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Full Length Research Paper

Surveillance Robot Using Microcontroller and DTMF Technology

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ABSTRACT

The present paper discusses a surveillance robot controlled by a mobile phone that makes a call to another mobile phone attached to the robot. In the course of a call, if any button is pressed, a tone corresponding to the button pressed is heard at the other end of the call by means of a "Dual Tone Multiple-Frequency" (DTMF) tone. The robot perceives this DTMF tone with the help of the phone attached to it. The received tone is processed by the microcontroller with the help of a decoder IC. The microcontroller then transmits the signal to the motor driver ICs. One of the motor drivers IC is used to operate the motors connected to the chassis in order to drive the motors for forward or backward motion or take a turn. Other motor driver IC is used for driving the motors used for the rotation of the mobile phone which acts as camera and cause it to rotate through an angle of 360 degrees horizontally as well as vertically. The mobile that makes a call to the mobile phone stacked in the robot acts as remote control. So this research does not require the construction of receiver and transmitter units.

Key words: DTMF, Remote Control, Mobile Phone, Robotics

1. INTRODUCTION

Robotics is an interesting field where every engineer showcases his creative and technical skills. Pleasing aspect of robotics is that a robot can be made indigenously by anyone. In this competitive world there is need for every enthusiastic, from amateur to professional, to make a simple robot having innovated applications and with robust control. Mobile phones today became an essential entity for one and all and so, for any mobile-based application there is great reception. In this scenario making a mobile phone operated robot is a good idea. In this paper the robot is controlled by a mobile phone that makes a call to the mobile phone attached to the robot. In the course of a call, if any button is pressed a tone corresponding to the button pressed is heard at the other end called "Dual Tone Multiple frequency (DTMF) tone.

The robot receives these tones with help of phone stacked in the robot. The received tone is processed by the Microcontroller with the help of DTMF decoder IC MT8870. This decoded signal is sent to the microcontroller and further microcontroller sends corresponding signal to the motor driver IC L293D which drives the motor in forward direction, reverse direction, turn left, turn right. There is another IC L293D which is used to rotate the structure having a camera within it. This

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camera is used for surveillance and its movement is controlled in the same way by the microcontroller IC according to the DTMF tones it receives which causes the rotation of the motor attached to the camera in vertical and horizontal directions, clockwise as well as anticlockwise. Conventionally, wireless controlled robots use RF circuits, which have the drawbacks of limited working range, limited frequency range and limited control. Use of mobile phone for robotic control can overcome these limitations. It provides the advantage of robust control, working range as large as the coverage area of the service provide.

2. WORKING PRINCIPLE

In order to control the robot, one need to make a call to the cell phone attached to the robot (through head phone) from any phone, which sends DTMF tunes on pressing the numeric buttons. The cell phone in the robot is kept in 'auto answer' mode. If the mobile does not have the auto answering facility, receive the call by 'OK' key on the rover-connected mobile and then made it in hands-free mode. The DTMF technique outputs distinct representation of 16 common alphanumeric characters (0-9, A-D, *, #) on the telephone. The lowest frequency used is 697Hz and the highest frequency used is 1633Hz. The DTMF keypad is arranged such that each row will have its own unique tone frequency and also each column will have its own unique tone frequency. By pressing a key, for example 5 will generate a dual tone consisting of 770 Hz for the low group and 1336 Hz for the high group.

3. CIRCUIT DESCRIPTION

An MT8870 series DTMF decoder is used here. All types of the MT8870 series use digital counting techniques to detect and decode all the 16 DTMF tone pairs into a 4-bit code output. The built-in dial tone rejection circuit eliminates the need for pre-filtering. When the input signal given at pin 2 (IN-) in single-ended input configuration is recognized to be effective, the correct 4-bit decode signal of the DTMF tone is transferred to Q1 (pin 11) through Q4 (pin 14) outputs. Q1 through Q4 outputs of the DTMF decoder (IC1) are connected to port pins PD0 through PD3 of microcontroller (IC2). Outputs from port pins PB0 to PB3 and PB4 to PB7 of the microcontroller are fed to inputs IN1 to IN4 and enable pins (EN1 and EN2) of motor driver L293D(1) and L293D(2) to drive two geared DC motors of chasses and to drive the two DC geared motors for camera rotation respectively.

