# Mediterranean Forum for Applied Ecosystem-Based Management (MED4EBM)

## MED4EBM Project Citizen Science Aqaba Fisheries Data Gathering Campaign

## Aqaba Fisheries Data Gathering and Analysis Deliverable 4

## Final Report

***Submitted to***

**United Nations Development Programme**
**(UNDP - Jordan)**

**Thaghr el Ordon**
**Fishermen Society**

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**Study Team**

Hala Ghazi - Data Gathering Specialist, Team Leader
Ahmed Shehab - Data Gathering Field Assistant
Osama Saleh - Data Gathering Field Assistant
Omar Kabariti - Data Gathering Field Assistant

**Thaghr el Ordon Fishermen Society Management Supervision Team :**

Bader Yassen- Head of Thaghr el Ordon Fishermen Society
Ghazi Maroof- Secretary of Thaghr el Ordon Fishermen Society
Mohammed Almarafi- Accountant and Logistics Thaghr el Ordon Fishermen Society

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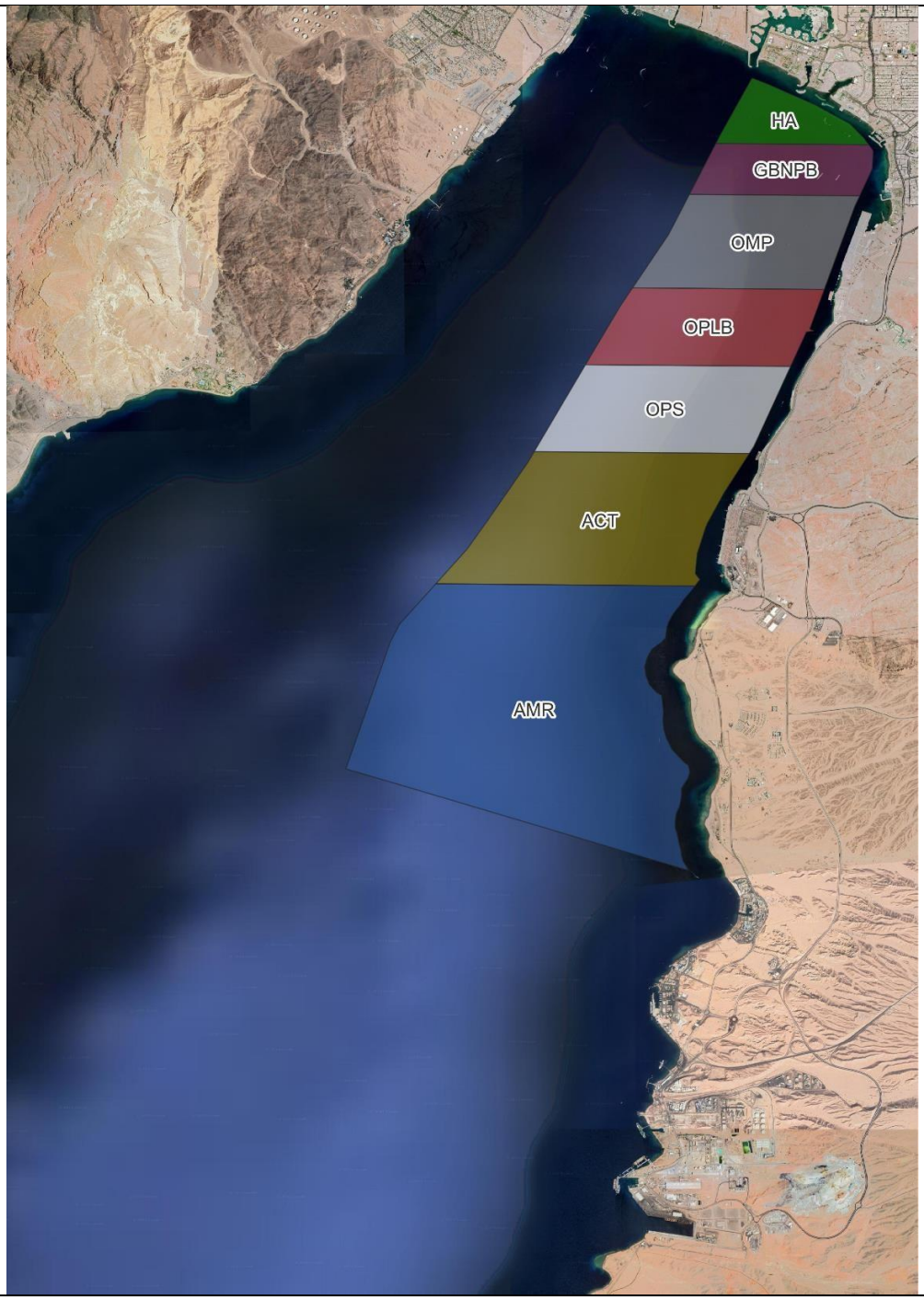
# MED4EBM Project Citizen Science Aqaba Fisheries Data Gathering Campaign

## Aqaba Fisheries Data Gathering and Analysis Deliverable 4


## Abstract

Following the Ecosystem Based Management approach applied in the MED4EBM project and based on the analysis of ecological and socioeconomic component of the coastal Zone in Aqaba Jordan, fisheries management was determined as a national priority identified by the Project's stakeholders. LB UNDP Jordan allocated a part of the Data Gathering Campaign budget for this purposes and contracted Thaghr el Ordon Society Fishermen to do the job according to the Project's contractual procedures. This abstract outlines the fourth consultancy deliverable, presenting key achievements in the form of elementary Data Analysis covering the period from 28th August to 28th September 2023. Further in depth analysis will be continued by the Fishermen Society and Aqaba Marine Reserve for more comprehensive understanding of the data which will continue to be gathered after MED4EBM Project ends. This report delves into fish catch data and associated fishing operations, emphasizing details such as fish counts (Kg), the number of fishing trips, dates, total catch (Kg), petrol consumption (JD), and fishing value (JD) across various locations ACT, OPS, OPLB, HB, and OPM (Please refer to Figure 1 below). The analysis unveils guiding insights into the relationship between the fishing effort and return. Notable fluctuations during specified periods highlight the fishing procedures dynamics. A detailed comparison of fish species caught exposes trends, with swordfish dominating and varying success observed for other species. Additionally, examining fish count (Kg) and fishing trips across sites reveals distinct patterns, with "ACT" consistently excelling and "OPM" displaying hire trends, suggesting potential attractiveness of these two areas fishermen. Noteworthy is that the entire Jordanian coast is about 27KM with several areas being restricted for fishing, which calls for careful management to sustain the fishing community livelihoods, keeping this traditional cultural heritage activity viable while at the same time sustaining viable fisheries in this restricted area and regenerative fishing stocks. While the data presented herein denote to a short period, it sets the ground for long term data reliable gathering with direct involvement of the concerned fishing community.




**HA:** In front of the Northern Hotels Area

**GBNPB**: In front of North Public Beach

**OMP:** In front of Old Main Port

**OPLB:** In front of Old Phosphate Loading Berth

**OPS**: In front of Old Power Station

**ACT:** In front of Aqaba Container Terminal

**AMR:** Offshore of Aqaba Marine Reserve

**Figure 1. Allowed fishing areas on the Jordanian coast of the Gulf of Aqaba**

# 1. Introduction

Following the Ecosystem Based Management approach applied in the MED4EBM project and based on the analysis of ecological and socioeconomic component of the coastal Zone in Aqaba Jordan, fisheries management was identified by the Project's stakeholders as a national priority LB UNDP Jordan allocated a part of the Data Gathering Campaign budget for this purposes and contracted Thaghr el Ordon Society Fishermen to do the job according to the Project's contractual procedures. The Society was founded in September 2011 in Aqaba, and it is a collective of individuals engaged in the artisanal fishing practice, commonly known as a Fishermen Society. This groups serve a crucial function in championing the rights and interests of fishermen, advancing the cause of sustainable fishing methods, and tackling the diverse issues confronting their members.

The Deliverable-Based Citizen Science Fisheries Data Collection Initiative is an ambitious project aimed at harnessing the collaborative efforts of citizen scientists to gather valuable fisheries data. This initiative seeks to involve individuals and communities in the systematic collection of fisheries-related information, instilling a sense of ownership and responsibility for our marine ecosystems. The data acquired will be a significant contribution to scientific research, fisheries management, and environmental conservation endeavors. This Report outlines the project's scope and findings of the Marine Fish Catch Data Sampling Campaign, which has been carried out within the framework of the MED4EBM Project supported by the ENI CBC MED Program. The Data Gathering Campaign is closely coordinated with the Project's Technical Team, and the results of the fisheries data gathering campaign will play a crucial role in supporting evidence-based marine fisheries management and ensuring the sustainability of fishing resources. The Fishermen Society, representing approximately 150 fishermen, is taking an active role in collecting field data related to marine fisheries in Jordan for the first time. To facilitate this process, the society has appointed a young team of a female specialist and three data gathering assistants.

Thaghr el Ordon Fishermen Society, and the Lead Beneficiary of the Project, UNDP Jordan Country Office, signed an agreement on Thursday, August 31, 2023, to conduct a fisheries management data gathering campaign that is meant to initiate data gathering and establish the foundation for a sustainable National Fisheries Data Gathering Program.

# 2. Statement of Problem

Analysis of previous fishing activities monitoring revealed the following points:

- **Incomplete Historical Data:** The ISP lacks historical records for fisheries activities in the Gulf of Aqaba before 2015. This gap hinders a comprehensive understanding of long-term trends and patterns in fishing practices, making it challenging to formulate informed management strategies.
- **Data Entry Discrepancies:** Irregularity in data gathering resulted in some discrepancies in the data handling, particularly concerning the representation of Fisheries data by day. The current representation by month may hinder the accuracy of daily monitoring and necessitates further verification.
- **Inadequate Environmental Information:** Previous data lacked a systematic approach to daily reporting of environmental conditions and fish abundance that rely on fishermen's

observations. This informal approach may lead to incomplete or inconsistent data, impacting the reliability of connecting fisheries and environmental data.

- **Limited Scope in Anthropogenic Impact Reporting:** Previous monitoring goals lacked specificity regarding the reporting of environmental incidental and anthropogenic impacts. There is a need for a more detailed framework to identify, document, and address such impacts that impact fishing activities in the Jordanian sector of the Gulf of Aqaba.
- **Mapping Challenges:** Mapping of different fish catches species and their density corresponding to fishing sites, as outlined in Monitoring Goals, may face challenges due to potential gaps in geographic coordinates or limitations in the accuracy of mapping tools.
- **Insufficient Information on Fish Population Characteristics:** Previous monitoring lacked detailed information on the size and age structure, gonads content, and maturity of caught fish populations. This gap hinders a comprehensive understanding of the health and sustainability of fish populations and fisheries management in the Jordanian sector of the Gulf of Aqaba.

# 3. Objectives

The primary goals of the Fisheries Data Gathering Campaign are as follows:

### 3.1. Assessing Fishing Activities

- ✓ Quantify the number of boats and crew members involved in fishing.
- ✓ Gather information about the fishing locations visited and the duration of fishing trips.
- ✓ Record data concerning fuel consumption and the types of fishing gear utilized.

