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REPRODUCTIVE BIOLOGY OF THE KURUMA SHRIMP *MARSUPENAEUS JAPONOCUS* ON THE WESTERN MEDITERRANEAN EGYPTIAN COAST

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ABSTRACT

The reproductive biology of 3418 specimens of Kuruma shrimp *Marsupenaues japonocus* collected from catches on the western Mediterranean Egyptian coast (Alexandria Port) was studied. There were monthly variation in sex ratio between males (1553 shrimp = 45.4%) and females (1865shrimp =54.6%). Overall sex ratio was 1: 1.20 for males to females respectively. The length at 50% maturity was 5.4cm carapace length for males and 6cm carapace length for females. The breeding season extends from April to September for males and May to October for females.

Keywords: Reproduction, *Marsupenaues japonocus*, the western Mediterranean, Egyptian coast.

1. INTRODUCTION

The study of reproduction of prawns is an important item in fishery biology. The determination of sex and sexual maturity stages find their primary application in providing basic knowledge of the reproductive biology of a stock (Yassien, 1992). The information derived from these analysis can be used in ascertaining the age and size at which prawn attain sexual maturing, the time and place of spawning and the duration of the cycle from the beginning of the development of the ovary to the final release of eggs (EL-Ganainy and Yassien, 2012). Although the important penaid prawns has been studied since the original work of Heldt, (1938); Petarson, (1939) and Hudinuga, (1942) and others, few information are currently available for *Marsupenaues japonocus*.

In Egypt some studies on the reproduction of penaeid species were reported by AL-kholy and EL-Hawary, (1970) and Yassien (1992) in the Red Sea by Abdel-Razek, (1974, 1985, 1988) in the Mediterranean and Delta Lakes by Bishara,(1976), in Lake Manzalah by Ishak *et al.*, (1980) in Lake Qaruon and by Gab- Alla *et al.*, (1990) in the Suez Canal Lakes.

The present work aimed to investigate the reproductive biology of *Marsupenaues*

japonocus collected from the western Mediterranean Egyptian coast.

MATERIALS AND METHODS:

Monthly subsamples were obtained from the commercial catch of *Marsupenaues japonocus* from Alexandria Port. Western Mediterranean Egyptian coast during the period from May 2015 to April 2016.

The following data were collected for both sexes separately:

- Carapace length (cm).
- Total body weight (gm).
- Total gonad weight (gm).
- Dissection of each individual was

conducted to follow up the maturity stages. Observations by naked eye on the mature, colors, size and turgidity or texture of the ovary for target species were recorded, and hence the season of highest spawning activity was determined.

The gonads after being removed were weighed to the nearest 0.01gm. The gonad somatic index (G.S.I) was calculated by the following formula:

$$\text{G.S.I} = \frac{\text{Weight of gonad (mg)}}{\text{Total body weight (gm)}} \times 100$$

The total body weight = total weight + viscera

RESULTS

Sex ratio:

There were monthly variation in sex ratio between males (1553 specimens = 45.4%) and females (1865 specimens = 54.6%). Sex ratio was 1:1.20 for males and females respectively (Table 1 and Fig. 1).

During all months except September and October, the numbers of females was higher than males. The percentage of females recorded highest values in February (63.6%), May (65.0%), June (61.3%), July (60.5%), August (60.0%) and November (60.8%).

The Ganado Somatic Index (G.S.I):

The values of gonado somatic index (G.S.I) of males were lower than that of females. The average values of G.S.I. of males recorded high values in July (2.09), August (2.23%) and September (2.77%) and low values in October (0.48%), November (0.71%) and December (0.82%) (Fig. 2). The average values of G.S.I. of Females increased from May (4.23%) to high values in September (6.32%) and October (6.79%). Then decreased to low values in November (1.33%), December (1.53%), January (1.93%), February (2.11%), march (2.37%) and April (2.71%) (Fig. 3). From the previous data the spawning season extend from April to September for males and May to October for females.