The L293D consists of four drivers. Pins IN1 through IN4 and OUT1 through OUT4 are input and output pins, respectively, of driver 1 through driver 4. Drivers 1 and 2, and drivers 3 and 4 are enabled by enable pin 1 (EN1) and pin 9 (EN2), respectively. When enable input EN1 (pin 1) is high, drivers 1 and 2 are enabled and the outputs corresponding to their inputs are active. Similarly, enable input EN2 (pin 9) enables drivers 3 and 4.

Frequencies	1209 Hz	1336 Hz	1477 Hz	1633 Hz
697 Hz	1	2	3	A
770 Hz	4	5	6	B
852 Hz	7	8	9	C
941 Hz	*	0	#	D

Table 1: Generation of DTMF Tone

4. APPLICATIONS

Scientific

Remote control vehicles have various scientific uses including hazardous environments, working in the Deep Ocean, and space exploration. The majority of the probes to the other planets in our solar have been remote control vehicles, although some of the more recent ones were partially autonomous. The sophistication of these devices has fueled greater debate on the need for manned spaceflight and exploration. The voyager I spacecraft is the first craft of any kind to leave the solar system. The Martian explorer's spirit and opportunity have provided continuous data about the surface of Mars since January 3, 2004.

Military and law enforcement

Military usage of remotely controlled military vehicles dates back to the first half of 20th century. Soviet red army used remotely controlled teletanks during 1930s in the winter war and early stage of World War II. There were also remotely controlled cutters and experimental remotely controlled planes in the red army.

Remote control vehicles are used in law enforcement and military engagement for some of the same reasons. The exposures to hazards are mitigated to the person who operates the vehicle from a location of relative safety. Remote controlled vehicles are used by many police department bomb-squads to defuse or detonate explosives.

Unmanned aerial vehicles have undergone a dramatic evolution in capability in the past decade. Early UAVs were capable of reconnaissance missions alone and then only with a limited range.

Search and rescue

UAV's will likely play an increased role in search and rescue in various areas. This was demonstrated by the successful use of UAV's during the 2008 hurricanes that struck Louisiana and Texas.

Recreation and hobby

Small-scale remote control vehicles have long been popular among hobbyists. These remote controlled vehicles span a wide range in terms of price and sophistication. There are many types of radio-controlled vehicles. These include on-road cars, off-road trucks, boats, airplane, and even helicopters. The "robots" now popular in television shows such as robot war, are a recent extension of this hobby. Remote control submarine also exist.

5. ADVANTAGES

- A wireless controlled robot overcomes the limitation of wired robotics completely by using latest mobile phone technology.
- The project used cell phone technology with the limitation of radio transmission range being no more constraint and with almost limitless area coverage being the main advantage.
- No line of sight is needed as it can be controlled remotely.
- Not sensitive to light.
- Not much sensitivity to environmental and weather conditions.

6. CONCLUSION

Conventionally, wireless-controlled robots use RF circuits, which have the drawbacks of limited working range, limited frequency range and limited control. In this paper with the use of a mobile phone for robotic control, I have overcome these limitations. It provides the advantages of robust control, working range as large as the coverage area of the service provider, no interference with other controllers and up to twelve controls. Although the appearance and capabilities of robots vary vastly, all robots share the features of a mechanical, movable structure under some form of control. The control of robot involves three distinct phases: reception, processing and action. Generally, the preceptors are sensors mounted on the robot, processing is done by the on-board microcontroller or processor, and the task (action) is performed using motors. So the motive is that to increase the range of remote controlled products. For this mobile phone operated control is best because we can globalize this paper and no limitation of range. Along with this the idea of attaching a camera to the robot and controlling its movement also through the mobile phone proved to be a good idea as we can keep a track of all the activities going around the robot and we can control the robot remotely which helps us to use this for spying, security purposes, in military and defense applications and also monitoring the activities of the areas where human access is physically not possible.