### 3.2. Daily Environmental Observations

- ✓ Provide daily observations on environmental conditions and fish abundance
- ✓ Collect observations and feedback from fishermen regarding live bait collection, which is a significant management and environmental concern in Aqaba, Jordan.
- ✓ Document observations of incidental of human impacts on the environment observed at fishing sites.
- ✓ Record any incidents encountered by fishing boats related to environmental impacts.

### 3.3. Fish Catch Assessment

- ✓ Determine the total landings of fish in the Jordanian sector of the Gulf of Aqaba.
- ✓ Document the species of fish caught and their relative abundance.
- ✓ Estimate the monetary value of the fish catch based on sale prices at the time of landing.

### 3.4. Mapping the Distribution of Fish Catch

- ✓ Create maps depicting the distribution of different fish species caught, including the specific fishing sites and depths.
- ✓ Calculate the density of fish species caught in relation to their respective fishing sites.

### 3.5. Assessing Fish Population

- ✓ Estimate the size and age structure of the fish populations caught to the best extent possible.
- ✓ Evaluate the gonad content and maturity of the fish populations that have been caught.

## 4. Methodology

An overview and analysis of fish capture data and related fishing operations over the period (August 28, 2023, to September 28, 2023) are given in this report. Fish counts (kg), number of fishing trips, date of trips, total catch (kg), fuel consumption (JD), and fishing value (JD) for every location are all included in the data. The report covers a month-long series of fishing excursions that were undertaken in all the allowed fishing locations and targeting all boats that operated between August 28, 2023, and September 28, 2023. The fishing excursions that took place at all allowed fishing sites in Aqaba are presented in Figure 1.

Obtaining detailed daily data regarding fishing activities, including information on fishing effort and fishing returns. This data has been presented in three data analysis reports that assess the fishery's status based on the collected information. The data collected is integrated into the MED4EBM project's database to augment the currently limited dataset and subjected to analysis using the Integrated Special Planning Program (ISP). Fishery data gathering team collected data by recording data on data sheets directly from fishermen when they return from their daily fishing trips. There measurement tools to measure length, width, and weight (Fig.2) were made available at the fishermen's harbor

**Fig. 2. Fish Catch Measurement tools at the fishermen's harbor**

### 3.1 Data Gathering

- ✓ Engage with local fishermen and fishing communities to acquire insights into fishing activities.
- ✓ Regularly conduct field visits to fishing sites to gather data on boats, crews, trip lengths, fuel consumption, and fishing equipment.
- ✓ Collaborate with fishermen to document daily environmental conditions, fish abundance, and bait fish observations.
- ✓ Collect information on environmental stressors through direct interviews with fishermen.
- ✓ Record data related to fish catches, species, and their relative abundance.
- ✓ Employ fish sampling techniques and leverage local fishermen's knowledge to estimate fish size, age distribution, gonad content, and maturity.

### 3.2 Data Management

- ✓ Process and analyze the collected data using descriptive and statistical methods.
- ✓ Produce maps that illustrate the distribution of various fish species and their density in relation to fishing sites and employ the use of ISP.
- ✓ Develop reports and visual representations to convey the findings.
- ✓ Share all data and results with the fishing community and governing authorities to inform the development of management protocols.

### 3.3 Historical Data Retrieval

- ✓ Retrieve historical data on fishing activities and environmental conditions from existing records and databases wherever possible. This historical data will primarily be used for reporting and interpreting results.

## 5. Results and Discussion

### 5.1. Fishermen Call in at the Fishing Port and Daily Routines

The number of officially registered fishing boats at Jordan Maritime Commission is 168. Keeping control on this number is an important management measure practiced by Aqaba Special Economic Zone Authority to avoid over licensing which may lead to increased pressure on the limited fisheries on the Jordanian coast of the Gulf of Aqaba. Table 1 summarizes the boats that were attended by their operators whether went in a fishing trip or just attended for maintenance or routine check. The total number of boats attended by their operators during the Data Gathering Campaign was 93 boats accounting for 55% of the total registered boats. Boat operators' attendance to their boats varied significantly with boats attended just once to boats attended daily. Results in the following sections focus mainly on the boats that have undertaken fishing trips whether they had fishing catch or not.

**Table 1. Fishermen Calling in at the Fishing Port and daily Routines**

| الرقم | اسم ورقم القارب | عدد الزيارات | الرقم | اسم ورقم القارب | عدد الزيارات |
|---|---|---|---|---|---|
| 1 | يزيد 547 | 11 | 48 | بانا 1031 | 15 |
| 2 | بشير 103 | 29 | 49 | نهاد | 19 |
| 3 | المحتسب 1514 | 30 | 50 | سارة2 474 | 14 |
| 4 | فتح الخير 562 | 21 | 51 | غازي 92 | 12 |
| 5 | محمد1 629 | 2 | 52 | ناصر | 15 |
| 6 | يامن 478 | 2 | 53 | منى2 | 22 |
| 7 | امير البحار 543 | 24 | 54 | اطلال | 7 |
| 8 | بسمان 69 | 5 | 55 | النتشة | 17 |
| 9 | ماشاء الله2 253 | 12 | 56 | اميرة البحر | 4 |
| 10 | عبدالرحمن 1362 | 30 | 57 | امير 173 | 18 |
| 11 | ابراهيم 123 | 5 | 58 | هديل | 22 |
| 12 | ابو ابراهيم | 3 | 59 | رضوان | 11 |
| 13 | فرحانه 535 | 16 | 60 | نور العيون 96 | 3 |
| 14 | ميسر 1723 | 30 | 61 | نادية | 4 |

| | | |
|---|---|---|
| 15 | امل 1596 | 14 |
| 16 | عهد الزرقان 1465 | 5 |
| 17 | فايزه 441 | 22 |
| 18 | رضا443 | 16 |
| 19 | هلا 402 | 10 |
| 20 | شرشيري 187 | 7 |
| 21 | هاشم 326 | 30 |
| 22 | داوود 544 | 23 |
| 23 | عروس البحر 440 | 11 |
| 24 | ابوجمعة 110 | 11 |
| 25 | دينا 558 | 25 |
| 26 | صهيب 628 | 9 |
| 27 | فخري 1373 | 15 |
| 28 | منسي 569 | 19 |
| 29 | فرس البحر 885 | 5 |
| 30 | ابو بدر | 23 |
| 31 | جمال 213 | 1 |
| 32 | دعاء 520 | 9 |
| 33 | ابان119 | 9 |
| 34 | هادية وفادية | 22 |
| 35 | عابر سبيل 315 | 8 |
| 36 | صقر البحر | 9 |
| 37 | قاصد كريم 429 | 22 |
| 38 | ابو الريان 563 | 13 |
| 39 | اكرم 182 | 11 |
| 40 | شبارة | 16 |
| 41 | عبالله علي | 5 |
| 42 | ابو الخضري | 22 |
| 43 | سعيد 548 | 17 |
| 44 | ابونجم 531 | 3 |
| 45 | ابوعلي | 20 |
| 46 | دلال 286 | 6 |
| 47 | سماح604 | 10 |

| | | |
|---|---|---|
| 62 | روبيان | 1 |
| 63 | اصيل 320 | 11 |
| 64 | مازن | 11 |
| 65 | سلطان 508 | 13 |
| 66 | الدرش 637 | 3 |
| 67 | فهد 419 | 24 |
| 68 | ام حسن 571 | 10 |
| 69 | ماريا 36 | 27 |
| 70 | السندباد 538 | 16 |
| 71 | معان 486 | 1 |
| 72 | مرضي 436 | 3 |
| 73 | الجارحي 847 | 2 |
| 74 | نديم 576 | 18 |
| 75 | ابو سعدة 974 | 30 |
| 76 | مار 931 | 24 |
| 77 | خالد 546 | 25 |
| 78 | عروة بن الورد | 2 |
| 79 | بدير | 13 |
| 80 | اسيد | 30 |
| 81 | قاسم | 16 |
| 82 | العزام | 20 |
| 83 | بشار 415 | 29 |
| 84 | ريان 1302 | 16 |
| 85 | عمار 1525 | 30 |
| 86 | هادي 810 | 11 |
| 87 | بيسان | 12 |
| 88 | جواد | 1 |
| 89 | سهر | 5 |
| 90 | الطيطي | 3 |
| 91 | بلال | 13 |
| 92 | سميح | 11 |
| 93 | سراج الدين | 30 |

### 5.2. Fish Catch Quantity (Kg) and Trip Counts to Fishing Sites

Examining fishing sites based on fished mass (Kg) and the number of fishing trips (Figures 3 & 4) over the data gathering campaign period shows distinct patterns varying even over the different weeks of the month. From August 28th to September 6th, "ACT" recorded 269 Kg from 59 fishing trips, whereas "OPS" had much lower trips count of 6 trips that yielded 180 Kg. "OPLB" and "HB" also had recordable catch with 240 Kg from 14 trips and 26.5 Kg two 2 trips, respectively. In contrast, "OPM" had the lowest catch of 1 Kg from a single trip during this period. Moving to September 7th to September 17th, "ACT" remained in catch and number of trips 1258 Kg from

118 trips. "OPS" increased to 157 Kg from 29 trips, while "OPLB" and "HB" had very limited catch. "OPM" displayed a notable increase as compared to the previous time slot, reaching 64 Kg from 8 trips. From September 18th to September 28th, "ACT" remained the highest with 731 Kg from 116 trips. "OPS" and "OPLB" had notable counts with fewer trips. "HB" experienced a significant increase in both catch (143 Kg) and number of trips (16). "OPM" also showed noticeable improvement with 140 Kg from 18 trips.