Maturity stages:

In male immature stage recorded by (81.2%) in November to (70.1%) in January, then decreased in the following month to (0.8%) in July. Maturing stage recorded by (30.3%) in May to (25.2%) in October. the same trend in late maturing, spent stage begging in July by (14.9%) to (1.1%) in March (Fig.4). In females immature stage recorded by (88.3%) in November to (93.2%) in January, then decreased in the following month to

(0.6%) in June. Maturing stage recorded by (39.2%) in May till (24.7%) in October. the same trend in late mature, spent stage begging by (12.3%) in July to (2.1%) in January (Fig.5).

The length at first sexual maturity:

The distribution of maturing and late mature specimens for each carapace length group for males and females was analyze to determine the size at 50% sexual maturing (L_{50}) (Tables 2&3). All males with a carapace length range from 2.0 to 9.9cm were mature. First maturation size was estimated for males at 5.4cm (L_{50} = 5.4 cm carapace length) (Fig. 6). All females with a carapace length higher than 3.0cm were mature. First maturation size was estimated for females at 6.0cm (L_{50} = 6.0 cm carapace length) (Fig. 7).

DISCUSSION

Reproduction characteristic is one of the most important aspects in dealing with the fishery biology of prawns. In the present work the overall sex ratio was 1:20 for males and females respectively for *Marsupenaeus japonocus* and these results are in agreement with those results of *M. japonocus* in Mediterranean and Delta lakes of Egypt (Abdel-razek, 1974), in the Arake Sea and Jachibana Bay, Japan (Minagawa *et al.* 2000).

The sex ratio was not constant throughout the years, particularly during the breeding season of the target species (Ishak *et al.*, 1980). Females are the dominant sex in the prawn (Yassinn, 1992 and Gab-Alla *et al.*, 1990). It is possible that the females are heavier and caught in the gear in larger numbers than that male, resulting in an unbalanced sex ratio (Heldt, 1938).

A large number of keys for maturity staging prawns have been devised, as King (1948), Lindner and Anderson (1956), Eldered *et al.* (1961) and Abdel Razek (1985).

In the present study the key of Abdel Razek (1985) was followed using five stages of maturity: immature, early maturing, maturing, late mature and spent stages for *Marsupenaeus japonocus*.

Determination of the spawning season of *M. japonicus* was done by following the variation in the monthly distribution of maturity stages. The results show that ripe females of *M. japonicus* in western Mediterranean Egyptian Coast are expected to be found in small numbers all the year round with an intensive peak of spawning during the period from May to October for females and from April to September for males. The result corporates

In the present work, the maturation size was estimated for males ($L_{50} = 5.4\text{cm}$ carapace length) and for females ($L_{50} = 6.0\text{cm}$ carapace length). These values are nearly similar to those recorded by Abdel.Razek, (1988) in Egyptian waters on Mediterranean Sea but smaller than those recorded by Minagawa *et al.*(2000) in Japanese waters.

Table (1): Monthly variations in sex ratio of *Marsupenaeus japonicus* collected from the western Mediterranean Egyptian coasts during the period from May 2014 till April 2016.

Sexes Months	No. of specimens	Males		Females		Sex ratio
		No.	%	No.	%	
May (2015)	181	64	35.4	117	65	1 : 1.83
Jun.	313	121	38.7	192	61.3	1 : 1.59
Jul.	347	137	39.5	210	60.5	1 : 1.53
Aug.	390	156	40.0	234	60.0	1 : 1.50
Sep.	318	258	81.1	60	18.9	1 : 0.23
Oct.	278	188	67.6	90	32.4	1 : 0.48
Nov.	324	127	39.2	197	60.8	1 : 1.55
Dec.	257	90	35.0	167	65.0	1 : 1.86
Jan. (2016)	272	119	43.8	153	56.3	1 : 1.29
Feb.	264	96	36.4	168	63.6	1 : 1.75
Mar.	273	110	40.3	163	59.7	1 : 1.48
Apr.	201	87	43.3	114	56.7	1 : 1.31
Totals	3418	1553	45.4	1865	54.6	1 : 1.20