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8. FIGURES

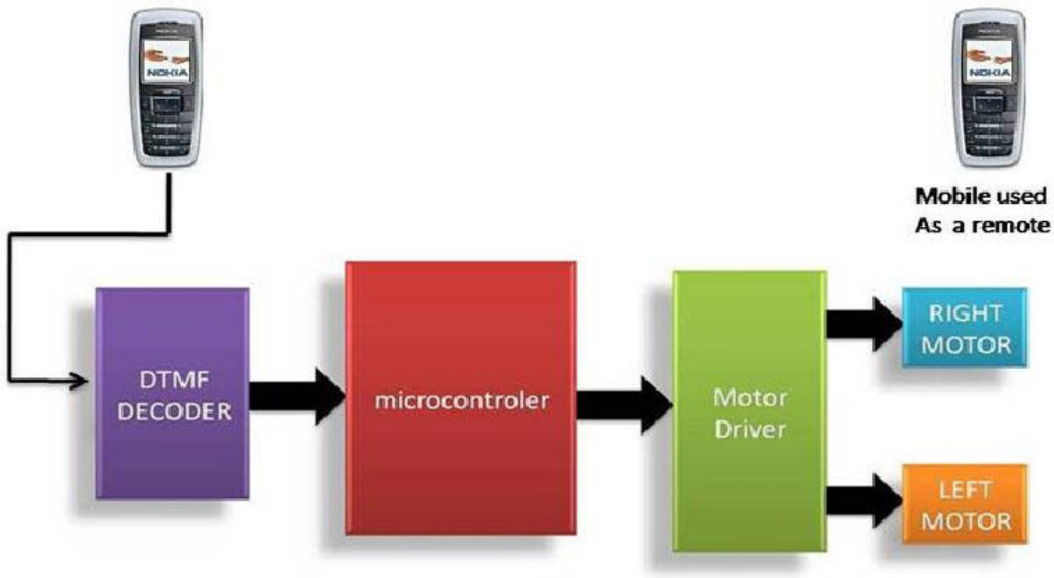

Figure 1: block diagram of surveillance robot

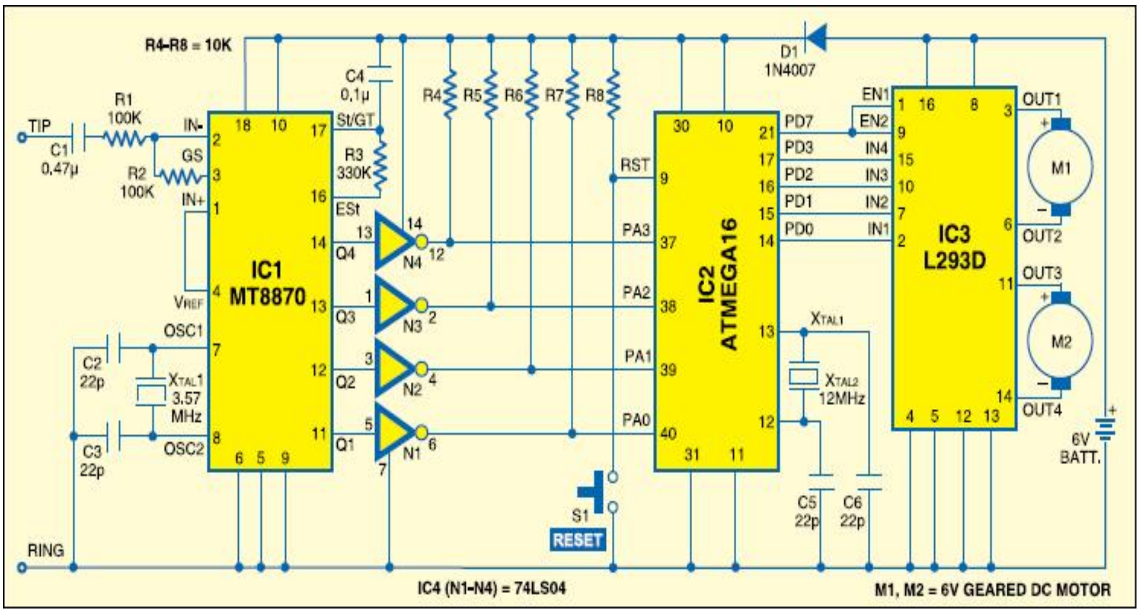

Figure 2: Circuit Diagram for Robot Surveillance

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Full Length Research Paper

Some Aspects on the Reproductive Biology of Greater Forkbeard Phycis Blennoides (Brünnich, 1768) in Western Algerian Coasts (Osteichthyes, Gadidae)

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ABSTRACT

The aim of this work was to study the annual reproductive cycle of the greater forkbeard (*Phycis blennoides,* Brünnich, 1768) through analysis and description of some physiological index. A sample of 225 females was captured between January 2012 and December 2012 from the Western coast of Algeria, from Mostaganem. Fish length and weight varied between 17.60-37.80 cm and 38.33-403.03 g, respectively.
Condition factors (K), gonadosomatic index (G.S.I.) and hepatosomatic index (H.S.I.) were calculated monthly.
Sex ratio of males to females was 1:0.91. The estimated length where 50% of analyzed individuals were sexual maturity was 24.73 cm for females. The peak value of the gonad somatic index was recorded in September and continued throughout October, indicating the highest spawning activity when the Kn values are low.

Key words: Greater Forkbeard, Phycis Blennoides, Gonadosomatic Index, Hepatosomatic Index, First Maturity, Spawning Period

1. INTRODUCTION

The greater forkbeard, *Phycis blennoides* (Brünnich, 1768) is a common gadoid occurring in the Mediterranean and in the North-eastern Atlantic, from Iceland to Morocco (Tortonese, 1975; Fisher *et al.,* 1987; Davis & Edwards, 1988; Whitehead *et al.,* 1989). It is usually found on muddy or sand bottoms in depths of 100-650m, the total length at first sexual maturity for males and females are 18-20 cm and 22-23 cm respectively (Gallardo-Cabello & Gual-Frau, 1984). In the Mediterranean, *P. blennoides* spawns from June to August (Gallardo-Cabello & Gual-Frau, 1984).

Taking into account that length at maturity, fecundity and sex ratio are some of the most important parameters in studying reproductive dynamics of gadoids population, this study was carried out by examination of annual changes of the gonado-somatic index