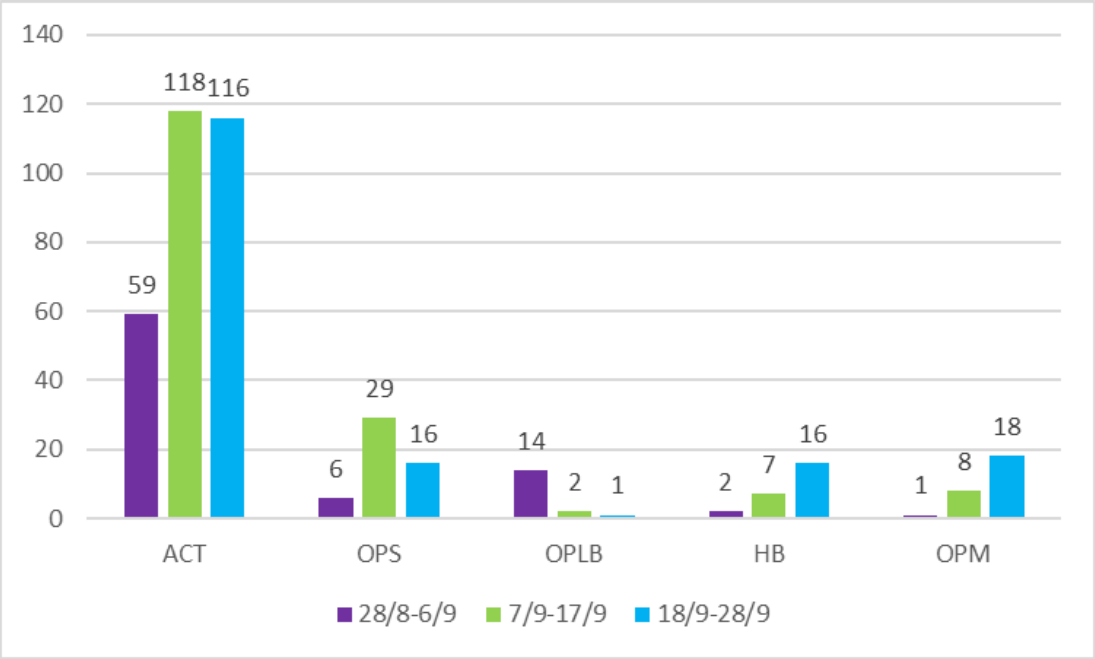



**Figure 3. Total fishing trips to specific fishing sites during the data gathering campaign period**

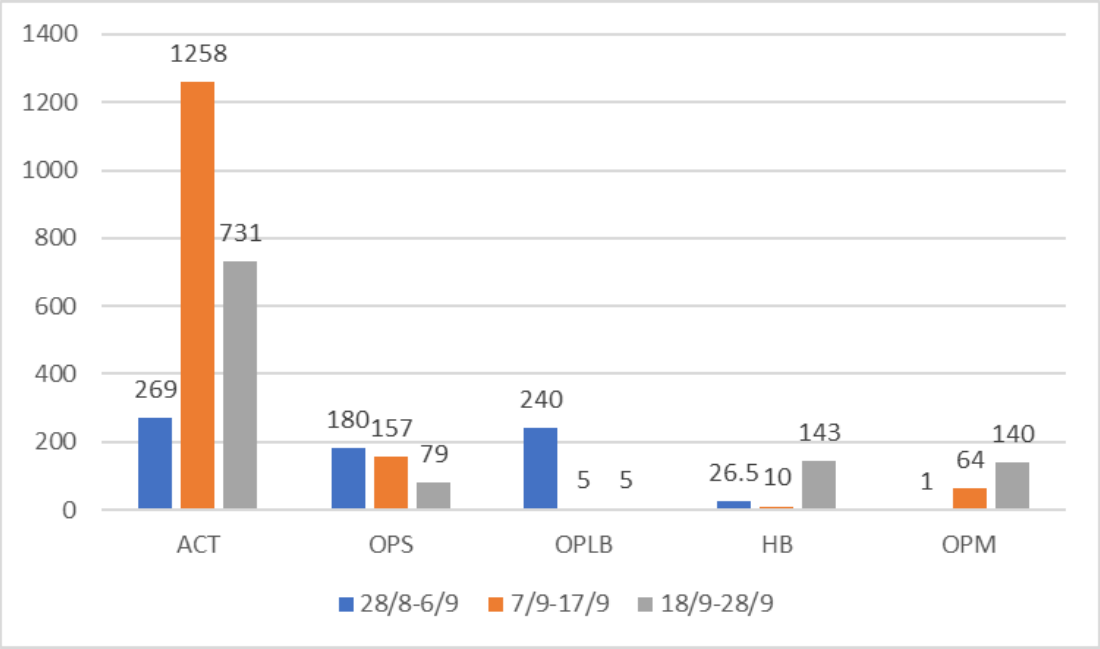



**Figure 4. Total Fish Catch (Kg) from fishing sites during the data gathering campaign period**

In summary, "ACT" consistently demonstrated a high fishing amount totaling 2258 Kg from 293 fishing trips. "OPS" had a decent count but fewer trips than "ACT." "OPLB" and "HB" exhibited fluctuating counts with varying trip numbers. Although "OPM" had the lowest overall fishing activity in catch and number of fishing trips. Noteworthy is that fishing is not allowed within AMR but can be practiced offshore with the width of AMR being 300 m from mean hightide followed by 100m buffer zone. Besides, this is the furthest allowed fishing area from the fishing boats Mariena which makes reaching there rather costly. Previous reports Al Hayek (2016) for example indicated that fishing locations can be classified into three categories: permitted, restricted, and prohibited sites. Permitted fishing sites are situated in the touristic and port zones, with key locations being the Royal Yacht Club (mentioned by 15% of respondents), hotels' area, and Ghandour beach (both mentioned by 12%). Restricted fishing sites are found along Aqaba Marine Park (AMP), excluding Tala Bay. Prohibited fishing sites are primarily within the special and industrial zones, and to a lesser extent in the touristic, port, and AMP zones. Tala Bay, along with the new and old military chalets, is identified as prohibited for fishing. The fishing areas calcification adopted in this report is based on the new fishing bylaw and Aqaba Marine Reserve bylaw of 2020.

### 5.3. Fish Catch Variation over the Data Gathering Campaign Period

Overall fish catch during the Data Gathering Campaign period is illustrated in Figure 5. Despite the short reporting period noteworthy differences have been noticed. The analysis indicates that swordfish consistently represented the highest catch throughout the period, reaching a peak of 1002 Kg during the time slot 7/9-17/9. Kingfish also showed a considerable catch, particularly in the initial period, ranking as the second-highest catch following swordfish. Sailfish and emperor fish (Bonqus) were also abundant in the fish catches, with peaks observed during 7/9-17/9. In contrast, certain species such as mahi-mahi and squid displayed inconsistent and comparatively lower catch records. In summary, the data highlights fluctuations in the catches of various fish species over the Data Gathering Campaign period, with migratory species more abundantly caught than local fish.

### 5.4. Fishing Return: Petrol Consumption versus Fishing Value

Similar to fluctuations in fishing trip counts and in landed fish quantities, there were also noticeable and strongly correlated fluctuations in both petrol consumption and caught fish return. This is illustrated in Figure 6. In the first time slot of the Campaign, August 28$^{th}$ - September 06$^{th}$, petrol consumption for all practicing fishing boats stood at 1542 JD, while the fishing money value was estimated at 3170 JD. Subsequently, between September 07$^{th}$ and September 17$^{th}$, there was a notable increase in petrol consumption to 2605 JD, indicating a higher use of fuel associated with increased fishing activity. The estimated fishing money value also experienced a surge, reaching 7482 JD during this period. From September 18$^{th}$ to September 28$^{th}$, both petrol consumption and fishing value witnessed declined to 2015 JD and 5507 JD, respectively.

In general petrol cost ranged between 35% to 50% of the fish catch value. It is worth mentioning that fuel cost is only one element of the catch effort. This high percentage of petrol cost considered all fishing trips including those that return with no catch that contributed to 57%, which emphasizes the importance of continuity of the Data Gathering Campaign to provide further data gathering and thorough analysis for determining fishing profitability detailing fishers time, fishing gear cost, boats maintenance cost, marketing cost and cost of proper storage of unsold fish considering depreciation of sale value upon storage. Artisanal fishing in Aqaba being a cultural heritage puts considerable

pressure on the coastal management authorities to support this profession and regularly enhance the conditions that support sustainable adequately rewarding fisheries.

