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First record of hermaphroditism in Bullet tuna *Auxis rochei* in the Mediterranean Sea: Syrian marine waters

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ABSTRACT

We report the first record of Hermaphroditism in Bullet tuna *Auxis rochei* caught in Syria – Eastern Mediterranean Sea When doing our current research entitled: "A Biological Study of economic marine fish species *Auxis rochei* in the marine waters of Lattakia and determining the concentrations of heavy elements in their tissue". The Bullet tuna *Auxis rochei* was sampled in purse seine from Ras Albasit – Eastern in Mediterranean Sea, between October 2021 - September 2022, we found a low prevalence of Hermaphroditism (one sample out of a total of 98 *A. rochei*) during studying the gonads and stages of sexual maturity for those individuals. We have confirmed this phenomenon through histological data of the sections in two sexes gonads.

Keywords: Hermaphroditism, *Auxis rochei*, Syrian marine waters, Mediterranean Sea.

1. INTRODUCTION

Hermaphroditism is the expression of both male and female reproductive functions differently in a single individual, abnormal hermaphroditism is an unusual type of hermaphroditism in which the gonads occasionally have both mature testicular tissue with sperm and ovarian tissue with vitellogenic stage oocytes (De-Mitcheson and Liu, 2008). Bullet tuna *A.rochei* belongs to the genus *Auxis* of the family Scombridae (Collette, 1986; Jasmine et al., 2013). The species is a multiple spawner with asynchronous oocyte development that carried out several spawning steps by reproductive season (Macías et al., 2006; Niiya, 2001). Several authors are described this biophenomenon in a number of teleost genus belongs to the families Scombridae such as: *Scomber scombrus* (Stewart, 1891), *Rastrelliger kanagurta* (Prabhu and Raja, 1958), *Katsuwonus pelamis* (Raju, 1960; Uchida, 1961), *Scomber japonicas* (Okiyama and Kawaguchi, 1974) *Thunnus orientalis* (Sawada et al., 2002), *Thunnus thynnus* (Caprioli et al., 2007), *Katsuwonus pelamis* (Pillai et al., 2007), *Scomber japonicas* (Özekinci et al., 2009) and *Euthynnus alletteratus* (Macías et al., 2014) but information on the abnormal hermaphroditism of *A.rochei* was not reported from the Mediterranean Sea. The main goal of this

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study is to report on a rare occurrence of an abnormal Hermaphroditism in Bullet tuna *Auxis rochei*.

2. MATERIAL AND METHODS

A total of 98 individuals were sampled between October 2021 – September 2022 by Purse seine in Ras Albasit – Syria – Eastern Mediterranean. Each specimen was measured for fork length to the nearest mm and weighted to the nearest 10 g. Gonads were removed from the gut cavity and identified as being male or female and gonad weight measured to the nearest g. Gonad stages and sexual maturity of specimens were determined using a macroscopic classification (Diouf, 1980). Histological sections were also performed for two sexes gonads.

3. RESULTS AND DISCUSSION

The result of the gonads examination of *A.rochei* showed the presence of a case of hermaphroditism in one of the individuals (Figure 1) by total weight 1308g and total length 431mm and fork length 414mm, caught on 10/8/2022 using the purse seine. The gonads were outwardly clear in terms of shape, size and color. We found a male gonad extending into the abdominal cavity with a total weight of 136.19g, white color and an atrophic female gonad in the male's gonads near its genital opening, yellow - orange color with a weight of 0.68g.

The histological sections of the gonads also showed the following (Figure 2A, 2B):

Male gonad (Figure 2A): Some spermatids and abundant spermatozoa (spz), greatly enlarged tubules, sperm duct full of sperm.

Female gonad (Figure 2B): Atrophic female progeny as a result of the growth and development of the male progeny at this expense.

Saber et al., (2019) study on the histological structure of the male gonads in *A.rochei* showed the presence of some spermatids and abundant spermatozoa, greatly enlarged tubules, sperm duct full of sperm and this is consistent with our results in the histological sections of the gonad of *A.rochei* but Atrophic female progeny as a result of the growth and development of the male progeny at this expense.

