



The culture of grey mullet in Egypt: the largest market in the Mediterranean region.

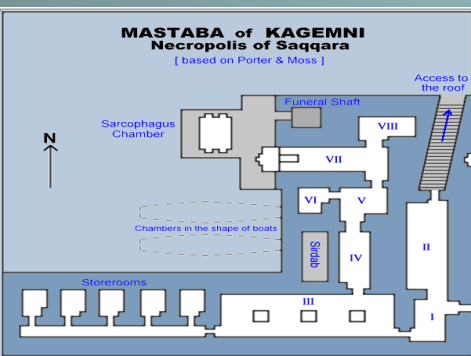


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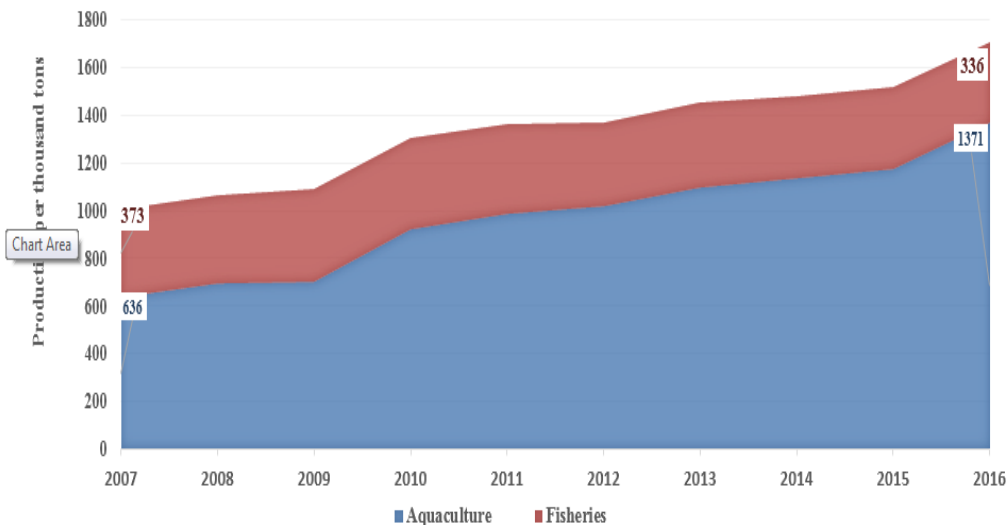
Bas-reliefs in Ancient Egyptian tombs, dating from 2340 B.C., depict the capture of mullets. (Tomb of KA-GMNI OYN VI, Sakara pyramid, Giza, Egypt).



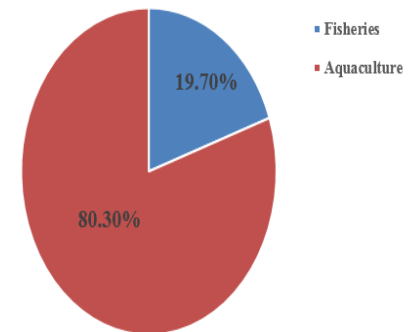
Egyptian Fisheries versus Aquaculture

- According to GAFRD statistics (2018) the total fish production in Egypt was 1.71 million tons where 1.4 million tons were produced through aquaculture.
- Aquaculture represents >80% of the total fish production.
- In the last 10 years the aquaculture activity has been tremendously increased 2.2 times, where in 2007 aquaculture production was 636 thousand tons and becomes 1.4 million tons in 2016.

Egyptian fisheries and aquaculture production during the period from 2007 to 2016 (GAFRD, 2018).

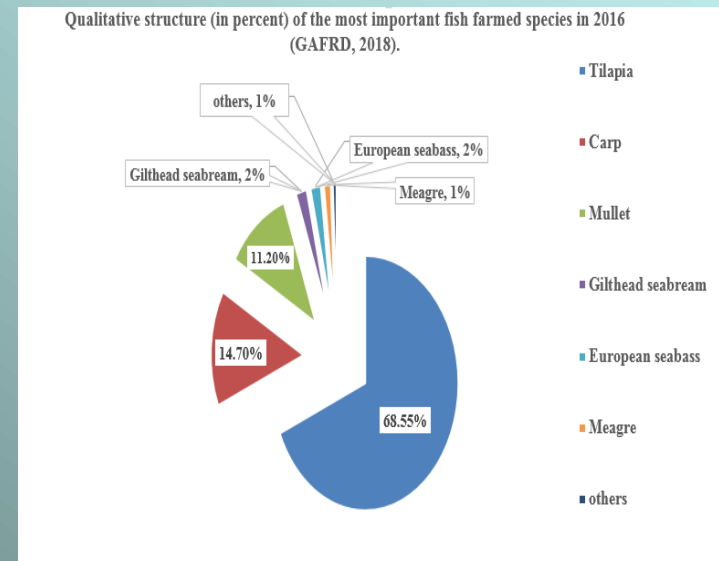
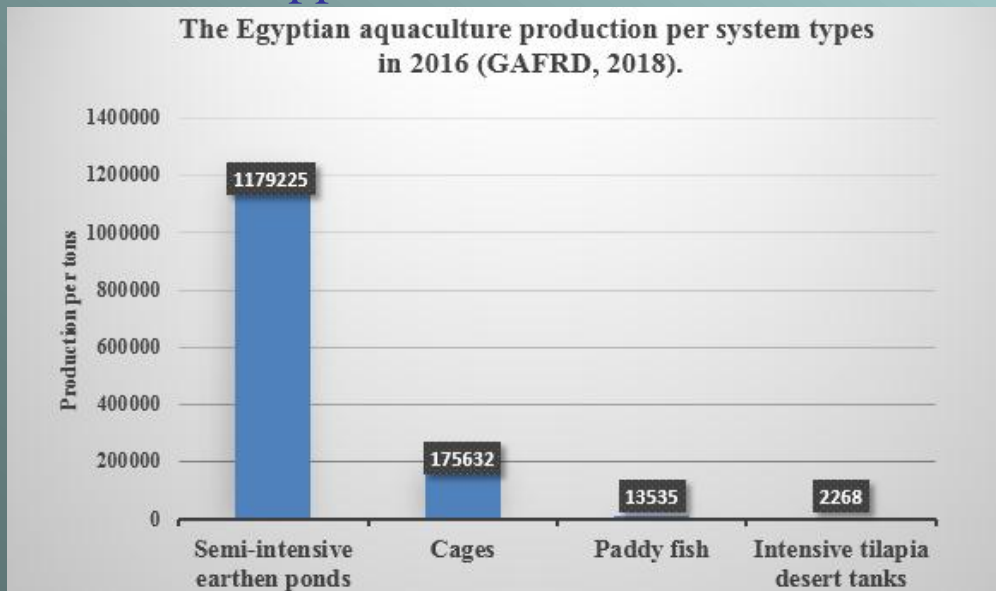


Egyptian fish landing production in 2016 for the total 1,706,273 tonnes (GAFRD, 2016).



Egyptian aquaculture production

- * Most of fish farms are located in Delta region, with four different Egyptian aquaculture production systems types (earthen ponds, cages, paddy field and desert aquaculture integrated with agriculture 71.7%, 24.5%, 3.4% and 0.4% respectively).
- * For a total surface of around 128 thousands hectares of earthen ponds practiced in Egypt are characterized by medium stocking densities and limited water exchange rate.
- * The private sector is producing 99 % of the total aquaculture production, and the public sector contributes only with 1 %. The public sector is contributing more with the fry and fingerlings production, extension support, artificial feeds and research support .



The Nile Delta (agriculture versus aquaculture)

The Nile delta or Lower Egypt, covers an area of (25,000 km²). It is about 160 km long from Cairo to the Mediterranean, with a coastline stretching some 240 km from Alexandria to Port-Said.

The Egyptian aquaculture map showed that fish farming activities are more concentrated in sub-regions of the Nile delta 98 % of the total surface area, where the water resources mainly the agriculture drainage water are available and non-agricultural lands.