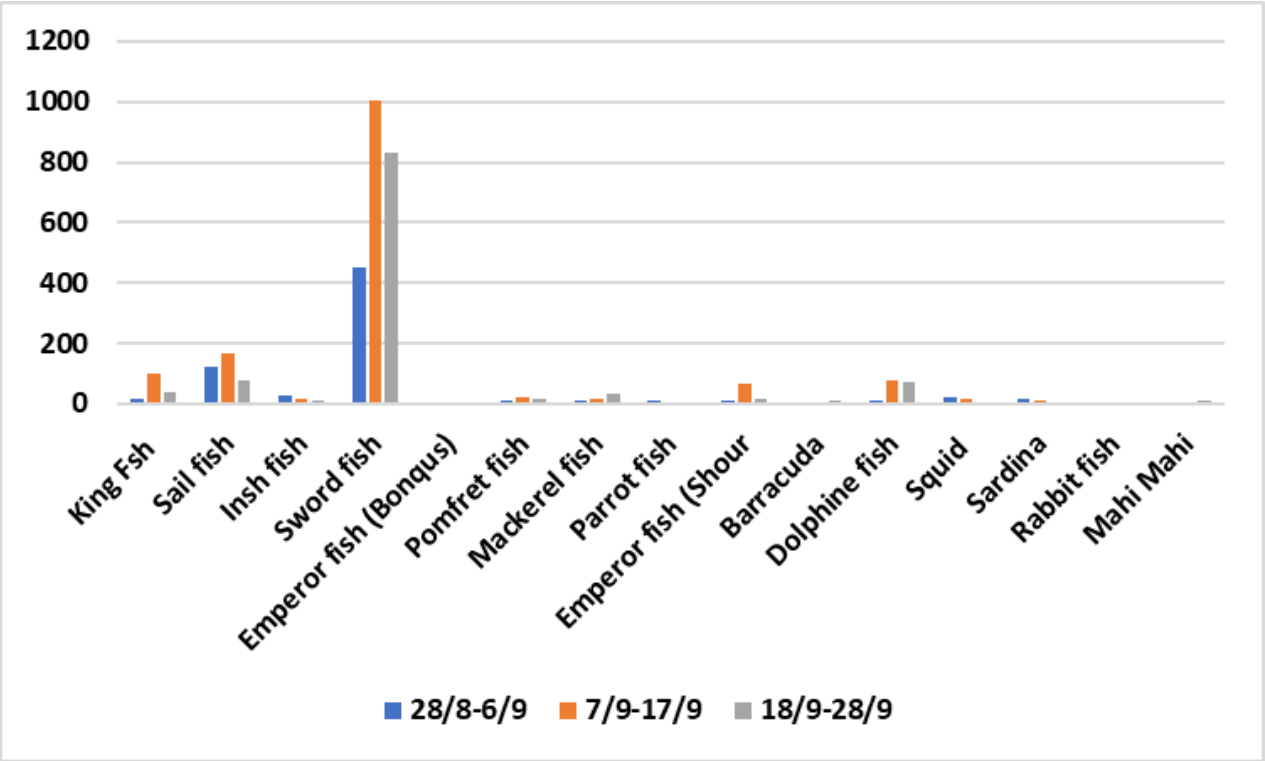



**Figure 5. Total fish catch per species during the data gathering campaign period**

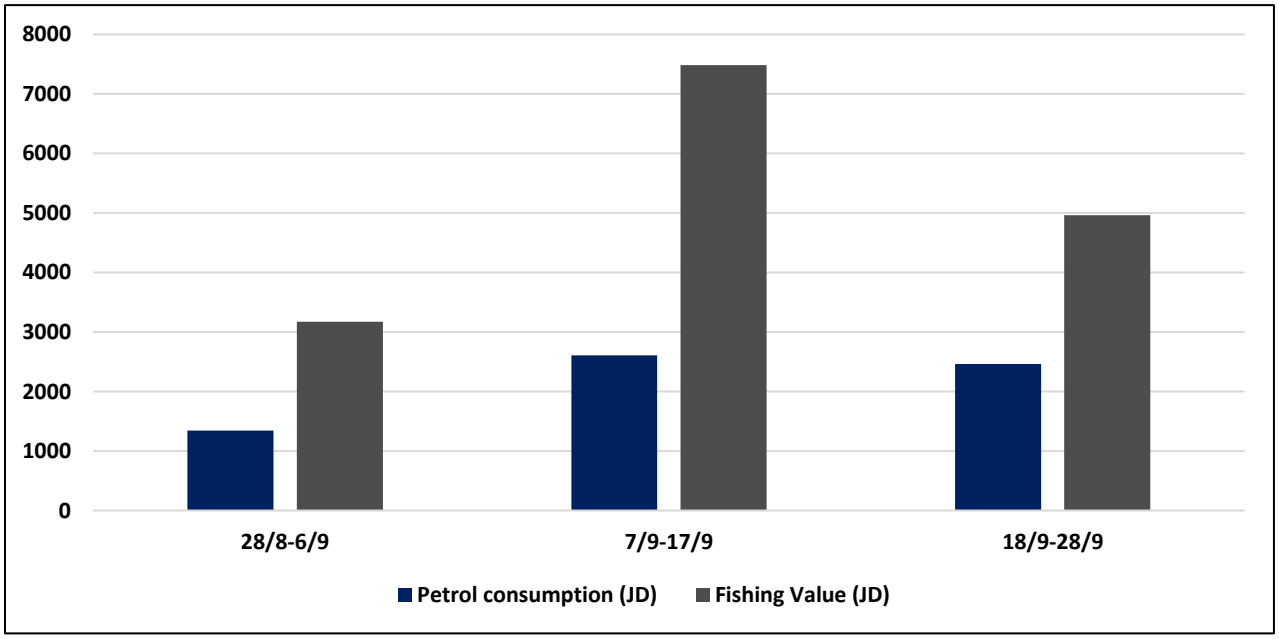



**Figure 6. Petrol Consumption and Fishing Money Value during the data gathering campaign period**

### 5.5. Additional Fishing Activity during the Data Gathering Campaign Period

MED4EBM Project Data Gathering Campaign was invited to collect fishing data of the first Arab Fishing Championship, which took place on the shores of Aqaba on Friday and Saturday September 8th -9th 2023. The competition focused on catching the largest fish. Significance of this competition to the Project is that it was the first ever Arab open fishing championship for amateurs, and it took place at a point on the Jordanian coast of the Gulf of Aqaba far south near the Saudi borders about 10Km away from the nearest allowed fishing area in Jordan. The competition joined 24 teams representing five Arab countries. The event was organized by Royal Marine Sports Federation, Aqaba Special Economic Zone Authority, and the Arab Confederation for Fishing. The tournament was distinguished also for participation of a Jordanian women's team for the first time in the history of fishing sports.

#### 5.5.1. Features of Arab Fishing Championship

Total catch in the tournament is illustrated in Figure 7. The highest three catch weight in a single day is presented in Figure 8. The tournament was friendly, it witnessed interesting competition. Eight of the 24 participating teams succeeded to catch some fish. The Kuwaiti, Bahrani and Jordanian teams luckiest in achieving the highest catch quantities. Abdullah Dawood (Rashid 2) led the Jordanian team of total catch weight of 49.7, featuring a notable Swordfish weighing 15.6 Kg and measuring 1.22 m. Ahmad Wasef (Fishzzle) further recorded for the Jordanian teams a remarkable Sailfish of 44.7 Kg and 2.25 m length.

The fishing tournament was conducted at the furthest southern end of the Jordanian coast of the Gulf of Aqaba. As competition for fishing space and identifying sustainable fisheries is a major management concern, the tournament provided a clew that even erase that are not frequently fished can only support moderate fish catch. Noteworthy also was that the main catch in the tournament was of migratory species not different from the catch in the regularly fished areas. While this could be seen as some kind of a relief, it may in contract the benefit for local fishermen in opening new fishing areas could be limited

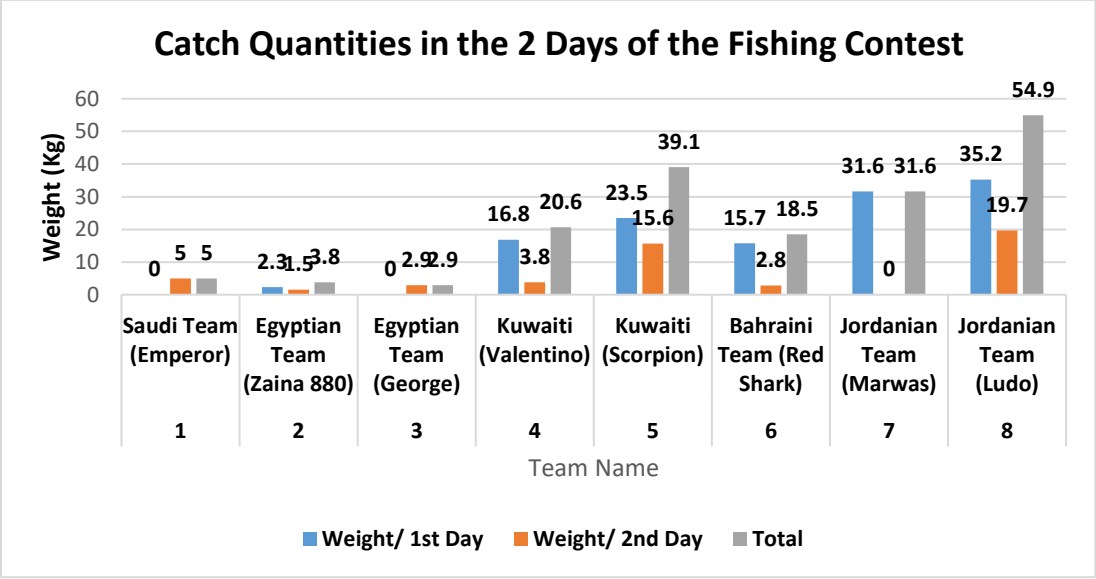



**Figure 7. Total Catch wright (Kg) for the Arab Fishing Championship, September 8th -9th 2023**

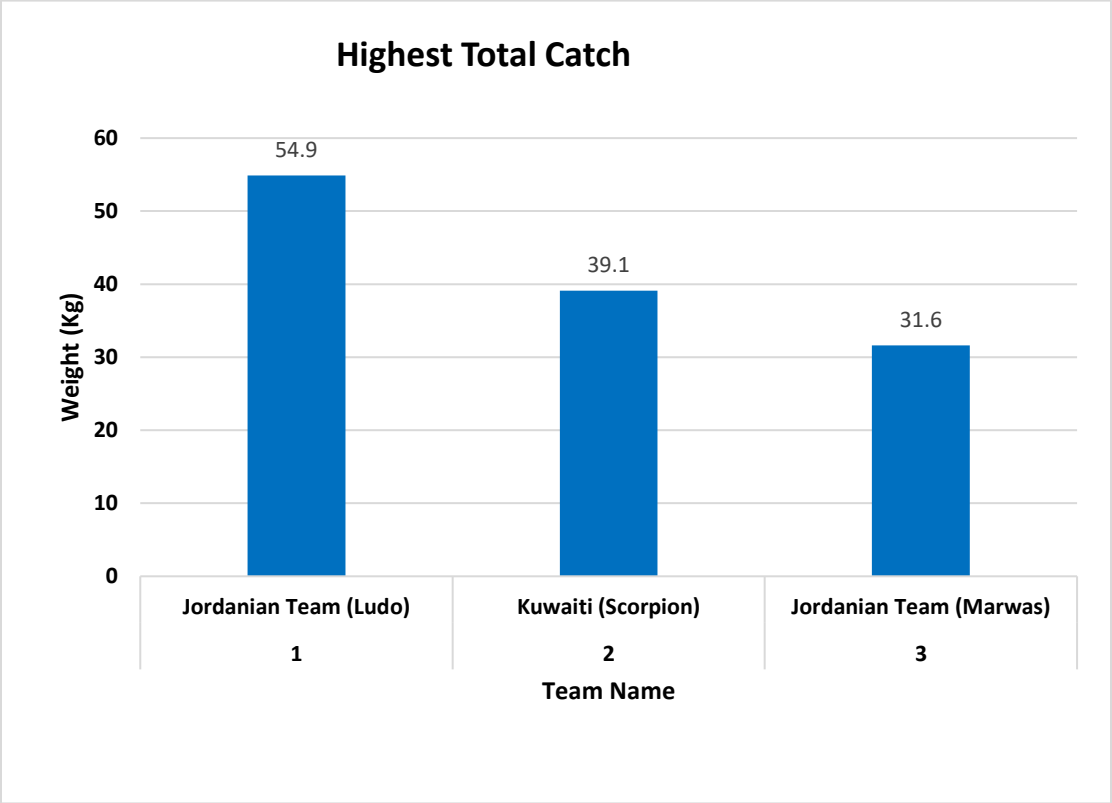



**Figure 8. Three Highest Total Catch in a Single Day in the Tournament**

### 5.6. ISP Data Handling and Analysis

Nine different indicators have been looked into using PROGEs ISP. These indicators were developed based on data collected in the Data Gathering Campaign according to MED4EBM Project Monitoring Protocol following Citizen Science Principles in Aqaba Fisheries Data Gathering Campaign.

- The indicators were associated and linked to the "Occupational Fishing" component of the system diagram (ID=59).
- The indicators were implemented based on a table previously loaded by the Data Gathering Team, given the name "X_Fisheries_New."
- Each indicator can be visualized through charts, and for each of them, a map and legend were configured for GIS visualization within PROGES-ISP.
- Priority was given to generating views through queries derived from the source table for a better and more flexible display of results and for cross-referencing data from different columns in the same table.
- Priority was given to visualizing results over the entire Data Gathering Campaign period, grouped and aggregated by fishing zones, rather than individual daily data.
- New, reworked, and more accurate fishing area map was utilized for this purpose. The map was previously uploaded to the DMT (Data Management Toolbox) for use on PROGES-ISP, with the name of "FishFinal".