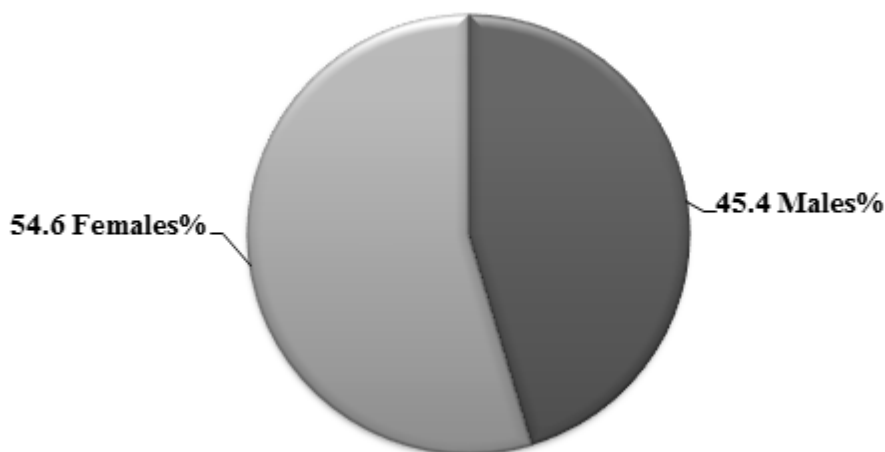


Figure (1): Overall sex ratio of *Marsupenaeus japonicus* collected from the western Mediterranean Egyptian coast during the period from May 2014 till April 2016.

those observed in the Egyptian waters (Al. Kholy and El- Hawary, 1970 & Abdel Razek 1974) and in the Japanese waters, in the Ariake Sea and Jachibana Bay (Minagawa *et al.*2000).

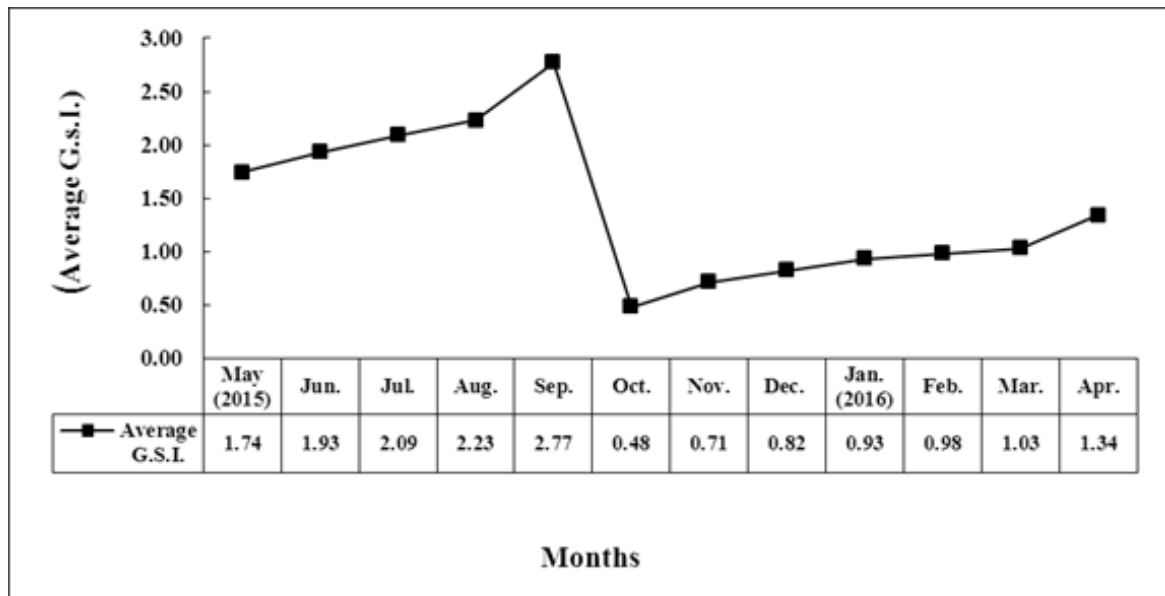


Figure. (2): Monthly variations in the average gonado-somatic indices in males *Marsupenaeus japonocus* collected from the western Mediterranean Egyptian coast during the period from May 2014 till April 2016.