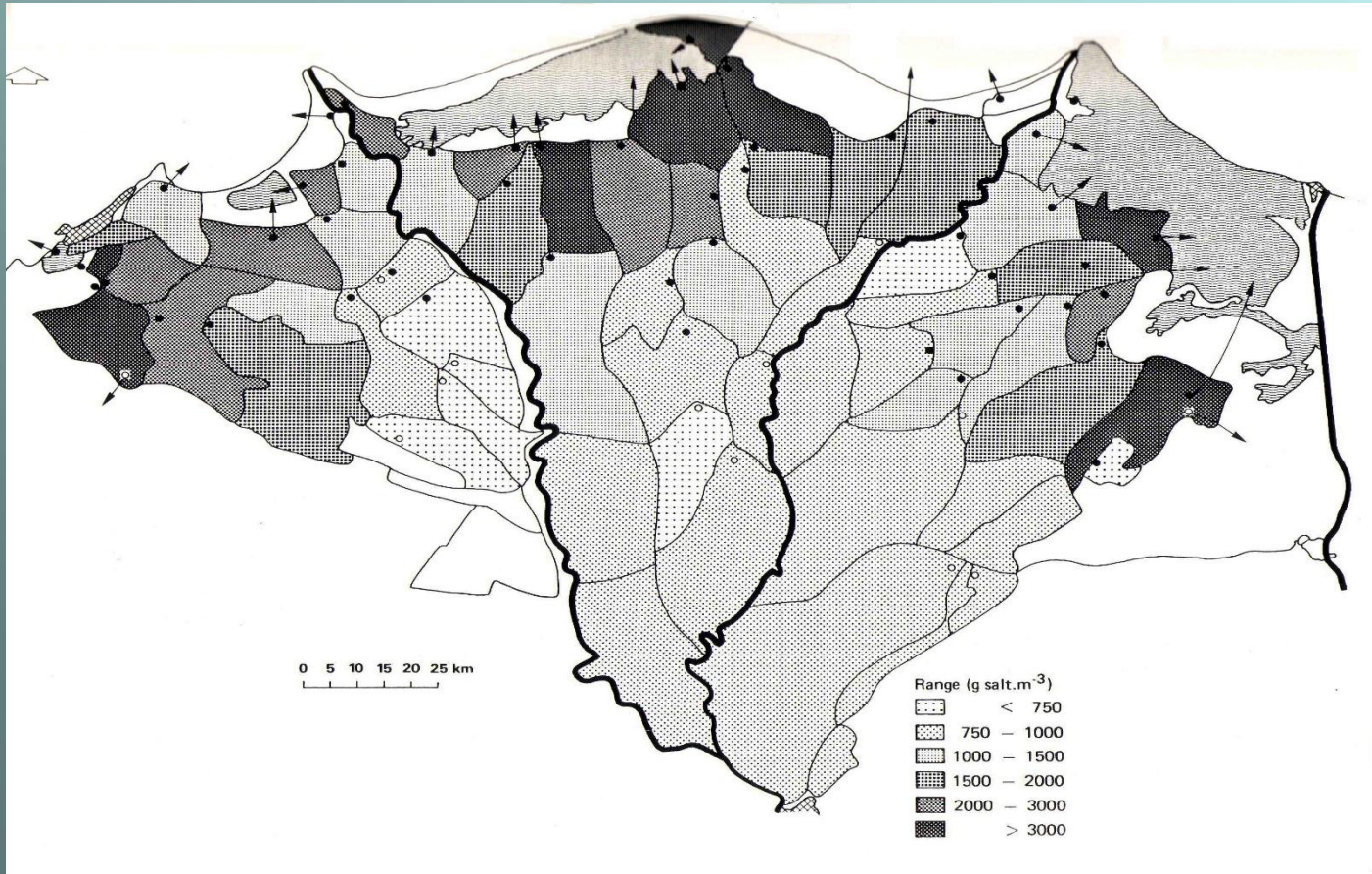


Source: Overview of Egypt (National Water Resources Plan for Egypt, 2004).

Egypt's water budget:

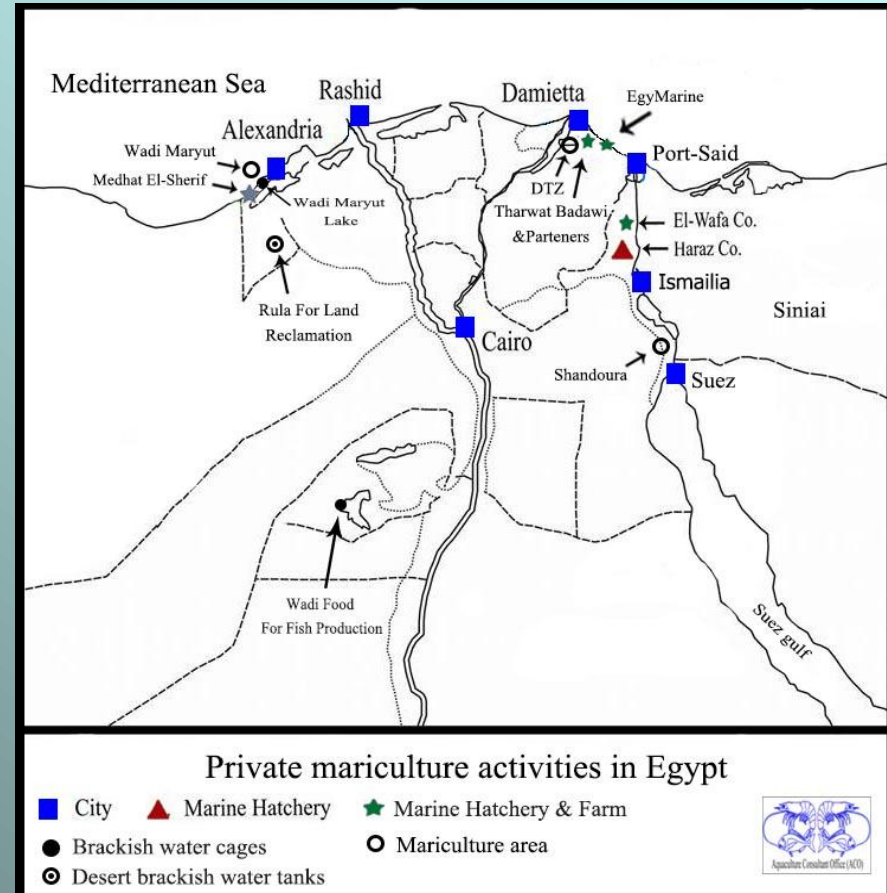
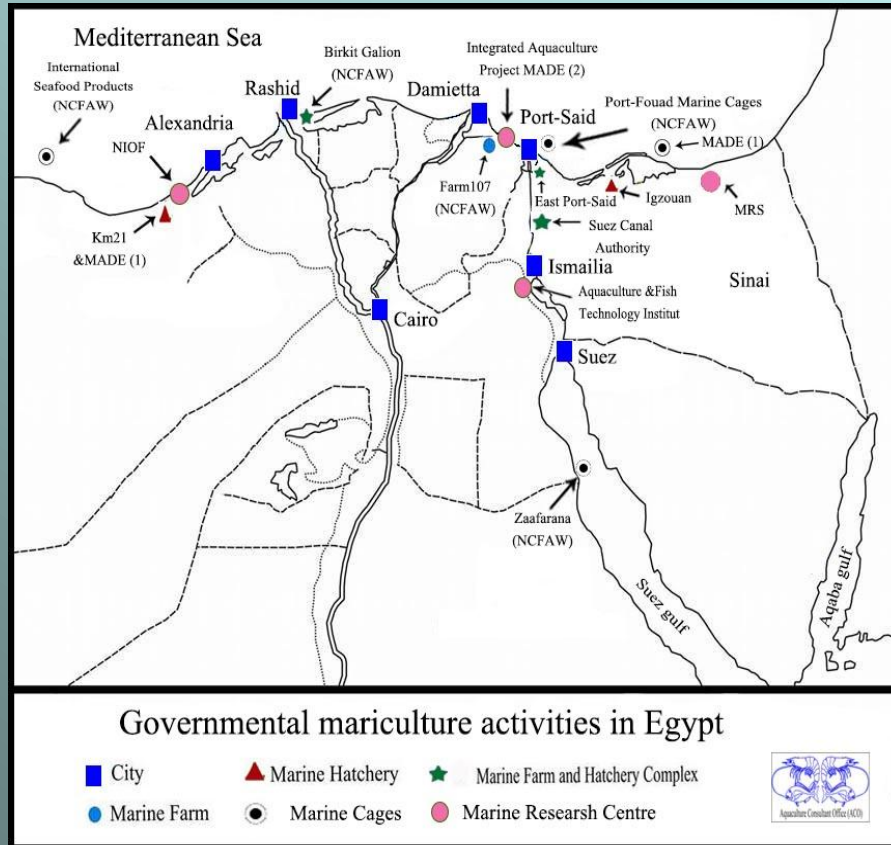
Egypt's yearly water budget **58.7 billion m³/yr** fresh water, **16 billion m³/yr** recycled water and **3.65 billion m³/yr** treated sewage water.