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(GSI), hepato-somatic index (HSI) and condition factor (Kn) in order to evaluate the level of the exploitation in the Algerian coasts.
In fact, on southern Mediterranean coast, the knowledge on *P. blennoides* is still fragmentary, being limited to some remarks about Algerian waters.
Therefore, the aim of the present paper was to study the reproduction and condition of this species. This is the first paper with a complete analysis of the biology of *P. blennoides* in the south-western Mediterranean.

2. MATERIAL AND METHODS

Reproduction study

A series of biological samples was conducted on specimens of *P. Blennoides* caught by the commercial trawlers in the sampling area of Mostaganem (Fig.1). Specimens' total length was measured and both sex and maturity were reported for females which represent the focus of our study, four different stages were defined (Table 1) according to (ICES, 2007).
For each fish, total length (TL) was measured using a simple caliper to the nearest 0.1 cm and weighed (Wt) to the nearest 0.1 g. Fishes were gutted, and gonads were removed and weighed (Wg) with three decimal accuracy. Sex was determined by macroscopic observation of the gonads (Macer, 1974). Sex ratio was examined using χ^2 (Chi-square) test with a probability level of 0.05 to test differences in relation to the expected ratio 1:1. The gonadosomatic index (GSI) was estimated as: GSI = Wg / Wt x 100. To estimate size at first sexual maturity, the data were fitted in equation: $P = 1/(1+e^{(abxL)})$; where P is probability that individuals are sexually matured and L is their length. The length when 50% of analyzed individuals were mature was calculated according to Sparre and Venema (1998): L50%=a/b.
Finally, to monitor morphological variations, the condition index was calculated to assess the degree of overweight consecutive to genital development and repletion state of the target species. Condition factor was studied in females in order to show differences of Kn (Le Cren, 1951) related to time, according to the formula: Kn = W/Wth with Wth = aL^b where "W" is the total weight, "Wth" is the theoretical weight, "a" and "b" are coefficients of the relative growth between weight and length and "L" is total length.

