipment; (viii) Identify species of fish and aquatic living resources that are prohibited from specific or unlimited fishing; (ix) Coordinate with concerned authorities, the union, the cooperative, and civil bodies involved in marine fishing and existing water resources; (x) Support the Director to consult with his counterparts in the countries of the region; and (xi) Develop a joint plan for the exploitation and management of shared living water resources.

²⁰ Ministry of Environmental Affairs, Palestinian Authority, *The Gaza Coastal and Marine Environmental Protection and Management Action Plan* (Ramallah, 2001) http://s3.amazonaws.com/zanran_storage/smap.ew.eea.europa.eu/ContentPages/723959522.pdf.

²¹ Such development partners include, but are not limited to, Danish International Development Agency (DANIDA), Department for International Development (DFID) of the United Kingdom (UK), the EU, FAO, Islamic Development Bank (IDB), the International Labour Organization (ILO), Japan International Cooperation Agency (JICA), Qatar Charity Foundation (QC), and United Nations Development Programme (UNDP).

²² The objectives of the General Directorate of Fisheries are (i) developing a national policy for fishing and aquaculture; (ii) proposing a general plan for the protection of fisheries resources and the long-term conservation, sustainability, development, processing and proper exploitation of fishery resources; (iii) organizing and managing fishing and aquaculture; (iv) developing programs to protect the marine environment and reduce pollution of fishing waters, working to address the adverse impact of fishing, avoiding excess fishing capacity, and maintaining the exploitation of fish stocks from an economic point of view; (v) developing investment in fisheries; (vi) following up on scientific research in the field of fisheries and aquaculture; (vii) establishing standards of conduct for all those involved in fisheries and aquaculture, and developing and rationalizing fishing methods and methods; and (viii) enhancing the contribution of fisheries and aquaculture to food security. http://moa.gov.ps/?page_id=39.

²³ The packing, packaging and market outlet is expected to become operational in 2021.

²⁴ It is believed by some that the Palestinian Coastal Police can monitor the fishing zone up to 6 NM from the coastline.

²⁵ <http://palestinecabinet.gov.ps/govservice/gospub/viewdetanis?id=65>.

²⁶ FAO is working with the Palestine Land Authority with regard to the marine cage zoning. See FAO, *Country Programming Framework for Palestine, 2018-2022* <http://www.fao.org/3/i8933en/I8933EN.pdf>.

²⁷ Source: Consultants consultation with FSU reviewing their annual report of 2019.

28 FSU is the FAO's main partner of the marine cage farming project in Gaza.

29 Until 2017, TC operated as a guarantee for fishers to obtain loans from Bank of Palestine (BOP) at the reduced interest rate of 2.6% per annum (the commercial interest rate is 5.5 %), but subsequently the program stopped because many fishers still could not repay the loans despite the soft terms. Currently, the accumulated debt is about 401,000 NIS (US\$114,285).

³⁰ Due to frequent power cuts, ice is made available at Gaza City Port and Rafah landing site. However, the production line sometimes malfunctions, and when this happens the ice is reserved for high-value species and for export. Khan Younis and Deir Albalah ports do not have ice service.

³¹ For additional information about National Institute for Environment and Development, visit its website at <https://www.nied.ps/>.

³² There are no fish observers' reports or actual fish catch reports. Data presented are amounts of landed fish.

³³ According to interviews with auctioneers and municipalities, the revenues of an auctioneer come from two main sources. First as a middleman, the auctioneer takes 3% from the buyer and 4% from the seller for each transaction. Second as a trader, the auctioneer buys and sells for his/her account, making profit from the spread between buying and selling. The auctioneers currently have 31 employees, with an average monthly salary of about 1500 NIS (US\$434) per person.

³⁴ Al Tawfeek Cooperative (TC) collects 50 NIS (US\$14) per 750 kg of usage of the cold storage.

³⁵ FSU has an office at each port to service fishers.

³⁶ The facility was used by the PCP and damaged during the war.

³⁷ The government assigns formal sites. When there is no place for fish landing, fishers use informal sites, but these sites are not recognized by the government.

³⁸ Dario Pinello and Mark Dimech, *A sub-regional Analysis of the Socio-economic Situation of the Eastern Mediterranean Fisheries* (Rome: FAO, 2016) <http://www.fao.org/3/a-i5792e.pdf>.