- Gap between available water resources and needs is about **20 billion m³/yr**.
- This gap could be overcome by reusing non-conventional water resources (via **agricultural drainage water**, treated wastewater and groundwater). **The agricultural drainage water is the main water source of the Egyptian aquaculture industry.**

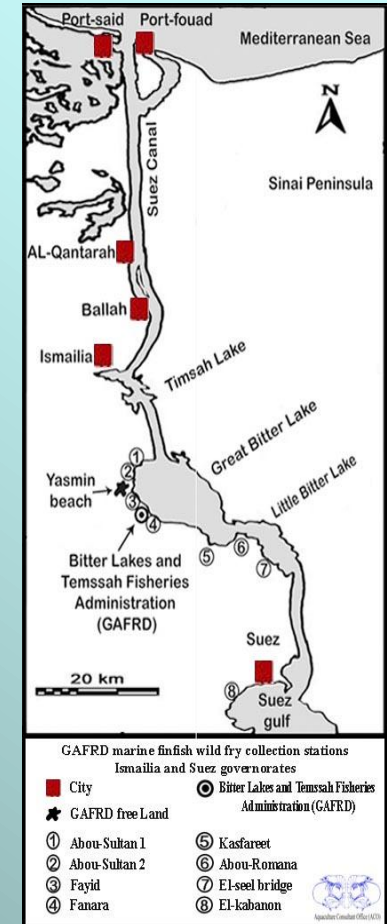
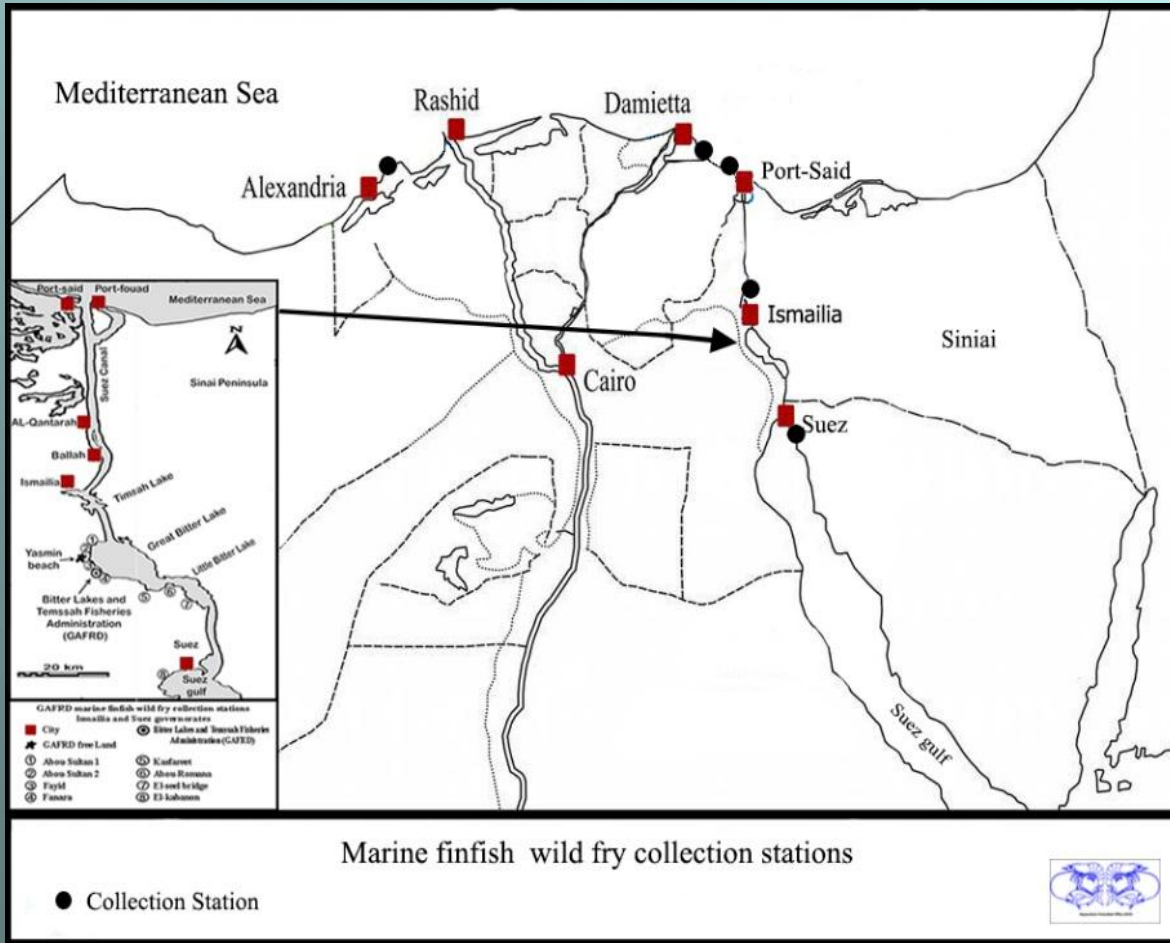


Salinity of the drainage water per catchment in the Nile Delta.

Government and private mariculture activities in Egypt.

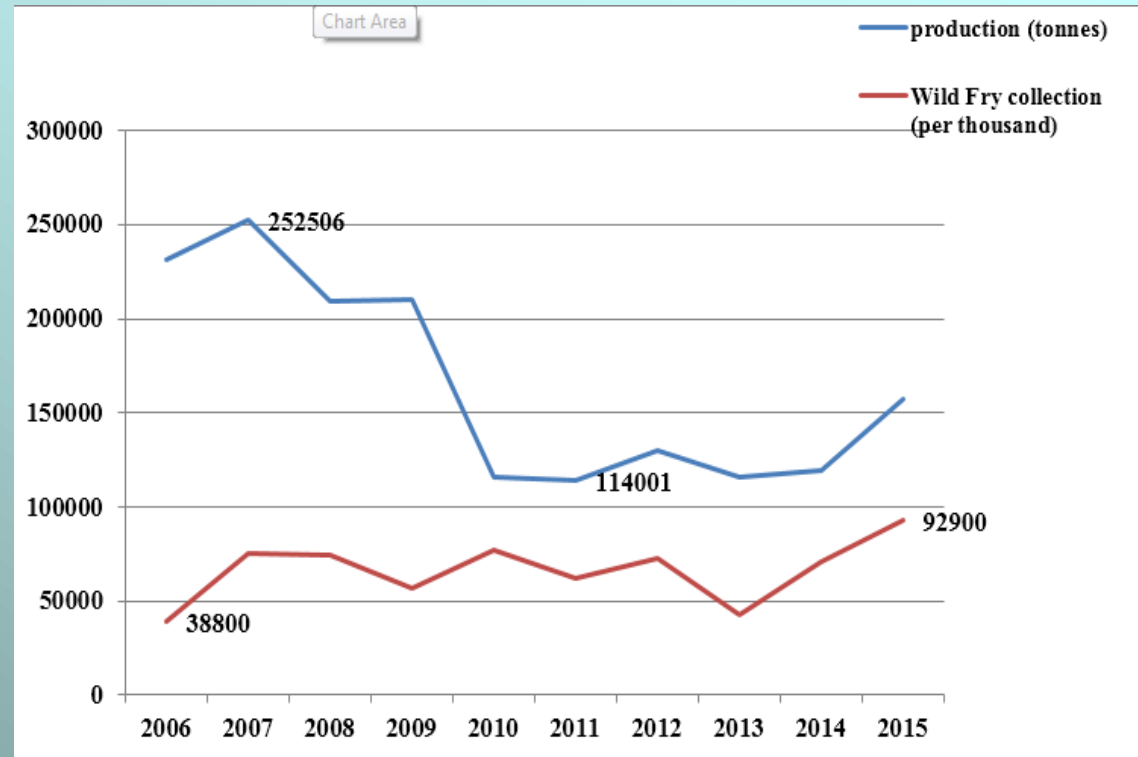


Marine finfish wild fry collection stations in Egypt.