3. RESULT

Study of reproduction

1) Sex–ratio

After sexing of 461 specimens we found a sampling rate of 51.30% of Males significantly more important than females sex ratio (48.70%) the sex ratio (male: female) was 1:0.91and it was statistically different from 1:1 ratio (X2=24.37; P<0.05) (Table 2).
The length abundance curve is shown in Fig. 2. Fig. 3 shows a variation of the percentage of females per month. The female's percentage is dominant during fall and spring season, declining in the winter and summer period.
This finding indicates that males are, on average, significantly larger than females.
As regards the sexual maturation of females, different stages of maturation of the gonads during different months of the year are shown in Fig. 4.

2) Indices of fish condition

In our study we have used three indexes to determinate the spawning period of the species in the study area: the gonado-somatic index (GSI), hepatosomatic index (HSI) and condition index (Kn). These allowed to quantify morphological changes of the specimens and to identify reproduction period by studying the evolution of maturity stages of the ovary.

Hepato-Somatic Index (HSI) and Gonado-Somatic Index (GSI) and condition factor (Kn).

Monthly averages of GSI and HSI calculated from 225 females are plotted in Fig. 5. Only one peak were observed corresponding to the maximum annual spawning period of the population. The highest value of GSI were found in September (0.48 ± 0.06) and the lowest values in November (0.06 ± 0.04).

The highest values of the HSI occurred in July (9.19 ± 0.87) and the lowest fall in November (2.53 ± 0.34) (Fig. 5). Fig. 6 shows the condition factor Kn by seasons in both sexes. The values of Kn resulted overweight, thus revealing breeding events and confirming a rapid maturation occurring from July (1.12 ± 0.11) to September (0.91 ± 0.15) when the values of Kn are very low with irregular variations.

3) Length at maturity

For the statistical method, the L50 point estimated the body size at sexual maturity at 24.73 cm (Fig. 7). All data are combined in Table 3. Our results confirmed values reported for Mediterranean.

Fisheries which differ from those from the North Atlantic where specimen's length at maturity is longer than that they found in the Mediterranean Sea. Total individuals' length of the monthly samples ranged from a minimum of **17.50** centimeters to a maximum of **43.5** cm. Minimum sizes correspond to females and maximum sizes correspond to males.

4. DISCUSSION

This study presents first data of reproductive characteristics of forkbeard in the south-western Mediterranean Sea and therefore results were compared with other gadiform species common for this area.

We found a change in the rate of femininity with a significant dominance during the fall, which seems to correspond with the period when we recorded the maximum peak of the RGS which could correspond to a strong and early maturation of the ovaries.

The sex ratio showed a predominance of males, the catch rate (48.70%) for females (51.30%) for males, the sex ratio (male: female) is 1:0.91 In fact, this value is significantly different ($\chi 2$ = 24.37, p> 0.05) of the 1:1 theoretical value. The study of sex ratio depending on the size shows the dominance of male individuals up to size 26 cm, and that beyond this size the proportions of females are dominant, to the size where all females reach sexual maturity. These results are in agreement with the different regions of the Mediterranean (Gordon *et al.*, 1995. Rotllant et al, 2002.). This predominance of females in older individuals could be explained by several authors by availability or larger female catchability; is a higher natural mortality in males. These studies showed that the females grow faster than males: in four years (Cohen *et al.*, 1990.).