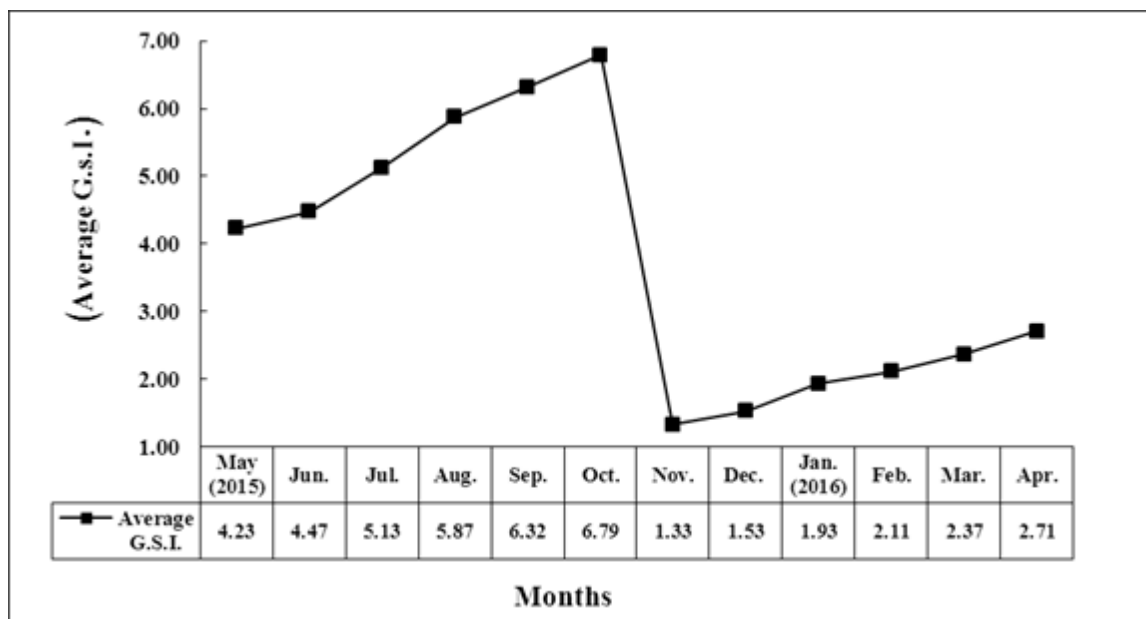
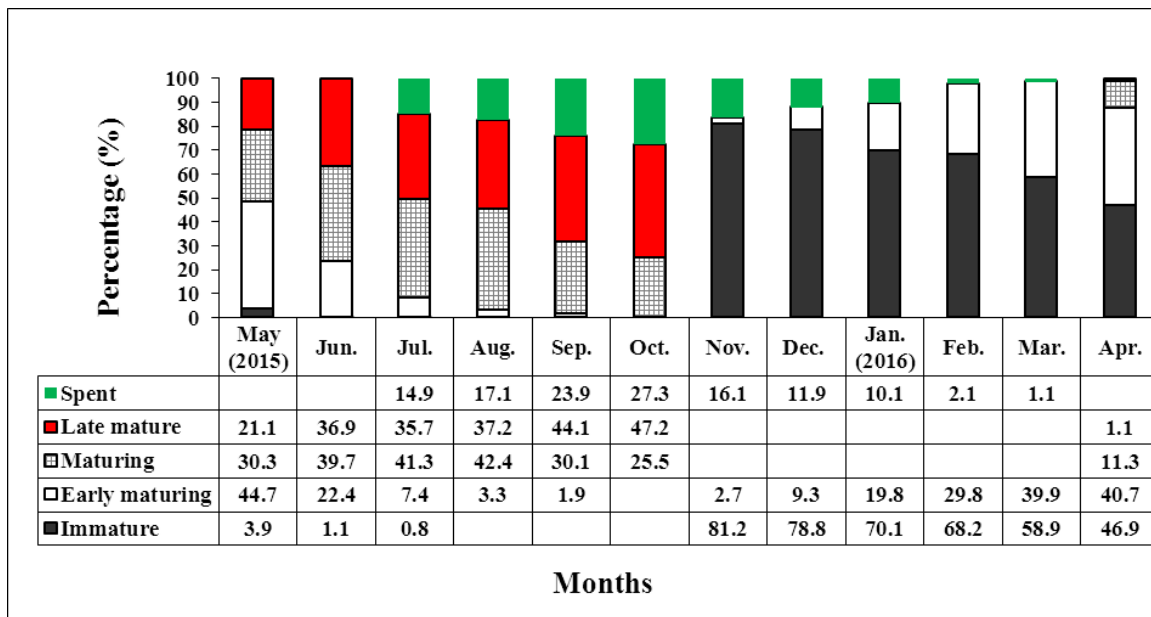