Wild mullet fry collection versus mullet aquaculture production during 2006-2015 (GAFRD, 2015).



During the last ten years:

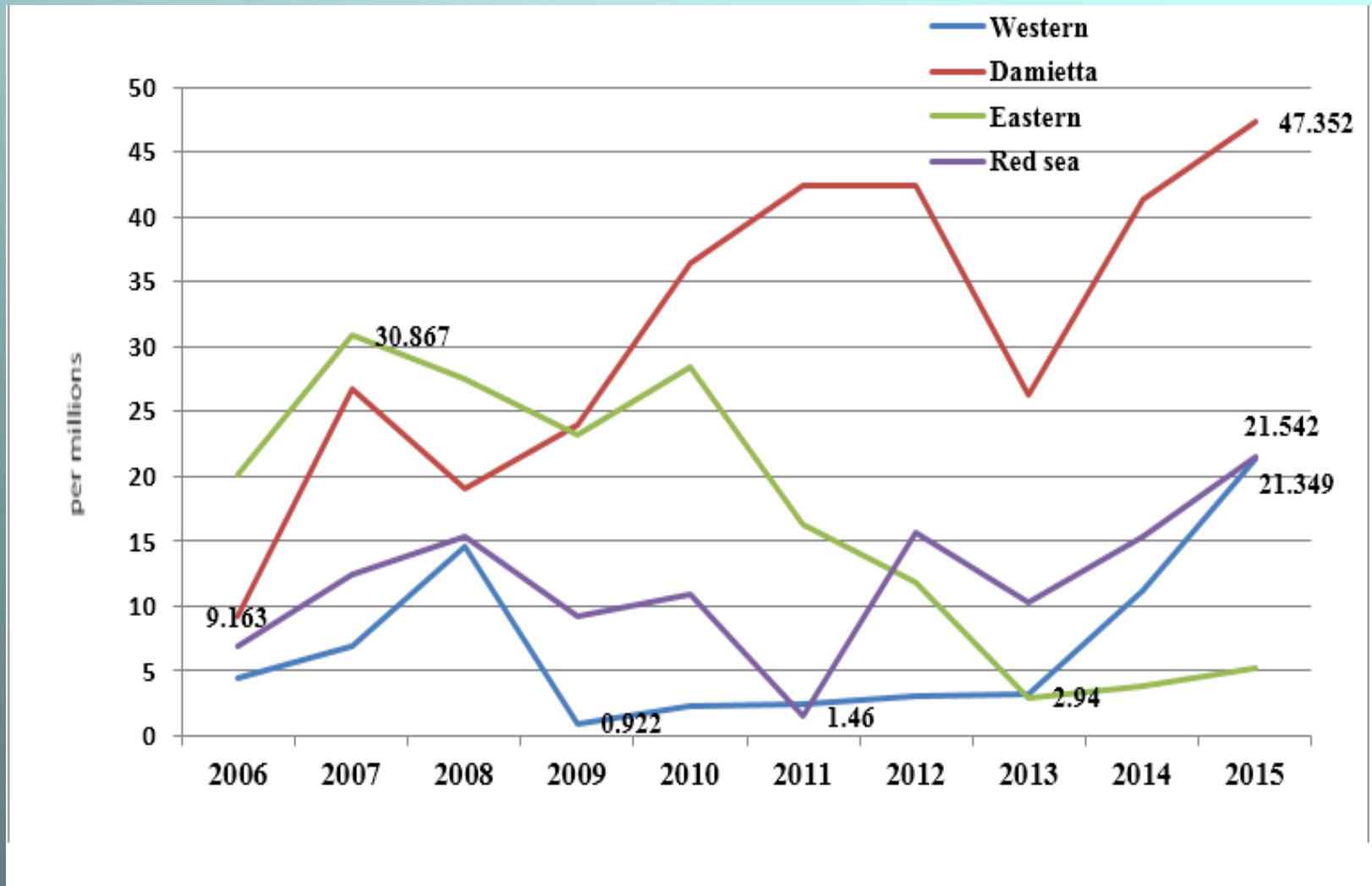
- Mullet aquaculture production has decreased **55 %** from **252.5** thousand tons in **2006** to **114.0** thousand tons in **2016**.
- Wild mullet fry collection has increased **140 %** from **38.8** million fry in **2006** to **92.9** million fry in **2016**.

Results:

- Mullet landing **fisheries** and **aquaculture** production have decreased.
- Fish farmers are believing: **NO** scientific evidence that wild fry collection is harmful to the environment + wild mullet fry are abundant and easy to collect + if it will not be collected it will be die in the sea?



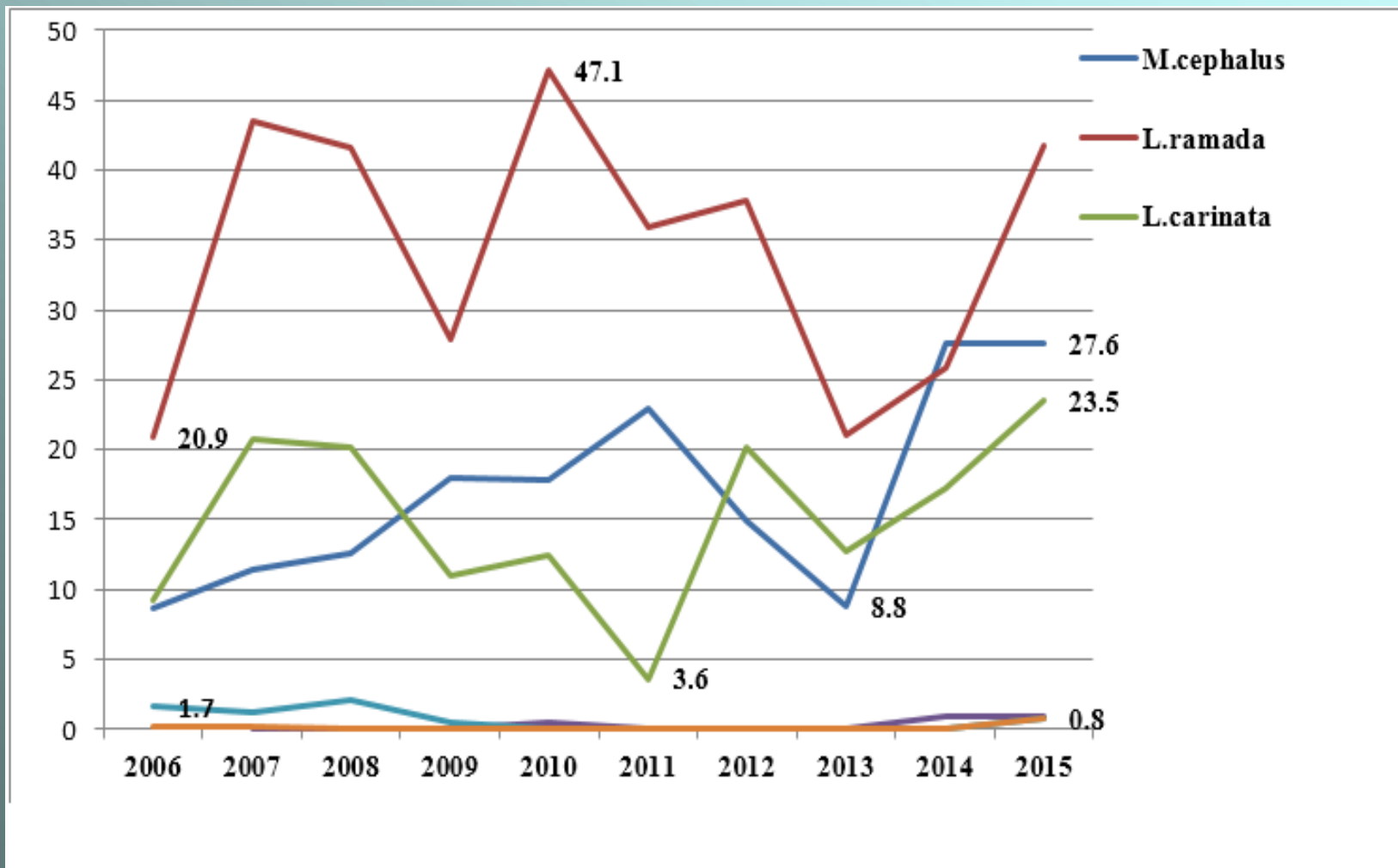
Geographical wild marine finfish fry and shrimp seed from the collection stations during 2006-2015 in million (GAFRD, 2015).