Two main issues have been encountered during the data loading and implementation process:

**1)** A previously existing indicator, already loaded by the previous team, did not display the kilograms of fish caught, as indicated in the name of the indicator and in the chart legend, but rather

the daily number of caught fishes. Even after correcting the names, unfortunately, PROGES-ISP didn't automatically group the data by locality or day, and showed only the first value encountered in the table for that particular day in the case of multiple values on the same day. Two different views in the DB have been created to solve this issue. The queries were not yet uploaded into the PROGES-ISP because a different approach that consider the whole monitoring period rather than daily values has been chosen. The views are on the database and can be uploaded as indicators inside PROGES-ISP for future analysis. Here are the queries used for views creation:

**a. Number of daily catches (by area)**

```
CREATE VIEW Qry_Protocol_Fisheries_NumCatches_Locality AS
SELECT
   LOC_CODE,
   DATE,
   SUM(F_COUNT) AS number_fish_catch
FROM
   X_Fisheries_New
GROUP BY
   LOC_CODE, DATE;
```

**b. Kg of daily catches (by area)**

Qry_Protocol_Fisheries_Kg_Locality

```
CREATE VIEW Qry_Protocol_Fisheries_Kg_Locality AS
SELECT
   LOC_CODE,
   DATE,
   SUM(TOTAL_DAY_CATCH_ALL_BOATS_KG) AS total_catch_kg
FROM
   X_Fisheries_New
GROUP BY
   LOC_CODE, DATE;
```

**2)** There is in the database table and in the data collection campaign excel files a location named 'HB,' while on the base map and GIS reference, the same location is named 'HA.' Due to this mismatch between acronyms on the map and those in the source table, all the charts were displaying zero values for the 'HA/HB' area. A query needed to be created to modify the source table and then reset and re-export all the maps presented hereafter. Here is the query:

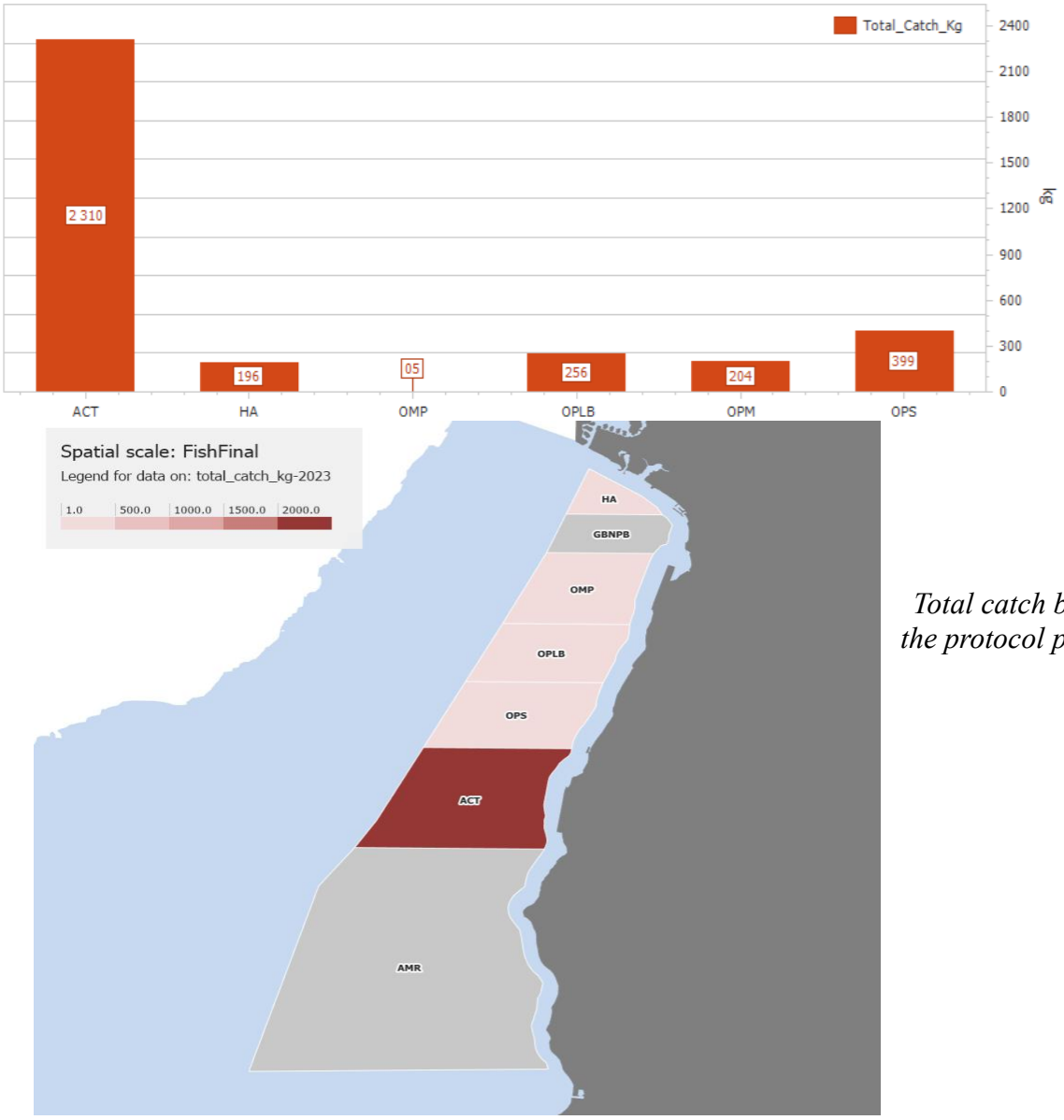
```
UPDATE X_Fisheries_New
SET LOC_CODE = 'HA'
WHERE LOC_CODE = 'HB';
```

**Indicator 1.** Fish catch data (kg) from the monitoring protocol grouped by fishing area.

- View name on DB: **Qry_Protocol_Fisheries_Kg_Locality_Year**
- Indicator name on ISP: **PROTOCOL_Fisheries Total Catch (kg)**

Query text performed:

```
CREATE VIEW Qry_Protocol_Fisheries_Kg_Locality_Year AS
SELECT
[LOC_CODE],
YEAR(DATE) AS year,
SUM(TOTAL_DAY_CATCH_ALL_BOATS_KG) AS total_catch_kg
FROM
X_Fisheries_New
GROUP BY
[LOC_CODE], YEAR(DATE)
```



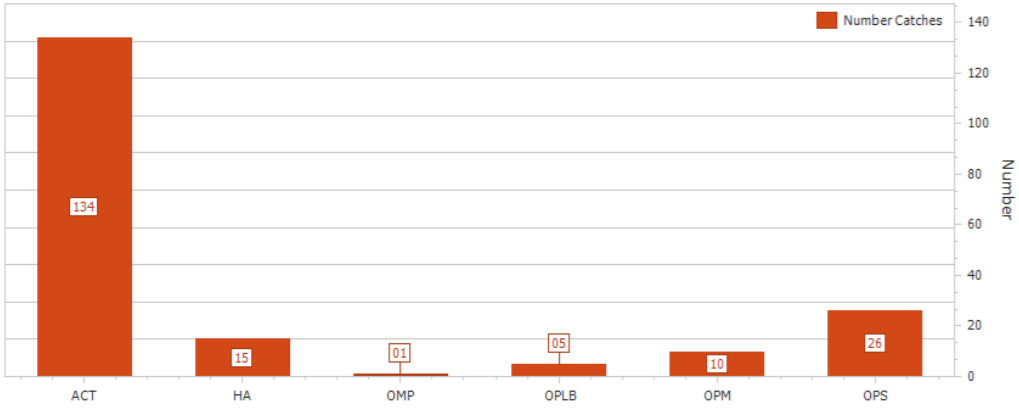

*Total catch by area in the protocol period (kg)*

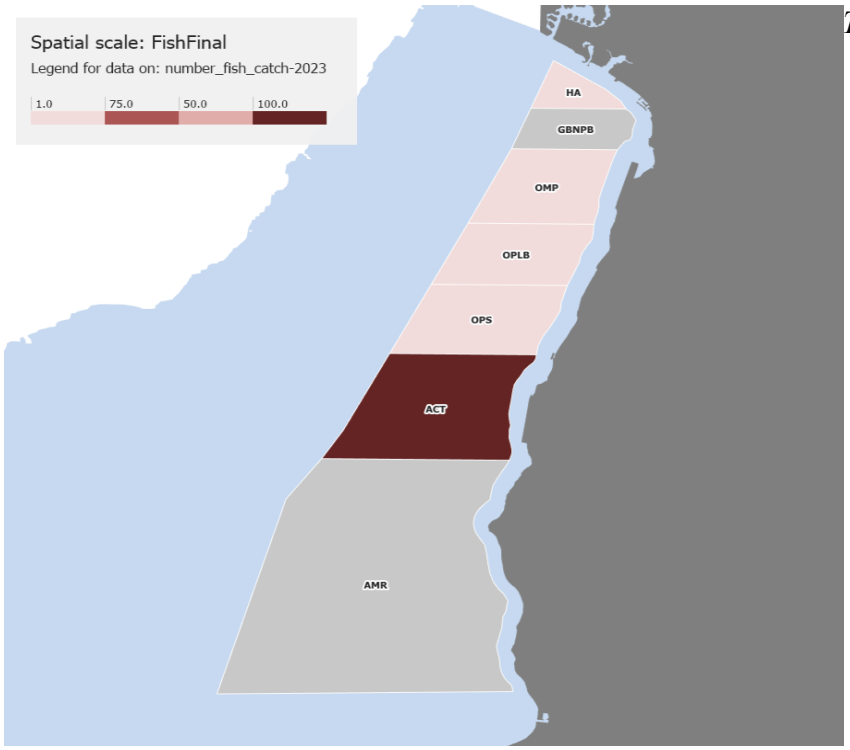
**Iindicator 2.** Total number of catches from the monitoring protocol grouped by fishing area.

- View name on DB: **Qry_Protocol_Fisheries_NumCatches_Locality_Year**
- Indicator name on ISP: **PROTOCOL Fisheries Number Catches**

Query text performed:

```
CREATE VIEW Qry_Protocol_Fisheries_NumCatches_Locality_Year AS
SELECT
   [LOC_CODE],
        YEAR(DATE) AS year,
   SUM(F_COUNT) AS number_fish_catch
FROM
   X_Fisheries_New
GROUP BY
   [LOC_CODE], YEAR(DATE)
```



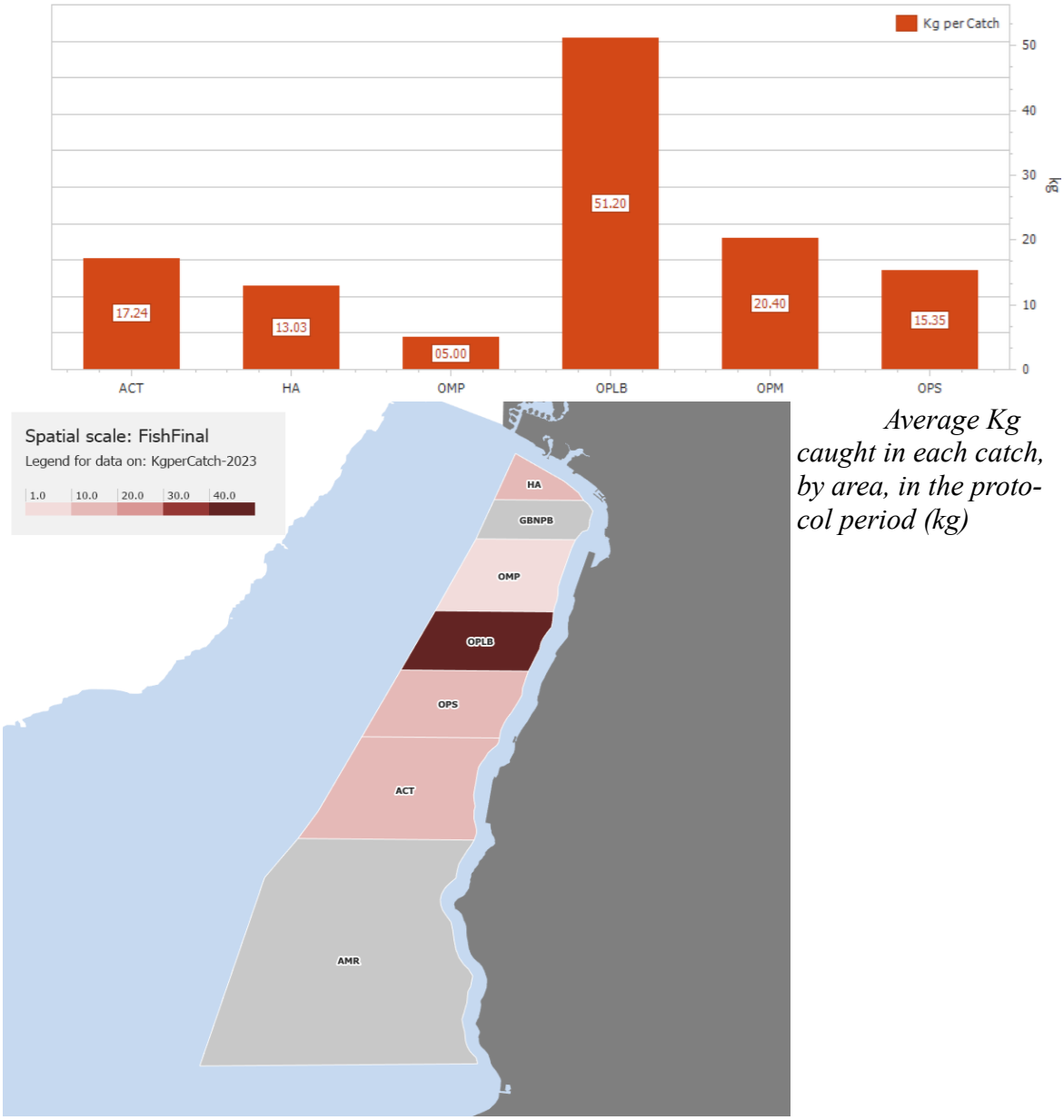

*Total number of catches by area in the protocol period*

**Indicator 3.** Average kilograms caught for each fish catch.

- View name on DB: **Qry_Protocol_Fisheries_KgperCatch**
- Indicator name on ISP: **PROTOCOL Fisheries Kg per Catch**