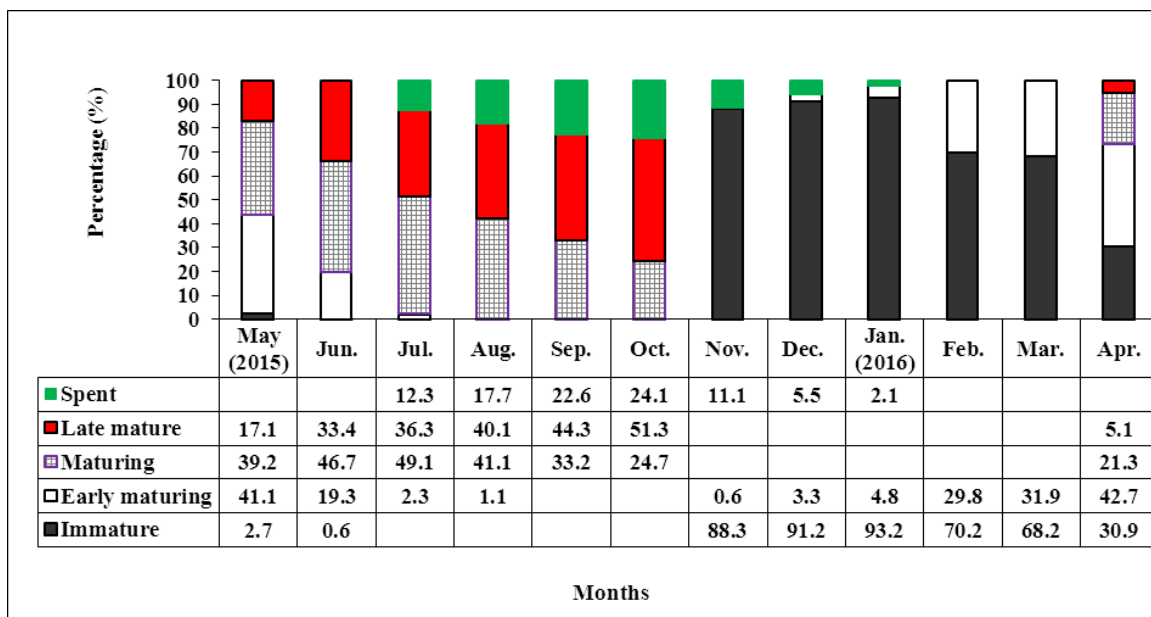