Four GAFRD's geographical aquatic zones through five governorates have collected mainly **47%** from Damietta, **25%** from Port-Said and Ismailia, **18%** from Suez and **10%** from Alexandria of the total wild mullet fry.



Production of wild marine finfish fry and shrimp seed from the collection station by species during 2006-2015 in million (GAFRD, 2015).



Legalization



Wild fry collection in Egypt is controlled by the Fisheries Law No. 124/1983 and

- * GAFRD's decision No. 917 of 2014
- * GAFRD's decree No. 927 of 2015
- * GAFRD decree No. 9 of 2016

- It is prohibited to fish, collect, handle or transport wild fish fry unless an official permit is obtained from the GAFRD;

- **Wild fry price** is defined by GAFRD and may fluctuate each year according to market demand; Official prices of mullet fry species for the season 2016-2017 (50% for GAFRD and 50% for fishermen) are reported here:

Mullet species	Period of harvesting	Price per thousand fry in EGP	Price per thousand in \$US
Flathead grey mullet (<i>Mugil cephalus</i>)	August to December	305	17.3
Thin lip mullet (<i>Liza ramada</i>)	January to April	150	8.7
Blue spot mullet (<i>Liza carinata</i>)	January to April/May	150	8.7

-Quantity allocated per growing season per acre for the fish private farms for **6,000 fry either *M.cephalus* or *L.ramada*/ha** and around **10,000 *L. caranita*/ha**;

-Unlicensed fry fishermen and trader: Black market prices are **3.0 times more** than the official prices of *Mugil cephalus* and around **2.0 times** for *Liza ramada* and *L.carinata* (*Personal estimation*).



Impact of wild fry fisheries:

The wild marine fish and shrimp fry fisheries activities have been identifies for his strengths, weaknesses, opportunities and threats, to evaluate the activity position, a SWOT analysis have been realized:

Strengths <ul style="list-style-type: none">• Improve the socio-economic conditions of middle man wild fry collector fisherman and wild fry delivery.	Weakness <ul style="list-style-type: none">• Destroy the fisheries stock in the nature;• Decrease the landing fisheries quantity per species and• Transfer disease from the nature to aquaculture.
Opportunities <ul style="list-style-type: none">• Supply a specific quantity of wild fry for new marine fish/shrimp candidates in the aquaculture before producing artificially and economically the fry in hatcheries.	Threats <ul style="list-style-type: none">• Creation of socio-economic problems wild fry collector fisherman and wild fry delivery in case if the government will stop this activity.



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1	Beach of El-Cabanon wild fry collection station by the Suez Gulf, Suez governorate.
2	Fishermen collecting wild Keeled mullet fry (<i>L. carinata</i>) in El-Cabanon wild fry collection station by the Suez Gulf, Suez governorate.
3	Wild Killed mullet fry (<i>L. carinata</i>) stocked in fisherman colleting boat with water change holes .
4	Wild Killed mullet fry (<i>L. carinata</i>) stocked in fisherman colleting boat ready to fry trader pick-up cars.
5	Boat with engine motor using to collect wild fry in the Nile estuary , Damietta, Damietta governorate.
6	Counting the number specific of wild Killed mullet fry to a private fish farmer pick-up, in El-Cabanon wild fry collection station by the Suez Gulf, Suez governorate.



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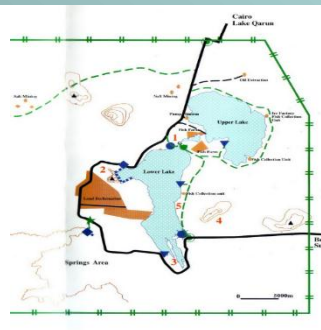
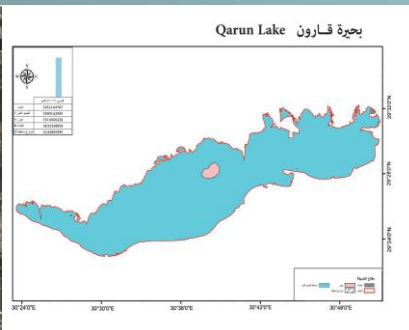
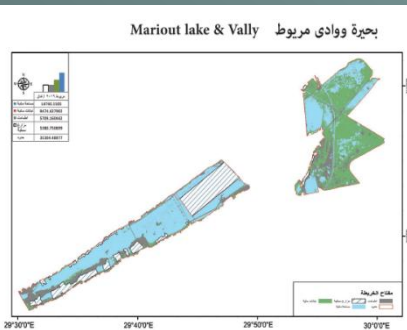
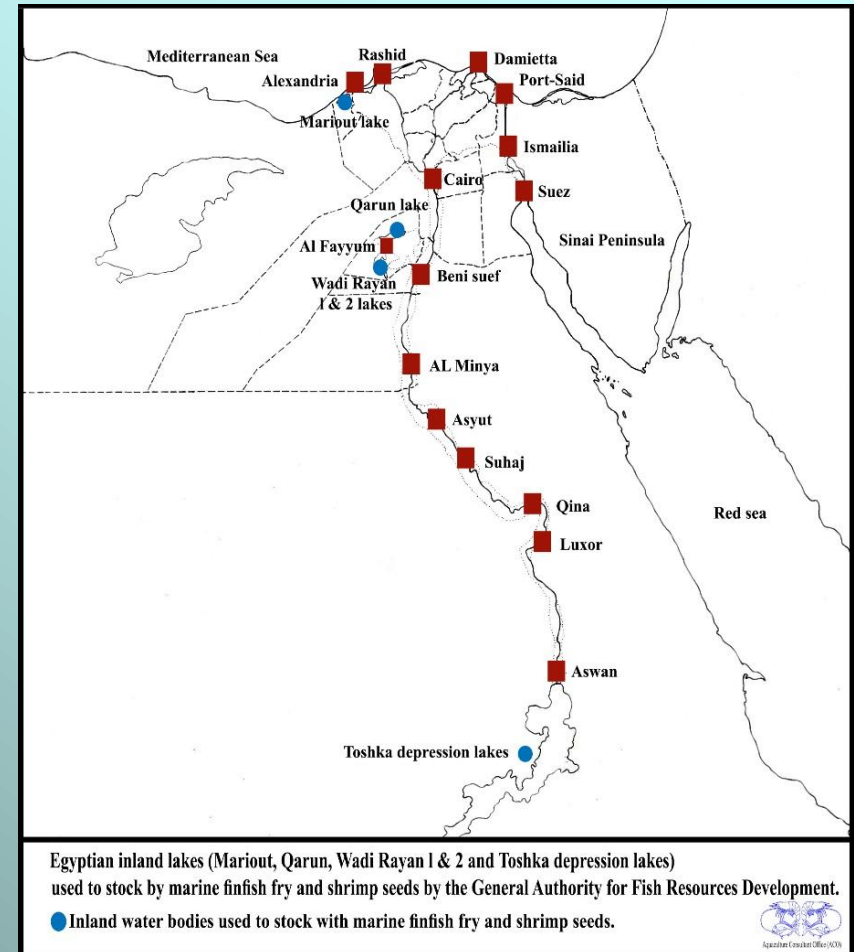
7	Fry packing in plastic bags ready to transfer for private fish farmers in Damietta, Governorate of Damietta.
8	Acclimatization and adaptation tanks for wild fry in the Bitter Lakes and Temssah Fisheries Administration, GAFRD, Fayed, Ismailia governorate.
9	Costal side of Bitter Lakes and Temssah Fisheries Administration , GAFRD, Fayed, Ismailia governorate showing the source of water to the acclimatization and adaptation tanks.
10	Wild fry trader in his shop with concrete nursing tanks, Damietta, Damietta governorate.
11	A movable HDPE live tank in Fanara wild fry collection area, Fanara, Ismailia during the season of wild Keeled mullet fry (January–April, 2017).
12	Fish trader's pick-up are waiting in El-Cabanon wild fry collection station by the Suez Gulf in Suez to transfer wild Killed mullet fry to the private fish farmers.