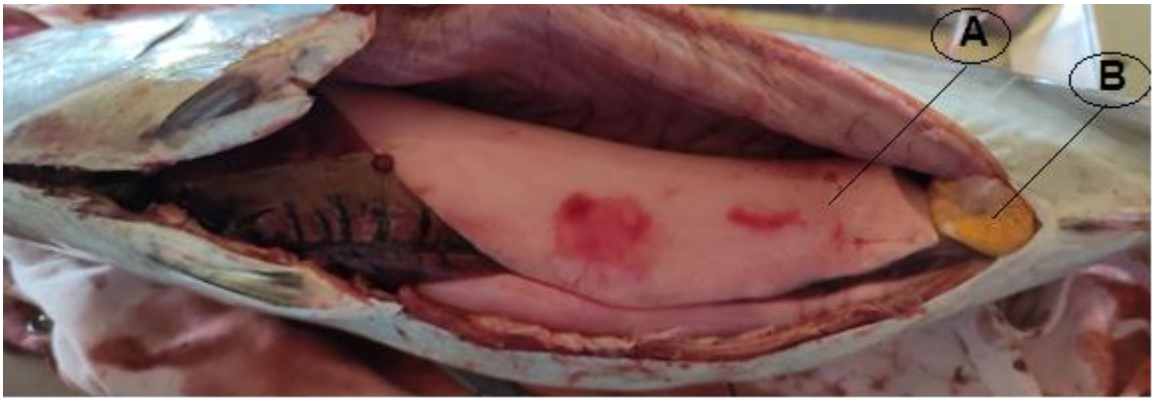

Figure 1 Abdominal cavity in *A.rochei*, showing male gonad (A) and female gonad (B)

Figure 2A Macroscopic and microscopic photographs of spawning stage of male *A. rochei*

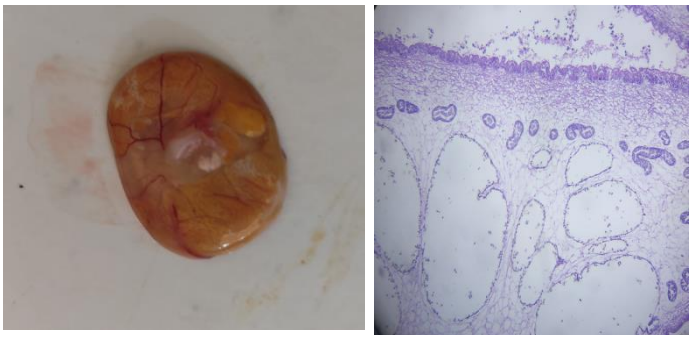

Figure 2B Macroscopic and microscopic photographs of female *A. rochei*

Devlin and Nagahama, (2002) attributed the phenomenon of hermaphroditism to environmental factors (pollution) and endogenous processes as affecting the sex determination of fish and this is what we confirm through the data for our current results 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.

4. CONCLUSION

As a result of our current research, the phenomenon of hermaphroditism is recorded for the first time in the *Auxis rochei* in the waters of the Mediterranean – Syrian marine waters.

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Author Contributions

All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by Ranim Mohammad Othman, Mohamad Younis Galiya, Hussam Eddin Karim Laika and Zouher Ahmad Almajid. Which the first draft of the manuscript was written by Ranim Mohammad Othman and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Declaration

I declare that this work which is in your hands is entitled: "First record of hermaphroditism in Bullet tuna *Auxis rochei* in the Mediterranean Sea: Syrian marine waters" has never been submitted to any other journal, it is the result of my laboratory work in the laboratories of graduate studies of Hydrobiology in the Faculty of Science Tishreen-University and any return to another search in this topic is documented in the text. This work has not been sent or published in any other journal.

Informed consent

Not applicable.

Ethical approval

The Animal ethical guidelines are followed in the study for species observation, identification & experimentation.

Conflicts of interests

The authors declare that there are no conflicts of interests.

Funding

The study has not received any external funding.

Data and materials availability

All data associated with this study are present in the paper.

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