Assessment of the Coastal Fisheries of the Tangier Port, Morocco 2011-2017

Fahd Darasi and Mustapha Aksissou

***Abstract*—This paper evaluates the production of coastal fishing and fishing efforts through coastal fishery data (landing and effort) at the Tangier port obtained from the National Fisheries Office for the period 2011-2017. The data were entered into the excel application to process and analyze the results. The total number of coastal fisheries catching in Tangier port increased gradually from 2011, with an estimated production of (5,030.8 Tons) and continued to increase in the years (2012– 2013– 2014–2015), the production record respectively (5,813.6 – 5,857.4 –7,611.3 – 9,068.4 Tons). Then the decline in 2016 and 2017 to (6,963.8 - 4,208.1 Tons), where the year 2017 saw the lowest production. Fishing efforts fluctuated between (6,796 Trips and 9,239 Trips) between 2011 and 2017. The minimum effort was recorded in 2013 in 6796 fishing Trips, with fewer boats reaching 1,286, while the maximum effort was recorded in 9,239 fishing Trips in 2015. The average of each CPUE in 2015, the highest 981.54 kg / Trip and the lowest in 2017 worth 543.05 kg / Trip while these values fluctuate in the remaining years. The lowest value in 2012 was recorded at 84,044,677.5 DH to reach a maximum of 167,005,585.5 DH in 2015, and fell again to 111,516,969.5 in 2017.**

***Index Terms*—Coastal Fisheries, Port of Tangier, Data, Effort, Catch.**

I. Introduction

The fisheries sector plays an increasingly important role in the Moroccan economy, realizing a gross value of fishery outputs 7761 Million DH, employing about 200, 000 people and supplying about 25 percent of animal protein intake in the country [1]-[21].

The rich fishing grounds of the Moroccan Coast, are largely the consequence of an upwelling zone driven by the Canary Current. Upwelling intensity changes according to season and location, due to the fluctuation in the trade winds through the year. The upwelling is weak in the winter, develops in spring and peaks in intensity during the summer [3].

The great biological potential of the economic zone, which had been extended to 200 miles in 1981, opened up profitable investment opportunities. As a result, this attraction has put increasing pressure on the development of fisheries resources, which has led to an intensification of fishing effort [7].

Accurate data on catches, corresponding fishing effort and catch per unit of fishing effort (CPUE) is important for the study and stock assessment [22]-[10]-[23]-[4]-[2]. Productivity trends in fisheries provide information on the level of fishing effort and catches of fish to assess the competitiveness of the fisheries sector.

The measurement of productivity can provide useful information on the actual fishing effort [27]- [29].

Fishing effort and fishing translated as a result of fishing work:

- The catch, expressed by weight, represents the amount of biomass taken from the ecosystem [8].
- Fishing effort corresponds to all the means used by fishers to catch a quantity of biomass during a given period [9].

Fishing efforts are one of the most important criteria for fisheries management and are directly or indirectly related to the majority of management measures [11].

When fisheries are not properly managed, it may collapse leading to major economic and environmental losses [20].

Coastal fisheries in the port of Tangier play a very important role in the economic development of the Province and livelihoods of fishermen, being one of the most important sources of protein supply.

This area, which ensures the exchange between the Mediterranean and Atlantic waters, is a route for large migratory species such as bluefin tuna and swordfish. This unique geographical location gives great importance to the fisheries sector at the national level [15].

The present study was done to update the data concerning catch, effort and catch per unit of fishing effort and to evaluate the current status of coastal fisheries exploited in the port of Tangier during the period 2011-2017.

II. Materials and Methods

A. Study area

Tangier is located in the north of Morocco on the Atlantic coast, 90 km from the port of Larache, 45 km from the port of Tangier, on the new Mediterranean Sea, east along the north latitude 35 ° 47 '13 and from the west line 005 ° 048 '24 [19]. It has a population of 947 000 inhabitants and covers an area of 195 km².