Figure. (3): Monthly variations in the average gonado-somatic indices in females *Marsupenaeus japonocus* collected from the western Mediterranean Egyptian coast during the period from May 2014 till April 2016.



Figure(4): Monthly changes in the stages of sexual maturity in males *Marsupenaeus japonicus* collected from the western Mediterranean Egyptian coast during the period from May 2015 till April 2016.



Figure(5): Monthly changes in the stages of sexual maturity in females *Marsupenaeus japonicus* collected from the western Mediterranean Egyptian coast during the period from May 2015 till April 2016.

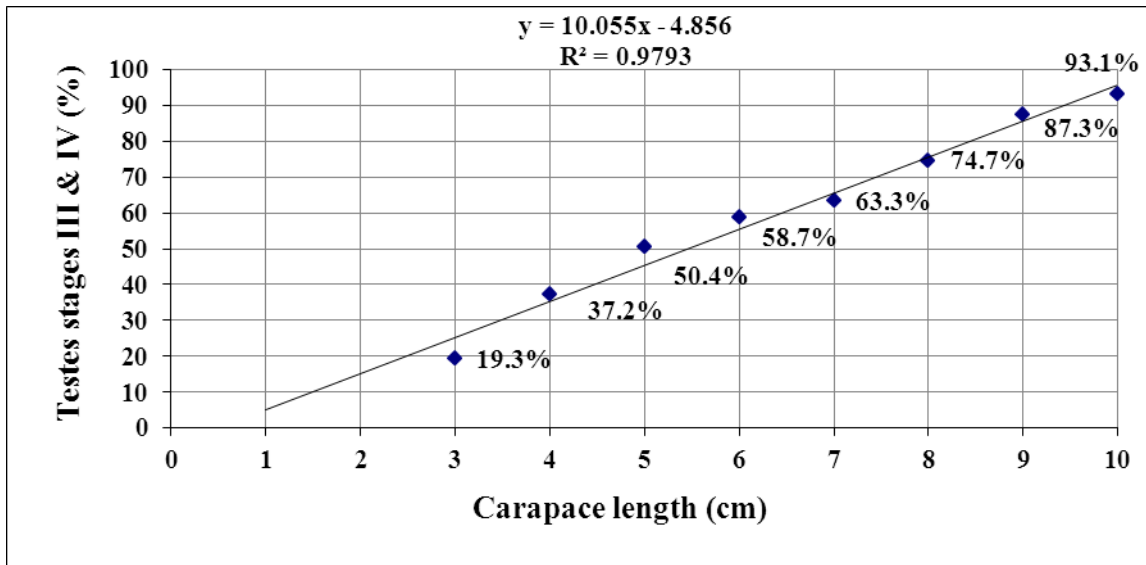


Figure (6): Relationship between testes maturation stages (III & IV) of males *Marsupenaeus japonicus* collected from the western Mediterranean Egyptian coast during the period from May 2014 till April 2016.