Query text performed:

```
CREATE VIEW Qry_Protocol_Fisheries_KgperCatch AS
SELECT     LOC_CODE, YEAR(DATE) AS year, CAST(SUM(TO-
TAL_DAY_CATCH_ALL_BOATS_KG) / SUM(F_COUNT) AS DECIMAL(10, 2)) AS
KgperCatch
FROM       dbo.X_Fisheries_New
GROUP BY LOC_CODE, YEAR(DATE)
```



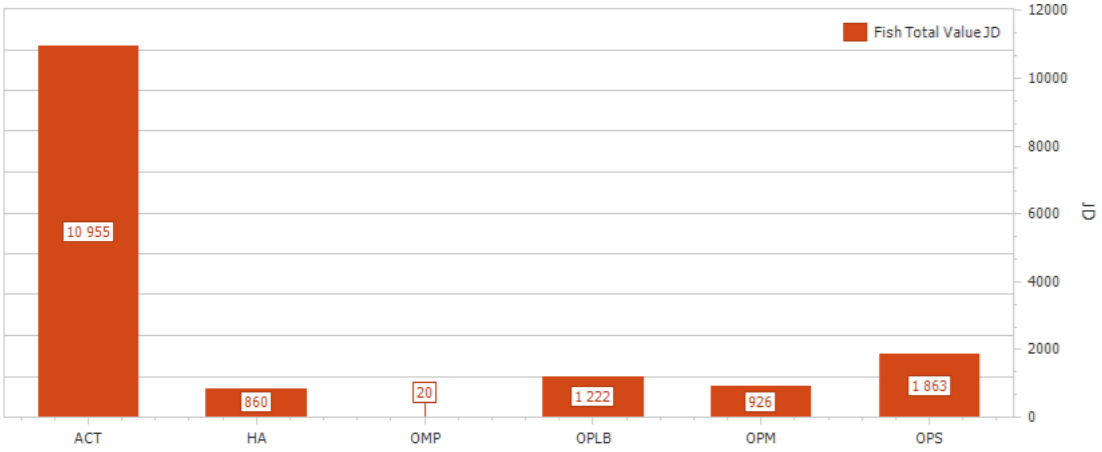

*Average Kg caught in each catch, by area, in the protocol period (kg)*

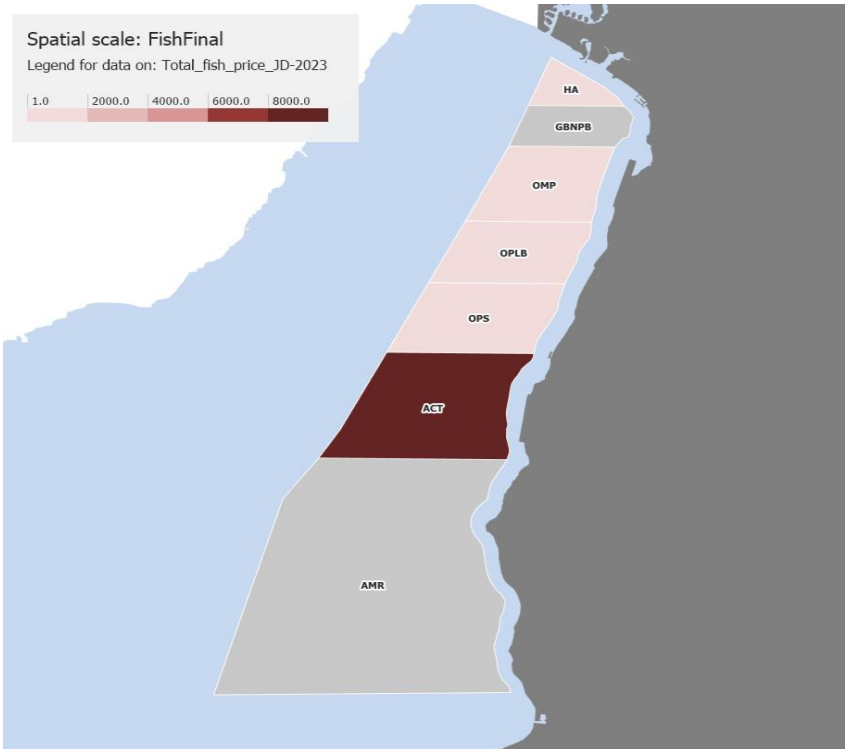
**Indicator 4.** Total fish value in JD caught for each area, for the entire monitoring period.

- View name on DB: **Qry_Protocol_Fisheries_Total_Price_JD_Locality_Year**
- Indicator name on ISP: **PROTOCOL Fisheries Fish Total Value (JD)**

Query text performed:

```
CREATE VIEW Qry_Protocol_Fisheries_Total_Price_JD_Locality_Year AS
SELECT
   [LOC_CODE],
        YEAR(DATE) AS year,
   SUM([TOTAL_DAY_FISH_PRICE_JD]) AS Total_fish_price_JD
FROM
   X_Fisheries_New
GROUP BY
   [LOC_CODE], YEAR(DATE)
```



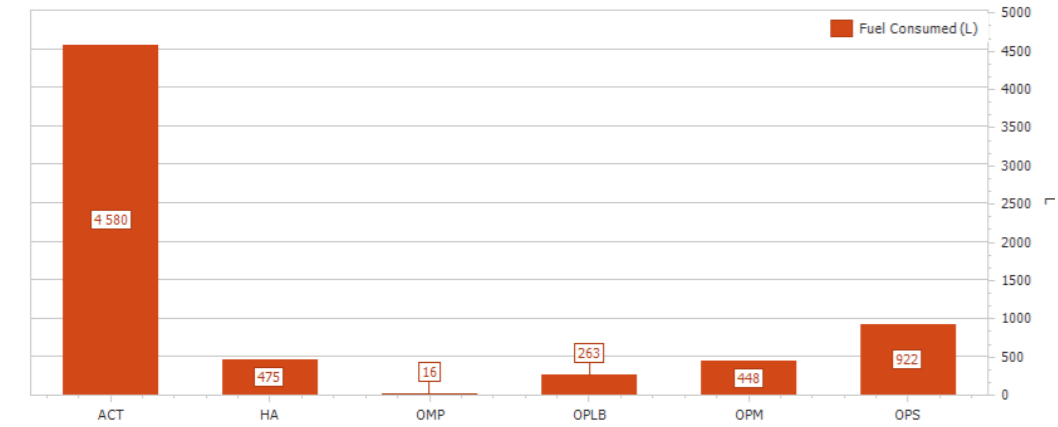

*Total fish value, by area, caught in the protocol period (JD)*

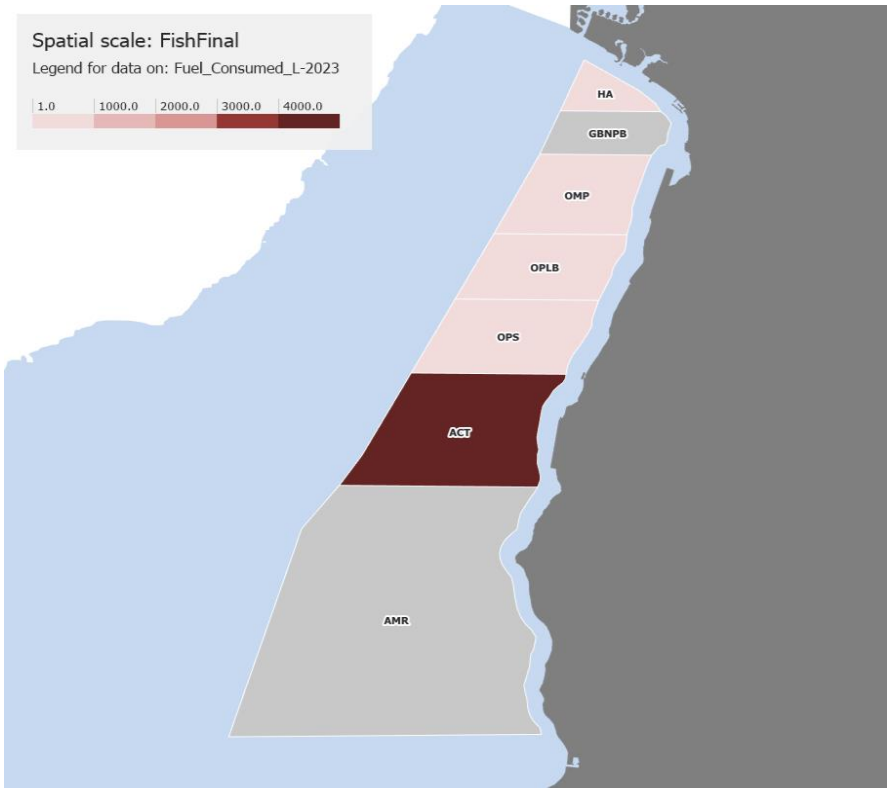
**Indicator 5.** Total fuel consumed (Liters) by area for the whole protocol monitoring period.