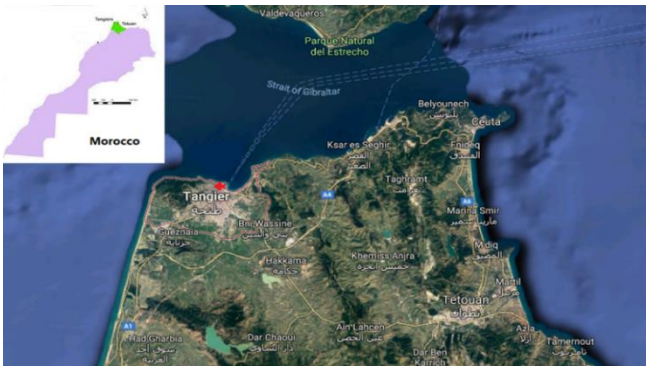

Fig. 1. Map of the Tangier area (Source Google Map).

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B. Methodology

The present study utilizes the catch and effort statistics data from 2011 to 2017 that have been recorded by the National Office of Fisheries (ONP). The data collected in Microsoft Excel are then entered into four components that generate monthly and annual estimates of fishing, voltage, CPUE, and prices. Then a complementary statistical analysis is performed.

The fish resources can be known from data and information on catches and fishing effort over the last 7 years using catch per unit effort (CPUE) or catch per capture. According to [26], the formula is:

CPUE = Catch / Effort

Where: Catch (C) = Total catch (Tons)

Effort (F) = Total fishing effort (trip)

CPUE = The catch per unit effort (catch / trip)

TABLE I: ANNUAL CATCH OF FISHES, FISHING EFFORT, CATCH PER UNIT EFFORT AND THE NUMBER OF BOATS FROM COASTAL FISHERIES FROM THE PORT OF TANGIER

Years	Catch (Tons)	Nb Trips	CPUE	Nb Boats
2011	5,030.75	8879	0.566589706	1677
2012	5,813.55	7044	0.825319421	1312
2013	5,857.35	6796	0.861881989	1286
2014	7,611.32	8089	0.940946965	1427
2015	9,068.42	9239	0.981536963	1449
2016	6,963.80	8052	0.864853453	1475
2017	4,208.07	7749	0.543046845	1235

III. RESULTS

A. Annual catch

The development of coastal fishery production of the port of Tangier for seven years (2011 -2017) has been exposed annually. Maximum annual production was in 2015 estimated 9,068.4 tons, and minimum annual production was in 2017 estimated 4,208.1 tons. The production in 2011 was estimated at 5,030.8 tons, and kept on increasing to 2015. Then production continued to decline in 2016 and 2017 (Fig. 2).

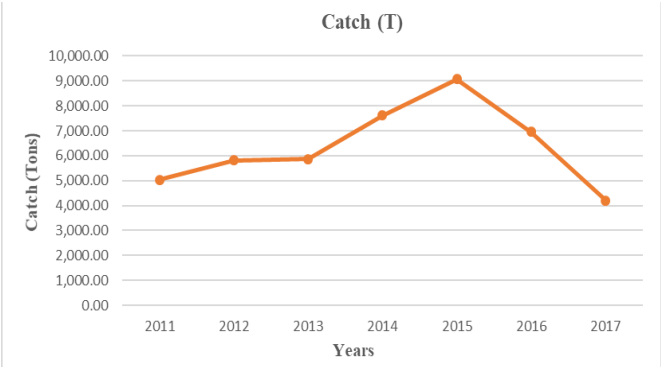

Fig. 2. Annual catch of coastal fisheries for the port of Tangier from 2011-2017.

B. Monthly Catch

During the year, the month of Mars recorded the maximum catch per year, 8,644,899 for the seven consecutive years and the month of October recorded the minimum catch 1,925,196. The average production during the year was 3,712,772.