The RGS is a real coefficient of gonadal maturation. Its increase coincides with gametogenesis while its decrease indicates an active spawning (Lahaye, 1972). Tracking monthly changes RGS allowed us to know the times of sexual activity *P. blennoides* and its breeding season.

We observed the presence of gravid females with a maximum of 0.48 RGS September also, there are resting females in summer and winter; these observations could be explained by the fact that after spawning adult females would regain deep waters. Similarly, males have emissions of their sexual products with a maximum RGS 0.50 in September, this shows that the eggs are laid at the studied species could take place in autumn. Our results are almost similar to those obtained by other authors. They all define clearly the spawning period in autumn; This situation is common to all the Mediterranean coast (Gordon and Duncan, 1985) and in the Ionian Sea (Matarresse *et al.*, 1998). Presence of ripe females indicated that spawning of *Phycis blennoides* occurs during early autumn to early winter. Rotllant *et al.*, (2002) investigated population of *Phycis blennoides* in the western Mediterranean Sea. Mature females in their study were found only in autumn.

Parallel to the RGS, we studied the RHS since the energy required for gonad maturity comes from fat reserves stored in the liver. The observation of the temporal evolution of the hepato-somatic report *Phycis blennoides* females showing phases of hepatic synthesis and consumption phases of liver lipids. The largest decline RHS is during the autumn which synchronizes perfectly with the period of mass reproduction in females and coincides with the transfer of liver reserves to the gonad.

The results of the study of the condition index (Kn) in females, set and confirm the spawning period in the range from September to November, as from September, the value of Kn begins to decrease with a minimum in October, which could be explained by a loss of organic matter associated with the laying period.

We estimated the size at first maturity (L50) to 24.73 cm. According to Rodriguez - Cabello *et al.*, (1998), the size at first maturity of females of the Mediterranean is smaller than that found in the North Atlantic; this difference (also found in males) was explained by suggesting a possible relationship between the maturity of the species and latitude (Lam, 1983). Our findings and conclusions support obtained by various authors mentioned above suggests that the reproductive parameters of *Phycis blennoides* differ from one region to another, probably under the influence of various environmental and geographical parameters (Leloup & Oliverau, 1951 Relini & Orsi - Relini 1987 Capapé *et al.*, 1991; Demestre & Martin, 1993; Guijarro *et al.*, 2007), as the passage of Atlantic currents entering the Mediterranean through the Strait Gibraltar rich in organic matter providing an ideal enrichment Algerian deep waters (Cartes *et al.*, 2002), Silva (1986) calculated length at first maturity at 41 cm for females and 36 cm for males in Azorean waters and in this study that length was lower and equal to 24.73 cm for females.

In the conclusion, this study shows that Greater forkbeard has group-synchronous ovarian development and spawning season from early September to late November. The obtained results from this study are important input data for management and stock assessment of this commercially important fish species.

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6. FIGURES

Figure 1: Study Area

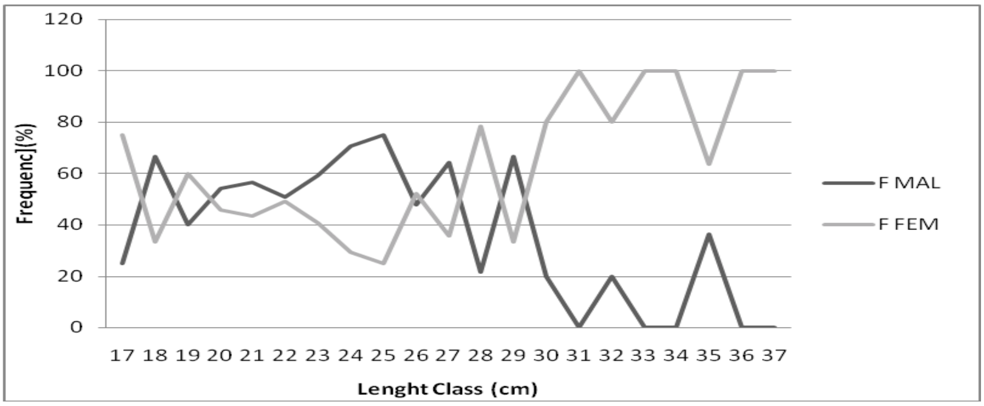

Figure 2: Abundance curve. Results of *X* 2 test show a predominance of one sex over the other by length of specimens (* p<0.05)