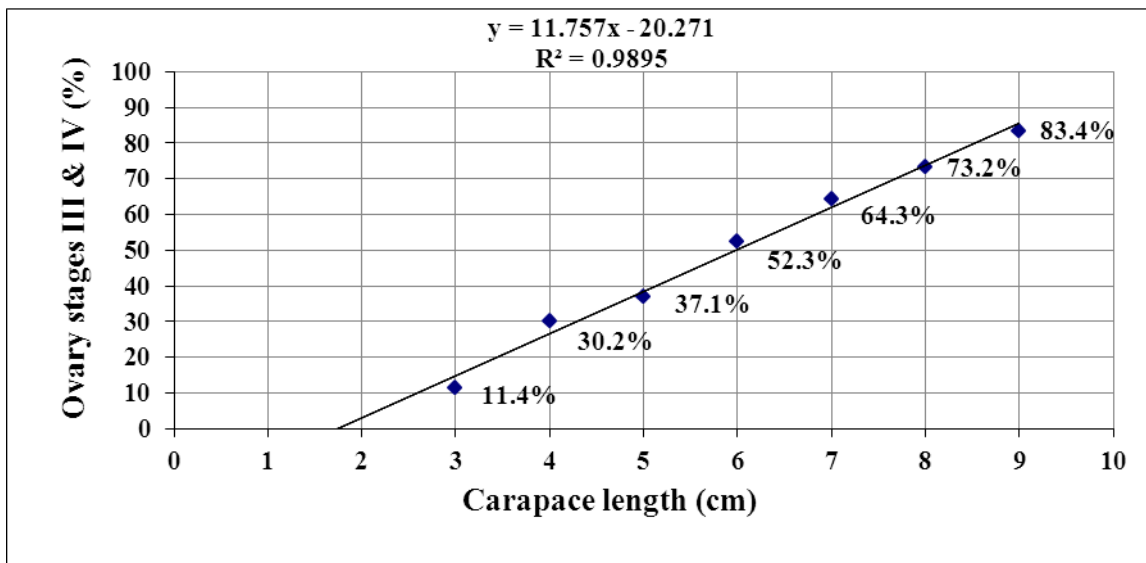


Figure (7): Relationship between ovary maturation stages (III & IV) of females *Marsupenaeus japonicus* collected from the western Mediterranean Egyptian coast during the period from May 2014 till April 2016.

Table (2): Percentage incidence of different stages of test maturation for different carapace length groups of *Marsupenaeus japonicus* collected from the western Mediterranean Egyptian coast during the period from May 2014 till April 2016.

Carapace length (cm)		Maturity stages						
Range	Mid point	Immature I	Early Maturing II	Maturing III	Late Mature IV	Spent	III & IV (%) observed	III & IV (%) calculated
2.0-2.9	2.45	-	20.1	13.4	5.9	-	-	-
3.0-3.9	3.45	43.1	19.7	28.1	9.1	-	22.2	29.8
4.0-4.9	4.45	23.2	26.4	32.5	17.9	-	41.2	39.9
5.0-5.9	5.45	10.1	31.3	41.2	17.5	-	50.7	49.9
6.0-6.9	6.45	11.3	25.4	31.8	31.5	-	53.3	60.0
7.0-7.9	7.45	2.8	21.3	47.2	27.5	1.3	65.7	70.1
8.0-8.9	8.45	0.9	8.0	34.6	52.7	3.8	79.0	80.1
9.0-9.9	9.45	-	2.2	21.8	71.3	4.7	84.1	90.2

Table (3):

Carapace length (cm)		Maturity stages						
Range	Mid point	Immature I	Early Maturing II	Maturing III	Late Mature IV	Spent	III & IV (%) observed	III & IV (%) calculated
1.0-1.9	1.45	92.2	7.8	-	-	-	-	-
2.0-2.9	2.45	80.3	19.8	-	-	-	-	-
3.0-3.9	3.45	76.5	23.5	10.1	1.3	-	11.4	20.3
4.0-4.9	4.45	42.2	27.6	26.3	3.9	-	30.2	32.0
5.0-5.9	5.45	23.8	39.1	28.4	8.7	-	37.1	43.8
6.0-6.9	6.45	12.3	35.4	38.4	13.9	-	52.3	55.6
7.0-7.9	7.45	3.3	32.3	39.5	24.8	0.2	64.3	67.3
8.0-8.9	8.45	-	26.4	25.6	47.6	0.4	73.2	79.1
9.0-9.9	9.45	-	10.3	23.2	60.2	6.3	83.4	90.8

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بيولوجية تكاثر الجمبري الاقتصادي " مارسو بنبيس جابونكس " فى السواحل الغربية المصرية- البحر المتوسط

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الملخص العربي

تم دراسة بيولوجية التكاثر لعدد ٣٤١٨ عينة من الجمبري الاقتصادي (مارسو بنبيس جابونكس) من المصيد التجاري في ميناء الإسكندرية على الشواطئ الغربية المصرية المطلة على البحر المتوسط. ومن خلال الدراسة وجد أن الإناث تمثلت ب ١٨٦٥ عينة بنسبة ٥٤,٦% والذكور بعدد ١٥٥٣ عينة بنسبة ٥٤,٤% بشق جنسي عام ١:١,٢٠ للذكور والإناث على التوالي وكان بداية النضج الجنسي للذكور $L_{50} = ٦\text{cm}$ وللإناث $L_{50} = ٥.4\text{cm}$. ويمتد موسم التكاثر للذكور من أبريل إلى سبتمبر وللإناث من مايو حتى أكتوبر .

الكلمات المفتاحية: بيولوجية التكاثر - مارسو بنبيس جابونكس- غرب البحر المتوسط على السواحل المصرية .