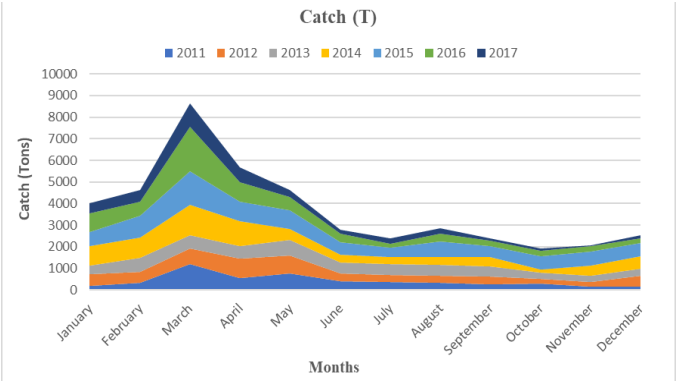

Fig. 3. Monthly catch of coastal fisheries for the port of Tangier.

C. Annual fishing effort

The annual fishing effort (boat trips) was estimated at 55,848 during the period from 2011 to 2017, with an average yearly effort of 7,978.286 trips. The maximum amount of effort was noticed in 2015 (9,239 trips). The minimum effort was recorded in 2013 (6,796 trips). The effort was above in 2011, 2014, 2015 and 2016. The effort went down from 8,879 in 2011 to 6,796 in 2013, and from 9,239 in 2015 to 7,749 in 2016.

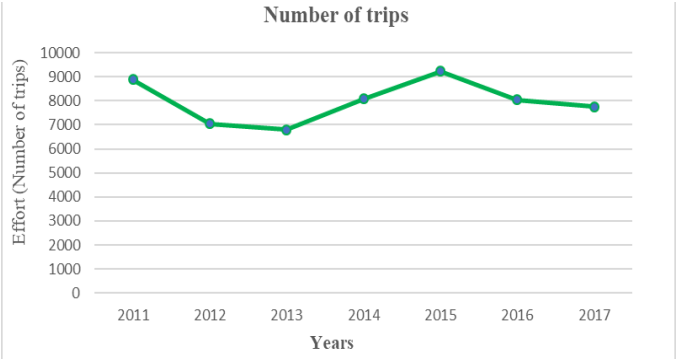

Fig. 4. Annual fishing Effort for the port of Tangier from 2011- 2017.

D. Monthly fishing effort

The estimated monthly effort of coastal fisheries of the port of Tangier during the period 2011–2017 is presented in Fig. 5. The average effort per month was 664.8571 boat trips and the maximum and minimum monthly effort was observed in May and October respectively. A high monthly effort was also observed during March, April, June and August. The effort was low occurred during January, February, July, September, November and December.

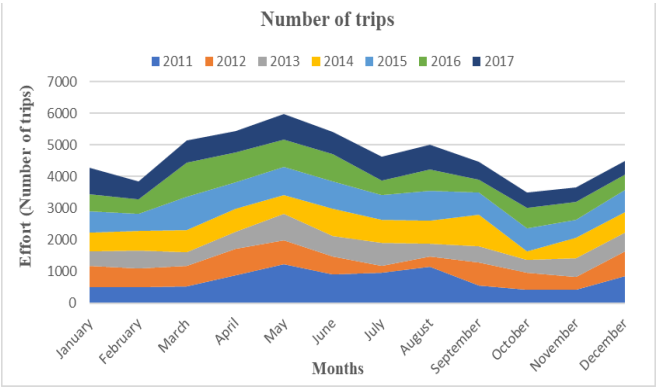

Fig. 5. Monthly fishing Effort for the port of Tangier.

E. Annual Catch per Unit Effort (CPUE)

The maximum CPUE (0.981 T) was noticed in 2015, and the minimum CPUE was recorded in 2017 (0.543 T). The average CPUE for the annual was (0.797 T). The annual CPUE increased from 0.566 T in 2011 to 0.981 T in 2015, then went down to 0.543 T in 2017.