- View name on DB: **Qry_Protocol_Fisheries_Total_Fuel_Liters_Locality_Year**
- Indicator name on ISP: **PROTOCOL Fisheries Total Fuel Consumed (L)**

Query text performed:

```
CREATE VIEW Qry_Protocol_Fisheries_Total_Fuel_Liters_Locality_Year AS
SELECT
   [LOC_CODE],
        YEAR(DATE) AS year,
   SUM([FUEL_CONSUMED_L]) AS Fuel_Consumed_L
FROM
   X_Fisheries_New
GROUP BY
   [LOC_CODE], YEAR(DATE)
```



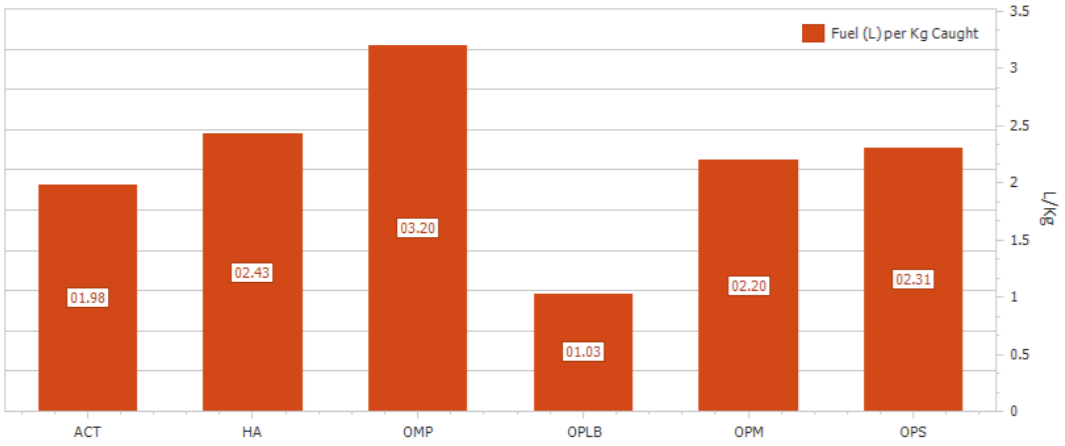

*Total fuel consumed, by area, in the protocol period (Liter)*

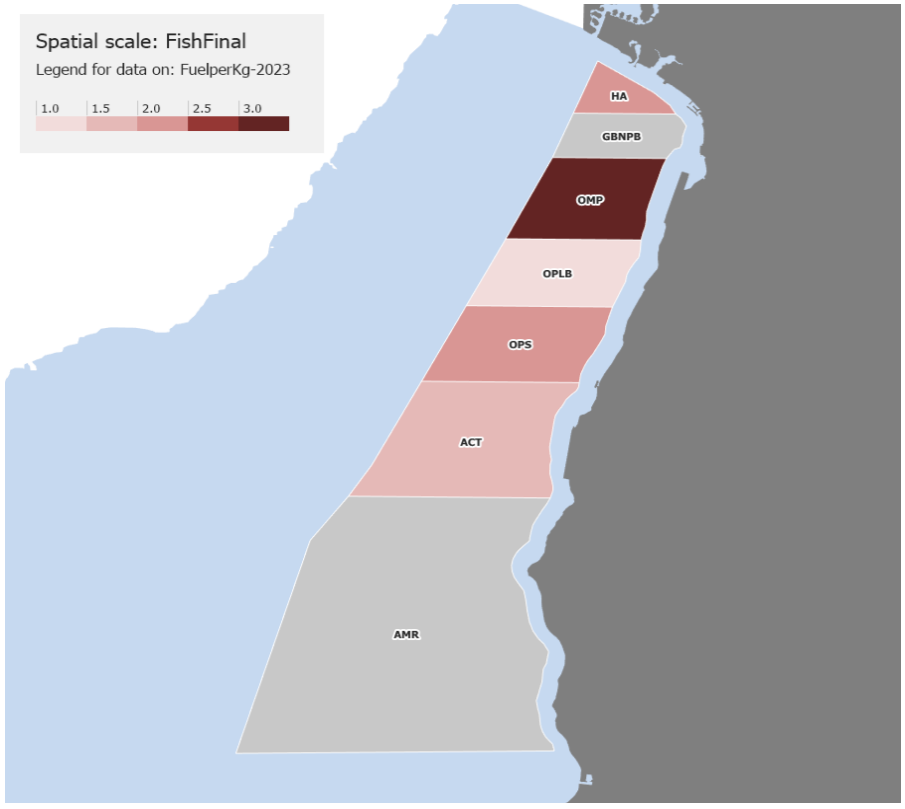
**Indicator 6.** Average fuel consumed by each Kg of fish caught.

- View name on DB: **Qry_Protocol_Fisheries_FuelperKG**
- Indicator name on ISP: **PROTOCOL Fisheries Fuel Consumed per Kg Caught**

Query text performed:

```
CREATE VIEW Qry_Protocol_Fisheries_FuelperKG AS
SELECT
LOC_CODE, YEAR(DATE) AS year, CAST(SUM(FUEL_CONSUMED_L) / SUM(TO-
TAL_DAY_CATCH_ALL_BOATS_KG) AS DECIMAL(10, 2)) AS FuelperKg
FROM      dbo.X_Fisheries_New
GROUP BY LOC_CODE, YEAR(DATE)
```



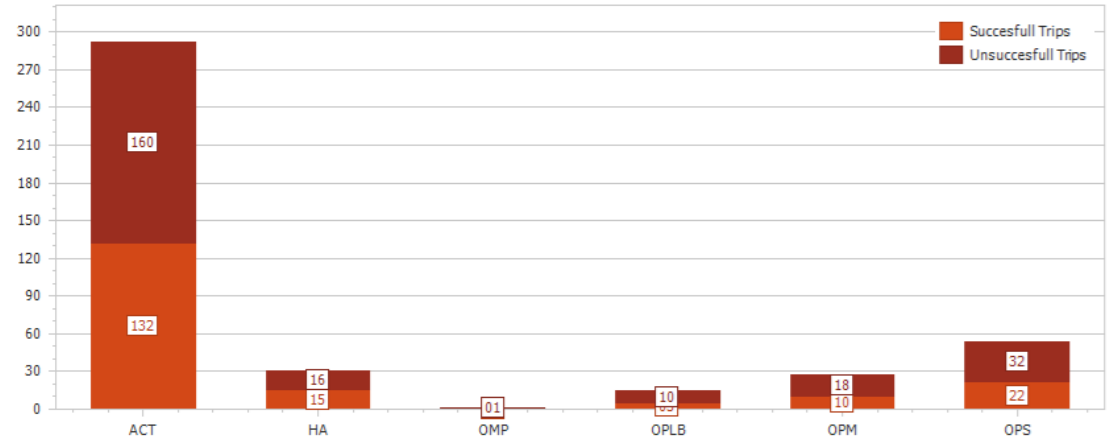

*Total fuel consumed, by area, per Kg of fish caught in the protocol period (L/Kg)*
*One L is about 1 JD*

**Indicators 7 and 8.**Number of trips as the sum of successful and unsuccessful fishing

- View name on DB: **Qry_Protocol_Successful_Unsuccessful_Trips**
- Indicator name on ISP: **PROTOCOL Fisheries Successful/Unsuccessful Trips**

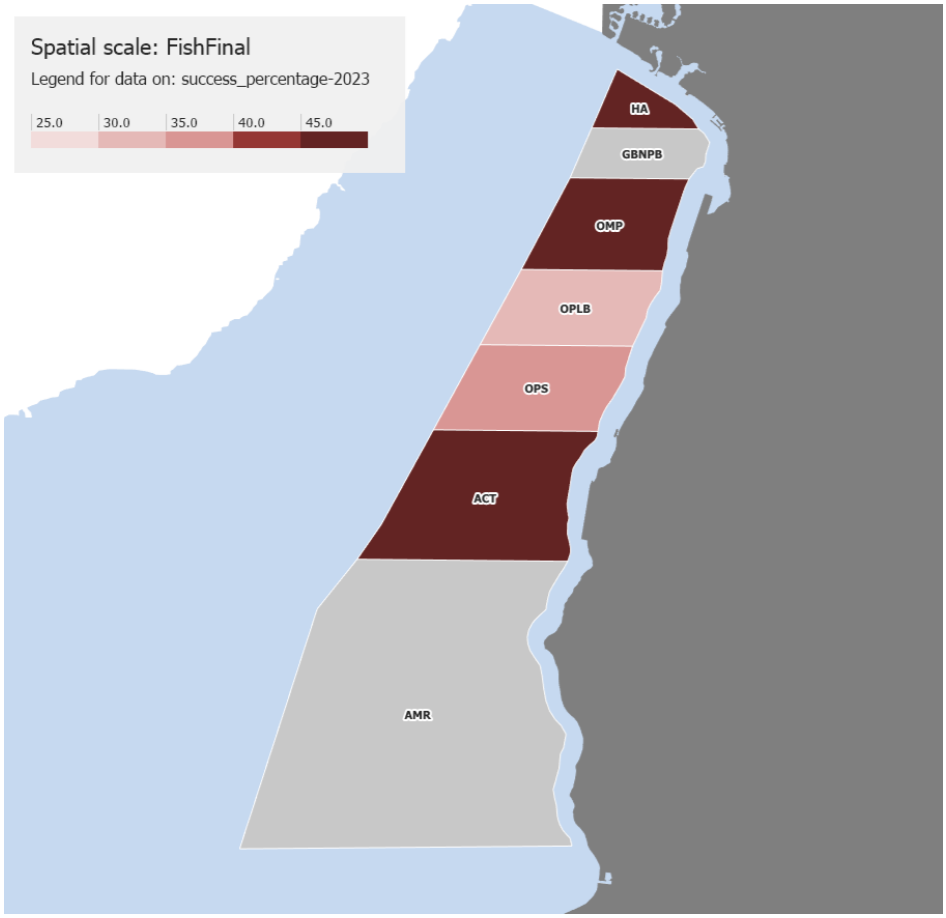
Query text performed:

```
CREATE VIEW Qry_Protocol_Successful_Unsuccessful_Trips AS SELECT
[LOC_CODE], YEAR(DATE) AS year,
SUM(CASE WHEN F_COUNT = 0 THEN 1 ELSE 0 END) AS unsuccessful,
SUM(CASE WHEN F_COUNT = 1 THEN 1 ELSE 0 END) AS successful,
COUNT(*) AS total_trips,
CAST(100.0 * SUM(CASE WHEN F_COUNT = 1 THEN 1 ELSE 0 END) /
COUNT(*) AS DECIMAL(10, 2)) AS success_percentage FROM   X_Fisheries_New
GROUP BY [LOC_CODE], YEAR(DATE)
```

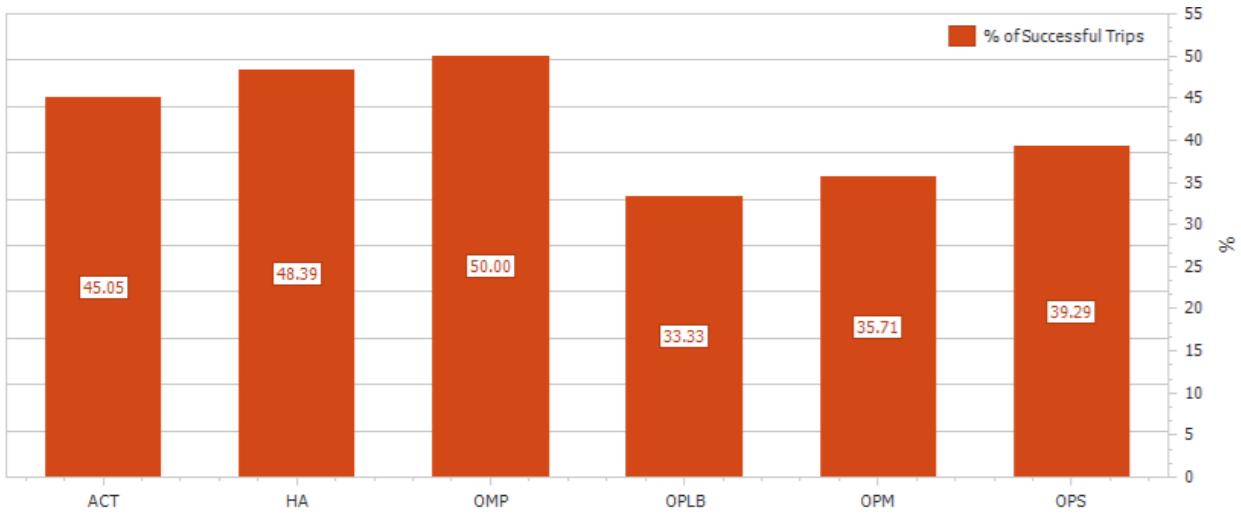



*Number of successful and unsuccessful trips, by area, in the protocol period.*

In order to create the legend for the GIS map, it is needed to choose between successful and unsuccessful column. To overcome this issue a third column was created with the query, which represents percentage of successful trips. This has been presented as a graph and added it into the ISP.




