

## Recording of Hermaphroditism in *Sardinella Maderensis* Caught in Lattakia Marine Waters-Syria

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**Abstract**— *Clupeid* fish occupies the first place in the economic fisheries in the world, as the annual catch rate of its species has reached (11) million tons (more than 20% of the general catch of fish in the world), of which more than a thousand tons are caught annually in the Mediterranean [1] [2].

While doing our current research entitled: "Study of diet, age and growth, and determination of the concentrations of some trace elements in *Sardinella maderensis* (Lowe, 1838) fish in marine waters of Lattakia coast", after collecting about 350 sardines in the period from 20/10/2021 to 28/04/2022, and when studying the gonads and stages of sexual maturity for those individuals, we found a case of hermaphroditism in one individual of *Sardinella maderensis* fish, 13 cm long and 18.05 g, caught on 17/03/ 2022 using the gill net, after examining and comparing the data of our current research and with the reference data, we confirm the existence of this phenomenon among individuals of *Sardinella maderensis* fish in our Syrian marine environment, and it is recorded for the first time.

**Keywords**— hermaphroditism, *Sardinella maderensis*, Syrian marine waters.

### I. INTRODUCTION

The seas in the world are exposed to multiple pollutants resulting from various activities (domestic - industrial - agricultural), where one of the most important risks facing humanity and other organisms is environmental pollution[3] and this is reflected in fish wealth and the suitability of fish meat for human consumption.

Sardines are distributed throughout the Mediterranean and are of high economic value [4].

Sardines caught in our territorial waters are included in the marine economical fish species list.

Four species of them were recorded in Syrian commercial fishing: (*Sardinella maderensis*, *Sardinella aurita*, *Etrumeas teres*, and *Alosa fallax*) [5] [6] [7].

*Sardinella maderensis* lives swimming in the pelagic coastal waters but tolerates low salinity in shallow waters in estuaries. It feeds on a variety of small plankton. It also hunts invertebrates, fish larvae, and phytoplankton. They reproduce in the epipelagic zone during the warm months [4]

*Sardinella maderensis* are Separate sex fish. the gross sexual maturity of *Sardinella maderensis* includes five stages according to [8].

•The first stage (immature) the gonads are about one-third the length of the body cavity, the ovary is pink and transparent and the testis is white, the eggs are not seen with the naked eye.

• The second stage (firstborn maturation and recovery) the gonads are about half the length of the body cavity, the ovary is transparent pink and the testis is white, the eggs cannot be seen with the naked eye.

• The third stage (maturity) the gonads are about two-thirds of the body cavity length. The ovary is pinkish-yellow granular in appearance and the testicle is creamy white. the eggs cannot be seen with the naked eye.

• Fourth stage (puberty) the gonads are about two-thirds of the body cavity length. The ovary is orange-pink with clear superficial blood vessels and large, transparent, mature, and visible ovules. The testicles are creamy-white and smooth.

• The fifth stage (post-ovulation) the testicle and ovary shrink to about half the length of the body cavity. The ovary may contain remnants of decomposing opaque and mature or transparent eggs engorged with blood and a flabby testicle.

### II. RELATED WORK

Sardine has several characteristics that make it one of the most important Syrian local fish, including its low price compared to the price of local fish, therefore, it is an important source of protein available to the majority of the population in addition to its anti-cancer properties, as it is beneficial for the heart, enhances the immune system, rich in nutrients and minerals, prevents anemia, maintains blood sugar levels, in addition to being used locally as bait for other fish, The interest in studying fish reproduction came from the fact that it contributes to the proper

management of fisheries, as determining the length at the first sexual maturity of fish determines the measurement of the openings of fishing nets as well as knowing the times of their reproduction to prevent fishing during the breeding times to allow fish to reproduce and mature even once. Several studies have been conducted on the reproduction of *Sardinella maderensis*, including the study of growth, mortality, and reproduction in fisheries off the Caribbean, Cameroon [9], the study of reproductive patterns in Cameroon[10], and the study of reproductive biology in Morocco [8]. There are no local studies on the reproduction of *Sardinella maderensis* and we are researching the reproduction of *Sardinella maderensis* in the Syrian marine waters for the first time.