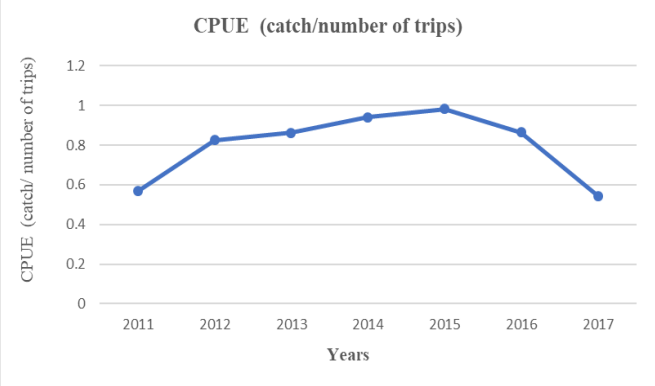

Fig. 6. Annual Catch per Unit Effort (CPUE) for port of Tangier

F. Monthly Catch per Unit Effort (CPUE)

The highest level of fishing per unit effort was recorded in September of each year during the study period (2011-2017) (Fig. 7), while the lower level was recorded in the months between June and August.

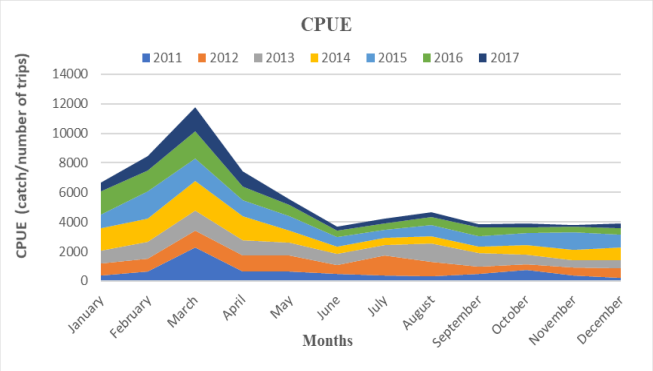

Fig. 7. Monthly Catch per Unit Effort (CPUE) for port of Tangier.

G. Annual value

The total value of the sector (Fig. 6) has fluctuated over the years, reaching a maximum of 167,005,585.5 DH in 2015 (17.6 Million USD) and a minimum of 84,044,677.5 DH in 2012 (8,846, 808 Million USD). The average annual value for 2011 -2017 were 123,577,988.1DH (13,008,209 Million USD). The annual value decreased from 143,285,706.5 in 2011 to 84,044,677.5 in 2012, then increased through 2013, 2014 and 2015 was 94,852,635.5, 150,421,906 and 167,005,585.5 respectively.

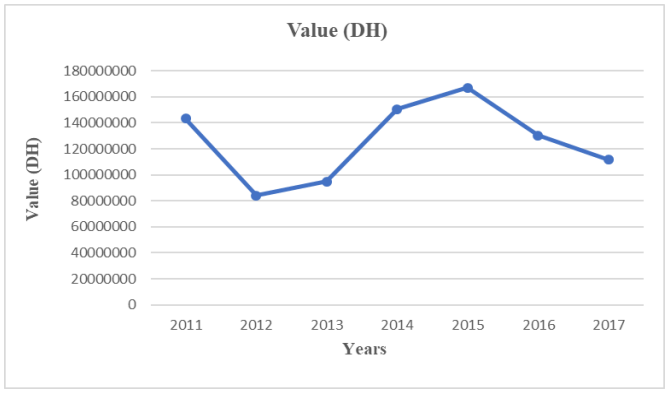

Fig. 8. Annual value of coastal fisheries sector in Tangier port

H. Monthly value

The highest value was recorded in May of each year during the study period (2011-2017) (Fig. 9), while the lowest value was recorded in the months from September to November.