Lake ranching in brackish water lakes to enhance mullet fisheries:

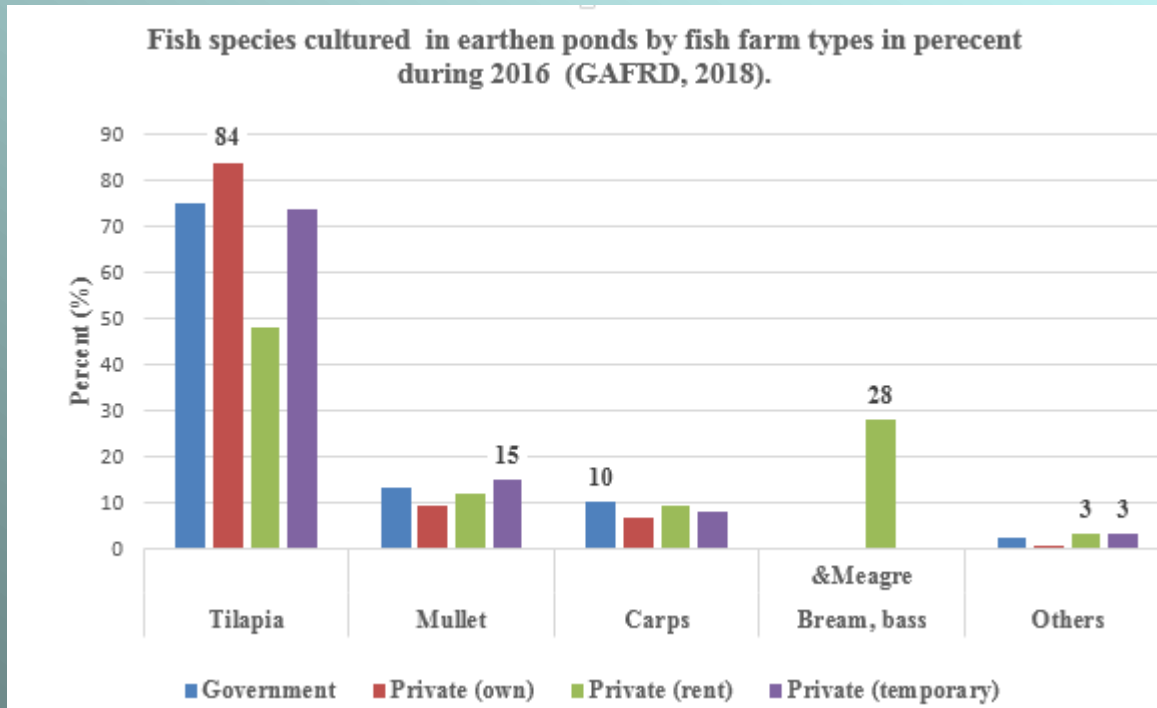
Mullet fry and fingerlings are stocked in inland lakes and reservoirs as a form of fisheries enhancement.

In early 1921, *Mugil cephalus* and *Liza ramada* wild fry were introduced to Lake Qarun (10 to 40 ppt).

Other water inland bodies both fresh and brackish water are: **Wadi Al Raiyan Lakes** (3-20 ppt), El-Fayoum province, **Maryut valley** (3 to 15 ppt) and **Hydro-dram** lake (1 ppt), Alexandria province.



Semi-intensive and intensive culture in the Nile Delta, Egypt

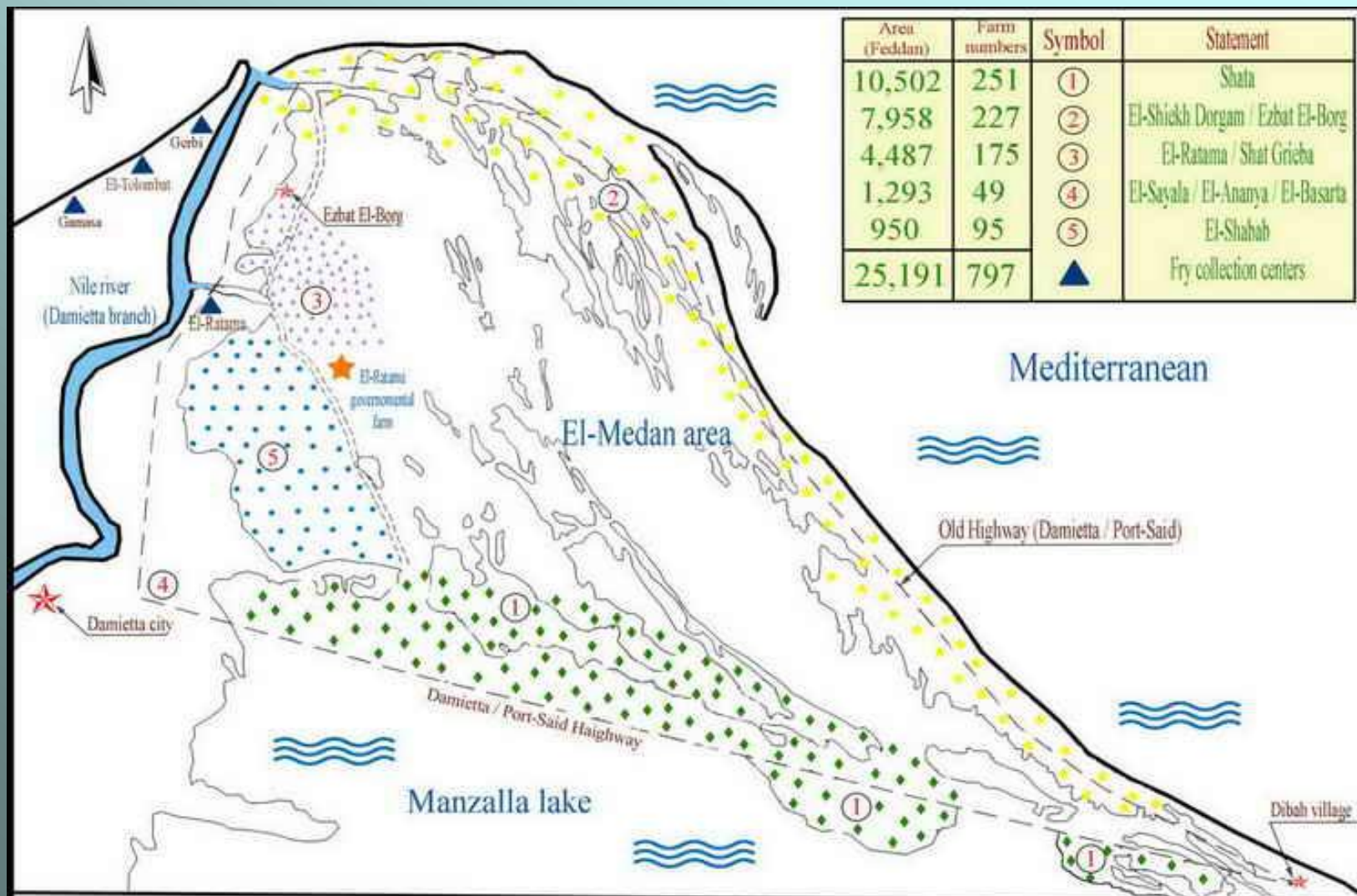


The rapid growth of mullet aquaculture in Egypt has been driven by a variety of factors:

- pre-existing **aquaculture practices**;
- availability of **brackish water**;
- **saline soil** unsuitable for agriculture and
- **wild fry** sources near the coastal lagoons and the Suez Canal.