³⁹ If some fishers are not allowed on board and are still unemployed, they register with cash-for-work programs funded by international donors. These programs hire fishers as lifeguards on the beach in summertime, and they make around 900 NIS (US\$260) a month.

⁴⁰ Mohammed Abudaya et al, "Correcting Mis- and Under-Reported Marine Fisheries Catches for the Gaza Strip: 1950-2010," *Acta Adriatica* 54, no. 2 (December 2013): 241–252 <https://s3-us-west-2.amazonaws.com/legacy.searounds/doc/Researcher+Publications/dzeller/PDF/Papers/2013/Abudaya-et-al-Gaza-Acta-Adriatica-2013.pdf>.

⁴¹ The fish landing amount data is from the DOF.

⁴² Stock assessment in GSA 27 (WB&G), FAO HQ, 2018 and 2019.

⁴³ Because of the frequent power cuts, some owners were forced to close their projects. In response, some personally procured generators that run on cheap Egyptian fuel. However, the destruction of the tunnels in 2013 put a halt to the importation of that fuel, resulting in the closure of a majority of the commercial fish firms.

⁴⁴ Power supply has been one of the main constraints, but these days the hatchery operators are trying to manage by maintaining three alternative sources: (1) the local electricity grid (the tariff is about 1 NIS per kwh), (2) electrical generators (the tariff is about 2 NIS per kwh), and (3) 15 kw 24-hours off-grid solar energy. Having off-grid solar energy has been helpful, but the supply is not yet enough.

⁴⁵ FAO West Bank and Gaza Strip, *Piloting Marine Cage Farm as a Social Business*, project brief (Rome: FAO, 2018) <http://www.fao.org/3/i9327en/i9327EN.pdf>.

⁴⁶ Over the past five years, there have been a small number of winter storms that have created currents of up to two knots and extreme waves up to approximately 10 meters in height relatively close to the shoreline. This weather pattern can pose a significant threat to fish in cages.

⁴⁷ The design of Tension Leg Cage system is ideal in that it is flexible and small in the upper section where the waves hit hardest, while its supporting structure is positioned at depth. In storm conditions, the cage does not oppose the marine forces, but rather moves in synergy with the waves almost like seaweed, thus minimizing the mechanical strain on all cage components.

⁴⁸ Palestinian agronomist Wael Mssalam, after experimenting with ways to grow azolla in an aquarium, state that “using azolla as a food for fish reduced the high-priced feed imported from Israel to 50 percent, which means achieving a higher profit margin for Palestinian farmers.” <https://news.cgtn.com/news/2019-08-08/Major-challenges-facing-fish-farms-in-coastal-Gaza-Strip-IZ15glGzfi/index.html>.
<https://www.middleeastmonitor.com/20190905-floating-new-ideas-for-animal-feed-in-gaza/>.

⁴⁹ A study conducted at the National Institute of Oceanography and Fisheries in Alexandria, Egypt concluded orange peel can improve the ability of Nile tilapia to absorb nutrients and grow more rapidly. The orange peel can be tested in fish farming in the GS. Heba Abdel-Ghany El-Sayed and Mohamed Salem, “Effects of Dietary Orange Peel on Growth Performance of Nile Tilapia (*Oreochromis niloticus*) Fingerlings” (2018)
https://www.researchgate.net/publication/329443772_Effects_of_dietary_orange_peel_on_growth_performance_of_Nile_tilapia_Oreochromis_niloticus_fingerlings.

⁵⁰ Another study compared orange peel feed and potato peel feed to commercial common fish feed. The study concludes that potato peel feed is highly nutritive and helps in the qualitative and quantitative growth of fish, and that orange peel feed showed brighter body scales.
<https://www.intechopen.com/books/fisheries-and-aquaculture-in-the-modern-world/effect-of-special-fish-feed-prepared-using-food-industrial-waste-on-labeo-rohita>.

⁵¹ FAO, *Piloting Marine Cage Farm*.

⁵² FAO, 2020 (in press). *FAO Yearbook of Fishery and Aquaculture Statistics 2018* (Rome, 2018)
http://www.fao.org/fishery/static/Yearbook/YB2017_USBcard/index.htm.