**III. METHODOLOGY**

Samples of *Sardinella maderensis* were collected from the marine waters of the coast of Lattakia between 20/10/2021 and 28/04/2022 using gills nets (14\*14mm). The number of individuals was 350 individuals. Morphometric measurements were taken for each individual, digestive tubes were removed to study diet, the sex of each fish was determined, as well as the stage of sexual maturity according to five different stages. The gonads were preserved with 10% formalin for later histological study for Fertility and reproductive period. the scales were also removed to determine the age and age structure of the *Sardinella maderensis* populations.

**IV. RESULTS AND DISCUSSION**

The results of the gonads examination of *Sardinella maderensis* caught in the Syrian marine waters during the period between 20/10/2021 and 28/04/2022 showed the presence of a case of hermaphroditism in one of the individuals (*Sardinella maderensis* fish, 13 cm total length and a weight of 18.05 g, caught on 3/17 / 2022 using the gill net.....



Figure (1): Normal testes with a weight of 2.07 g of a *Sardinella maderensis* fish, 17 cm long and 36.64 g, caught from Ras al-Basit on 28/04/2022.



Figure (2): Normal ovaries with a weight of 0.15 g in a *Sardinella maderensis* fish, 14 cm long and 22.25 g, caught from Ras al-Basit on 28/04/2022.



Figure (3): Testes with a weight of 0.12 g of a *Sardinella maderensis* fish, 13 cm long and 18.05 g, caught from Ras al-Basit on 17/03/2022.



Figure (4): Ovaries with a weight of 0.07 g in a *Sardinella maderensifish*, 13 cm long and 18.05 g, caught from Ras al-Basit on 17/03/2022.

## Discussion

It was not possible to differentiate between male and female outwardly, but upon autopsy two types of gonads were found, different in shape, size, and nature, and they have separate genital ducts and open independently on the genital papilla, which was muscular and not membranous as expected in the female as mentioned by the examiner George [11]. It can be considered an abnormal condition, as it was observed that there were right-sided testes with two perfect lobes, with a total weight of 0.12 g, in a pale white color, where the testes were elongated in the form of a fleshy spherical pouch Figure (3), while on the left side we found ovaries with two perfect lobes, with a total weight of 0.07 g, in a reddish color with a membranous nature and an elongated, flabby shape. Figure (4).

Given the measurements of the fish and their comparison with other mature specimens, it can be said that the fish has not yet entered the stage of sexual maturity, which makes us not sure which of the gonads will mature and release their reproductive secretions, so all possibilities are in place.

The arrangement of the parts of the gonads is widely variable in the case of abnormal hermaphroditism. James [12] notes that the shape of the oval gonads is divided almost equally into half testis and half ovary. Chacko & Krishnamurthy [13] note that the anterior third of the gonads are testes and the rest are ovaries. While Prabhu & Anatomy raja [14] found that the left gonad was a complete ovary, while the right was a complete testis, which is identical to what was found in our studied sample hunted the Syrian marine waters. This incident is recorded for the first time in *Sardinella maderensis* in Syria.

It was found that pollution with heavy metals affects the testes of fish [15] and thus the productivity of fish. Pollution can also cause mutations that may be the cause of an abnormal phenomenon such as hermaphroditism, where the Syrian coast was exposed to the leakage of an oil slick from the two reservoirs of the thermal station in the eighth month of 2021.

## V. CONCLUSION AND FUTURE SCOPE

Studying the biological characteristics of economic marine fish, to develop fisheries and fish farming, is a major goal of scientific and governmental organizations in the world. As we record our current search "Study of diet, age and growth, and determination of the concentrations of some trace elements in *Sardinella maderensis* (Lowe, 1838) fish in marine waters of Lattakia coast"

The presence of hermaphroditism in *Sardinella maderensis* (for the first time) in the marine waters of the coast of Lattakia – Syria, is consistent with international scientific references [12], [13] and [14]

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