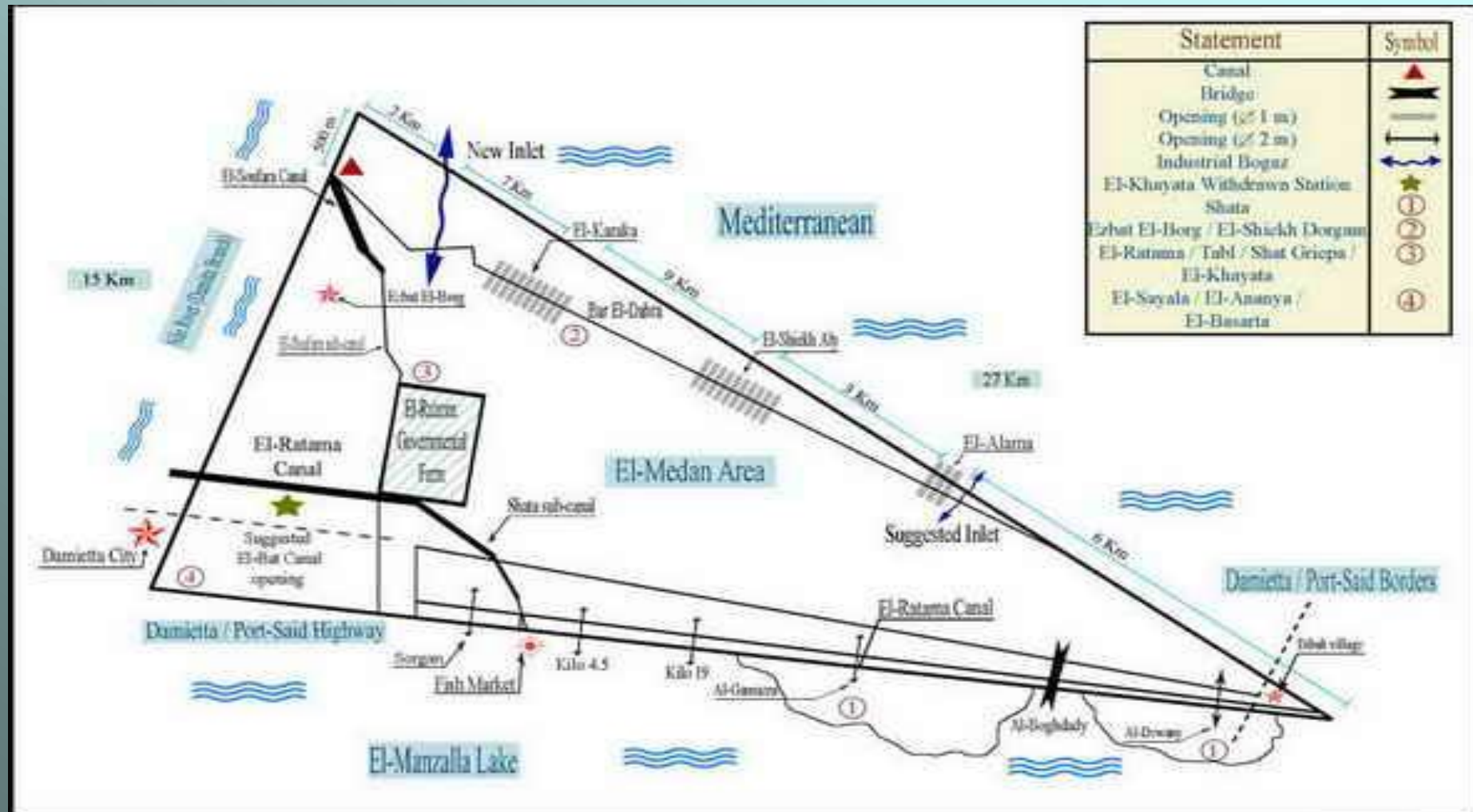


Distribution of the aquaculture sites in Damietta Triangle Area (DTA), Damietta and Port-Said governorates.



Distribution of aquaculture in Dibah Traingle Zone - Damietta / Port-Said - Egypt

Distribution of the different water sources in Damietta Triangle Area (DTA), Damietta and Port-Said governorates.



Distribution of different water resources in Dibah Traingle Zone - Damietta / Port-Said Governorates - Egypt

Egyptian Coastal Aquaculture (Lower Nile Delta-The Culture of Mullet)



Mullet mono and polyculture systems:

North-eastern and middle Nile delta: Mulletts are reared in polyculture in brackish-water at low salinity (3 to 7 ppt), they are usually stocked with tilapia, common carp *Cyprinus carpio* and silver carp *Hypophthalmichthys molitrix*.

• **North-western Nile delta (Diba Triangle Zone),** where the salinity is over 15 ppt and can reach 45 ppt, mullet spp. (*M.cephalus* and *L.ramada*) are cultured in polyculture with gilthead seabream and European seabass.

• **Monculture** of *L.carinata* is very common and polyculture system is very popular with marine shrimp (*P.semisulcatus* or *L.vannamei*) in high salinity (30 to 50 ppt).



Mullet Nile cages in Egypt (2016):