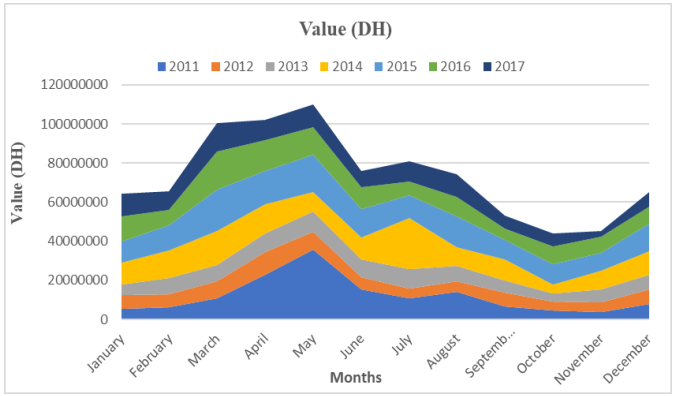

Fig. 9. Monthly value of coastal fisheries sector in the port Tangier.

IV. Discussion

The current study of coastal fisheries in the port of Tangier was an assessment of production and fishing efforts for the period (2011-2017). The seasonal evolution of the landing (Fig. 3) cannot be explained without reference to the fishing effort curve (Fig. 5). This trend is marked by a big peak in May, due to a major effort during this month. This increase is due, on the one hand, to an improvement in the fishing climate and, on the other hand, the growth in demand expressed by Moroccan exporters living in Tangier [9].

The increase in production in 2015 is due to an increase in the number of boats and an increase in the number of flights. In 2015, the bulk of the swordfish, 95.5% of the total tonnage. Almost all catches of this type (98%) are produced in the Tangier marine area [13]. It is also due to the use of fishing technology and fishing practices such as fishing gear and fishing distance [6]. This difference is due to the number of active boats and the average number of trips per boat [11].

Fig. 5 illustrates the evolution of fishing efforts in the port of Tangier. Note that at the beginning and end of the year and with prevailing climatic conditions during autumn and winter, fishing efforts decreased during October, November, January and February. This is mainly due to the limited availability of bluefin tuna in the Gibraltar Straits region. Other factors may also explain the declining trend in fishing

efforts, including deprivation that causes significant economic losses and adverse weather conditions (eastern winds) that limit the number of boat trips [12].

The "Chergui" in northern Morocco, which is a wind from the east, is often strong and very humid. It paralyzes the fishing activity because it makes the sea very agitated between Tangier and Spain [14].

Fig. 3, the intensification of fishing is evidenced by the significant increase in estimated fishing effort, (Fig. 5) despite minor changes in the number of vessels [30].

The decrease in fishing effort (engine downtime over several months, high cost of spare parts, fleet renewal, which requires a long time) and bad weather can be explained. All these parameters reduce the number of trips [18].

Volatility due to climatic events may lead to differences in catches during the study years. The impacts of increased fishing pressures fisheries, together with climate change, are likely to have a negative impact on marine resources [30].

The problem in fisheries. In some cases, the decline can be explained, but in others the cause has yet to be identified, although several hypotheses exist [16].

That Catch per Unit Effort (CPUE) is a method used to determine the results of the amount of marine fishery production averaged over the year [25].

The increment or decrease of fisheries production in an area can be seen from the results of CPUE [31]. The catch per unit fishing effort gives the sight about the relative abundance of the different fish stocks and consequently the status of the fishery [17].

V. Conclusion

Coastal fisheries in the port of Tangier have undergone significant changes over the past seven years, including a reduction in the volume of production. This trend is mainly due to the decline in fishing resources and the exposure of the region to strong winds, leading to a decline in the number of fishing trips.

The results presented in this paper represent information on a total catch, fishing efforts, CPUE and total value of coastal fishing in Tangier port of 2011-2017.

The study showed that 2015 recorded the largest amount of fishing, fishing effort and value sold.

Months (February to May) can be considered a high season for production. Are usually abundant in the abundance of fish rich in many phytoplankton, zooplankton and wind during these months, increasing the number of trips leading to increased production. During the months (June to December), a decrease in fishing was observed due to climatic conditions, wind and maintenance, which reduces the number of trips and thus reduced production.

In conclusion, it is imperative that a long-term strategy based on the “ecosystem approach” for an enhanced food security and the sustainable exploitation of marine resources.

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