*% of successful trips, by area, in the protocol implementation period.*

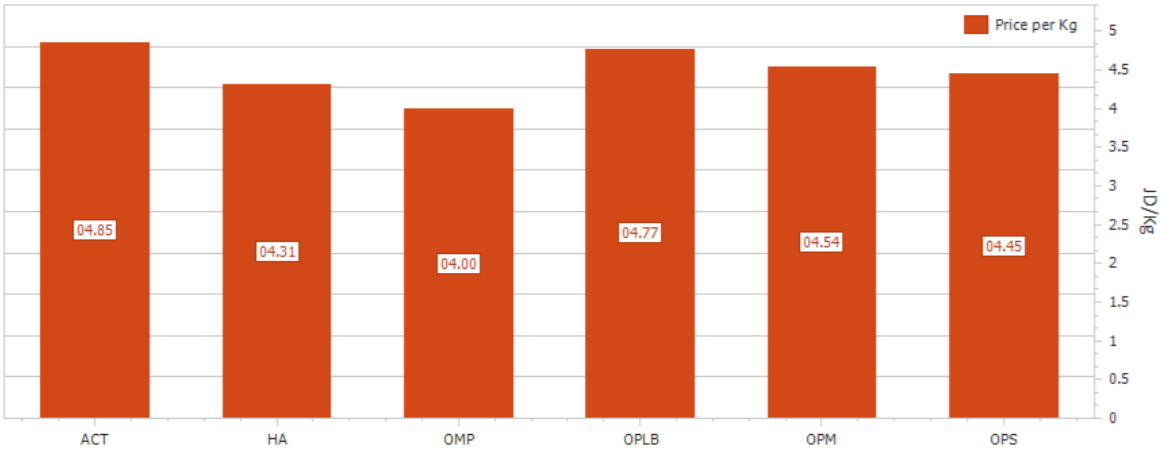


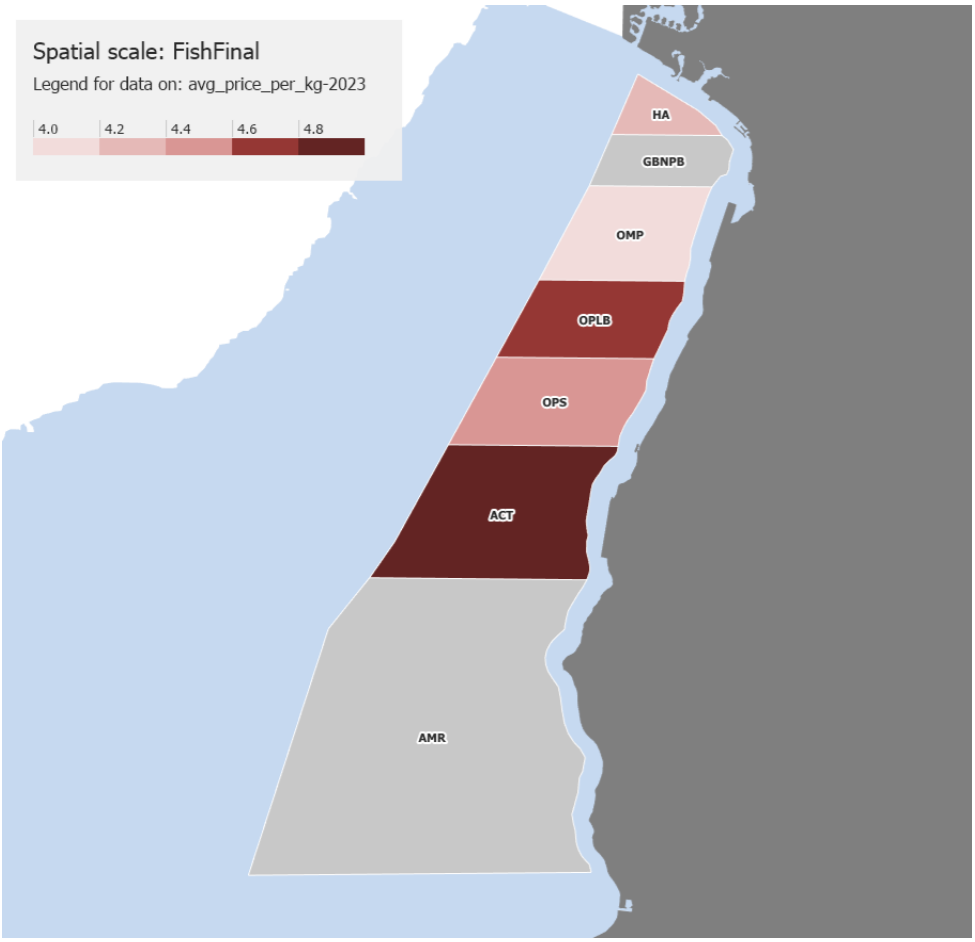
**Indicator 9.** Average fish value (JD) per Kg of fish caught in the monitoring protocol period.

- View name on DB: **Qry_Protocol_Fisheries_PriceperKg**
- Indicator name on ISP: **PROTOCOL Fisheries Price per Kg Caught**

Query text performed:

```
CREATE VIEW Qry_Protocol_Fisheries_PriceperKg AS SELECT [LOC_CODE],
        YEAR(DATE) AS year,
        CAST(SUM(TOTAL_DAY_FISH_PRICE_JD) / SUM(WEIGHT_KG) AS DECI-
MAL(10, 2)) AS avg_price_per_kg
FROM    X_Fisheries_New
GROUP BY   [LOC_CODE], YEAR(DATE)
```




*Fish value (JD) per Kg of fish caught in the monitoring period, by area.*

| | | | |
|---|---|---|---|
| PROTOCOL Fisheries Total Catch (Kg) | (Fishermen protocol) | Yearly Aggregation | Fishermen |
| PROTOCOL Fisheries Number Catches | (Fishermen protocol) | Yearly Aggregation | Fishermen |
| PROTOCOL Fisheries Kg per Catch | (Fishermen protocol) | Yearly Aggregation | Fishermen |
| PROTOCOL Fisheries Fish Total Value (JD) | (Fishermen protocol) | Yearly Aggregation | Fishermen |
| PROTOCOL Fisheries Fuel Consumed (L) | (Fishermen protocol) | Yearly Aggregation | Fishermen |
| PROTOCOL Fisheries Fuel Consumed per Kg Caught | (Fishermen protocol) | Yearly Aggregation | Fishermen |
| PROTOCOL Fisheries Successful/Unsuccessful Trips | (Fishermen protocol) | Yearly Aggregation | Fishermen |
| PROTOCOL Fisheries Price per Kg Caught | (Fishermen protocol) | Yearly Aggregation | Fishermen |

*New indicators uploaded in PROGES-ISP under Occupational Fishing (Id=59) component.*

## 6. Conclusions and Recommendations

The fisheries data gathering campaign represented a rich experience to the Project Team and Stakeholders in Aqaba, particularly those who rely on the sea for their livelihoods and had a strong historical misconception that gathering fisheries data is against their interest. The main conclusions derived from the campaign can be summarized as follows:

- The fishing community has become well aware of the importance of data gathering handling and sharing about the different aspects of fishing practice. They have well empowered, educated and trained to collect data benefiting from their local knowledge and daily fishing practice. The Fishermen Society who started the Campaign with suspicion ended the Campaign strongly determined to sustain data gathering as a part of their regular management routine. In addition to the rich information that can be gained through data gathering, this involvement enables the Fishermen Society to explore additional opportunities for collaborating with other specialized entities
- Data gathering addressed critical challenges facing sustainable fishing in Aqaba. The initiative's focus on comprehensive data collection is particularly commendable for aiming at bridge the gaps in historical records, rectify data entry discrepancies, and enhance the monitoring programs' reliability.
- The Data Gathering Campaign provided an outstanding opportunity to put in practice and mainstream the Data Gathering Management Protocol introduced by MED4EBM Project. The various challenges faced in the Data Gathering Campaign have mostly been resolved during implementation, which paves the ground for smoother and less costly long term program
- The Data Gathering Campaign by showcasing a robust approach to data collection and analysis and engaging local fishermen and a young data gathering team including a female in conducting regular field visits and utilizing fish sampling techniques demonstrate a commitment to obtaining accurate and comprehensive information. The incorporation of data analysis methods, including descriptive, statistical, and graphic presentation, along with production of maps and sharing reports, underscores a rigorous and transparent knowledge sharing process.
- Several initiatives happening in Aqaba supported by Aqaba Special Economic Zone Authority and follow up of UNDP through MED4EBM Project and synergy with other initiatives provide substantial support for continued data gathering and employing the information generated in enhancing Integrated Coastal Zone Management in general and sustainable fisheries' management in particular. Some of these initiatives include:
  - Fishermen Society implementing the Protocol will continue data gathering on their own after the Project ends

- Contacts have been established between Thaghr el Ordon Fishermen Society and PERSGA Sustainable Fisheries Project to continue implementing the Fisheries Daya Gathering Protocol
- Aqaba Fish Market and Marina are currently under commissioning, in which the Fishermen Society has been allocated 5 stores. All fish catch will be landed and inventoried in the fish market under supervision of the Fishermen Society
- Four Projects currently in the pipeline will adopt the Protocols in their implementation:
  - Enhancing Aqaba Marine Reserve Management Capacity
  - Enhancing Coral Reefs of the Gulf of Aqaba Resilience to Climate Change
  - UNDP ASEZA GEF Blue Economy on the Jordanian coast of the Gulf of Aqaba
  - UNEP PERSGA GEF Sustainable Blue Economy Project in the Red Sea and Gulf of Aden

## 7. Annexes

1) **Daily data collected.**
2) **Data Graphic Analysis**

## 8. References

Al-Zibdah M., Khalaf M., and Odat Nidal 2006. The Fishery Status in Jordan's Gulf of Aqaba, Red Sea. Dirasat, Pure Sciences, Volume 33, No. 1.

Wissam Yahia Al-Hayek 2016. Assessing Integrated Coastal Zone Management (ICZM) Status in Aqaba: A Participatory Geographic Information System (PGIS) Approach. PhD Thesis. University of York: 305 pp.