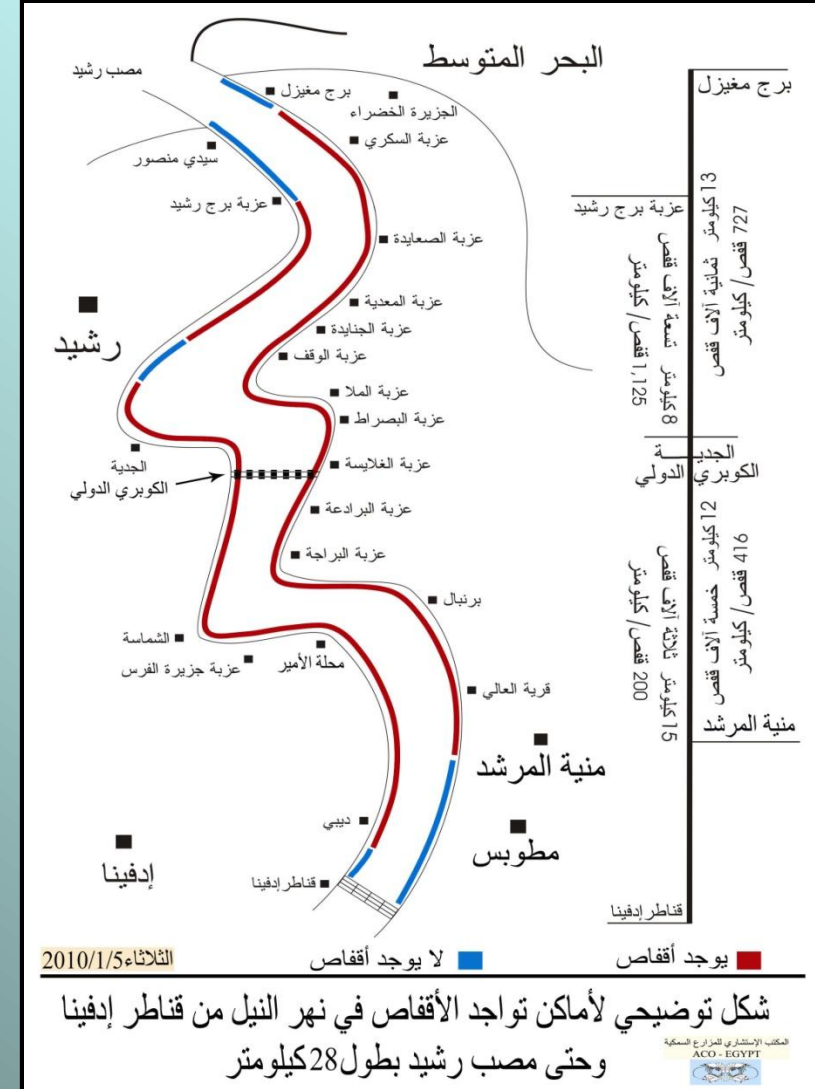
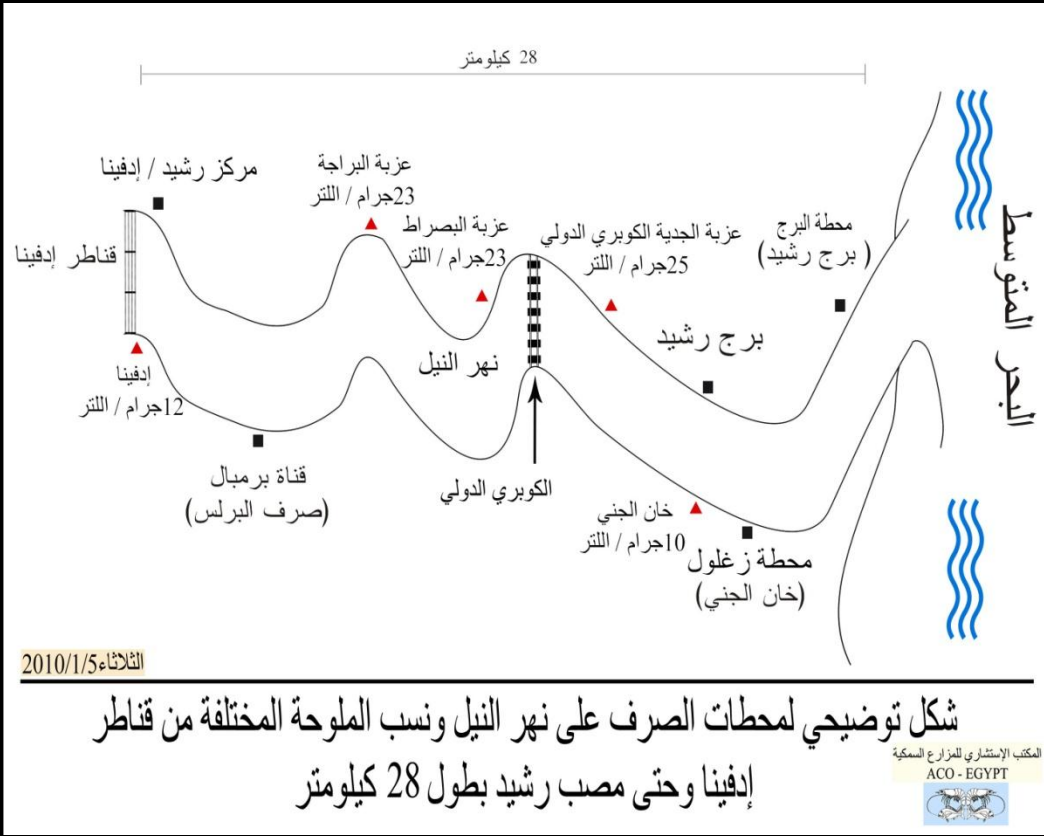
-Nile cages numbers near the mouth of Rashid branch reached 22 thousands with a total water volume of 6.42 million m³ and an annual production of 175 thousand tons (53.8% tilapia, 42.6% silver carp and 3.6% mullet respectively), and an average production of 27.3 kg/m³.

-The production of mullet (mainly *L. ramada*) in cage aquaculture began in 2006 with a yearly production 19,180 tons and reaching 35,343 tons in 2012, but decreasing to 6,250 t in 2016. Around 1.5 tons of mullet/cage with an average weight of 4–5 fish.kg⁻¹.

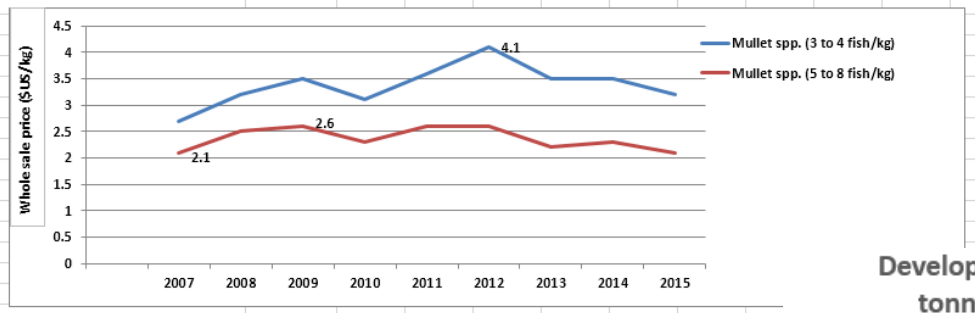
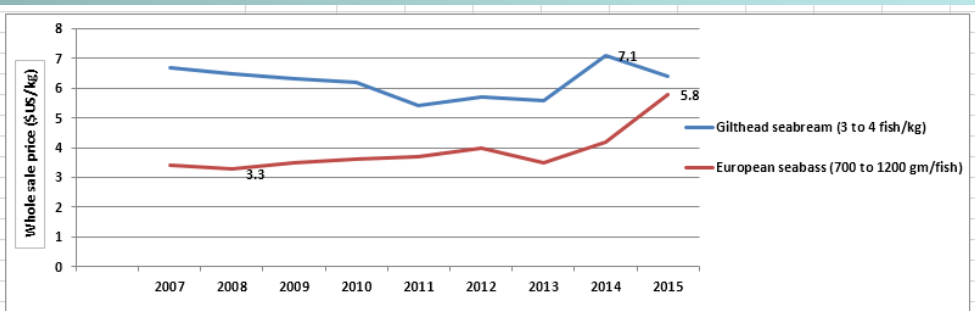
-In the first year the farmers feed mullets with wheat bran, stale bread inconsumable raw dried pasta. During the last three months they are fed compressed sinking pellets (25% CP) and remnants of raw dried pasta.



22 thousands Nile cages in Rashid branch



Average prices of marine fish species produced from aquaculture in the "Whole Sale Fish Market of El-Obour, Great Cairo" in \$US during 2007 to 2015 (GAFRD, 2016).



Development of the Egyptian seafood trade quantity per thousand tonnes (export/import) during 2007 to 2016 (GAFRD, 2018).



Conclusion and future trends:

- (1) Mullet could be the **first candidate in the dish of Egyptian, rather than tilapia**, if the mullet fry can be supplied from the mullet propagation in artificial hatcheries for the aquaculture industry.
- (2) It is a must that a **transition period is requested before prohibit the collection of wild fry** and until the artificial mullet propagation can reach a feasible production level.
- (3) **Fresh water and land competition**: The use for potable water and land crop production having priority over aquaculture activities.
- (4) **Agriculture drainage availability**: Reused agriculture drainage water for the delta region in year 2020 to reach 1.4 times the quantity reused in 2010, it is perceived that drainage water quantity and salinity would negatively be impacted (-12 % and 4%, respectively). The mullet culture can have a good opportunity with the increasing of salinity.
- (5) **Artificial fish feed**: price of fish feed (25% protein) has increased from \$US 165/ ton in 1995 to \$US 480/ton in 2018 (**three times during 13 years**). Egyptian aquaculture nutritionists are trying to reduce both mullet feed costs by enhancing the natural food in the ponds, improving economic feed formulation and minimize the environment impacts.

A serene sunset scene over a body of water. The sun is low on the horizon, creating a bright orange glow and a long, shimmering reflection on the water's surface. The sky transitions from a deep orange near the horizon to a dark, clear blue at the top. The foreground shows dark, silhouetted hills or a shoreline. The text "Thank you" is centered in the upper half of the image, rendered in a bold, orange, serif font with a slight shadow effect.

Thank you