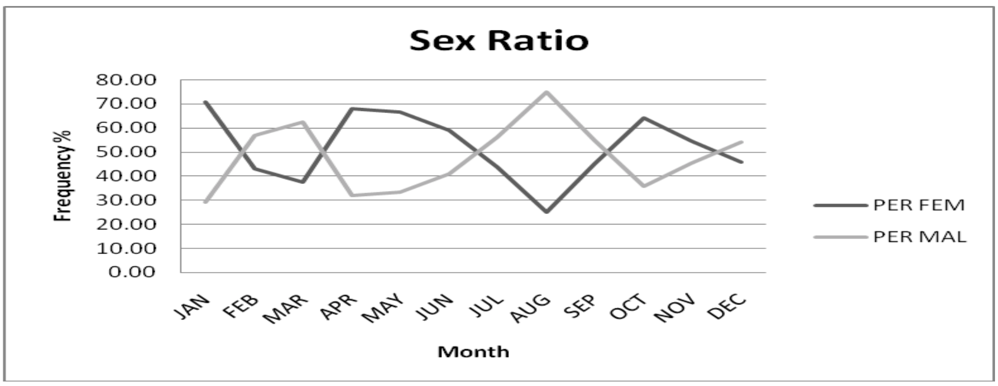

Figure 3: Distribution of males and females of *Phycis blennoides* by season. *X* 2 test results show a prevalence of one sex over the other per sampling month

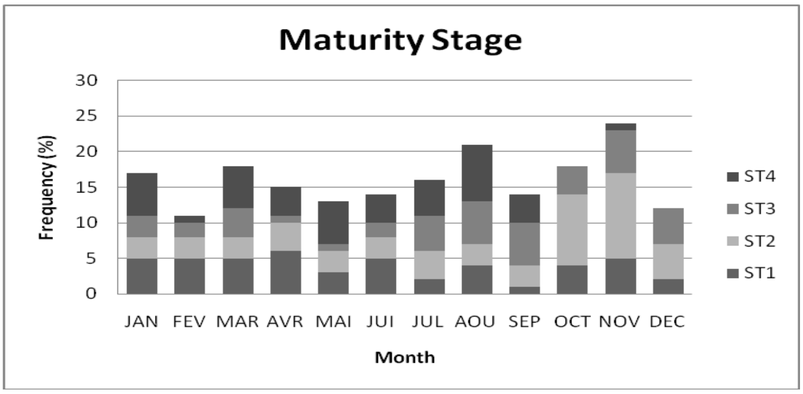

Figure 4: Percentages of different stages of sexual maturity in *Phycis blennoides* females per month

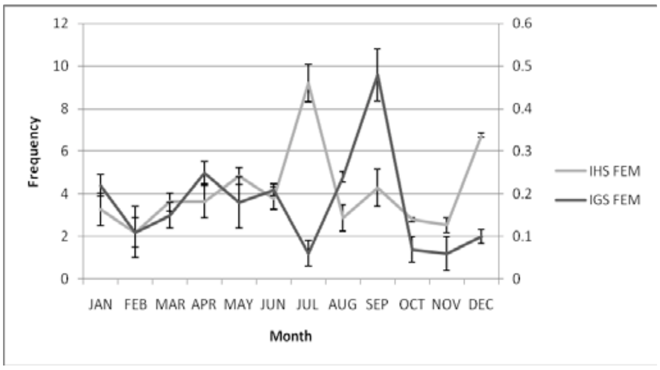

Figure 5: Monthly trend of GSI and HSI with standard errors in *Phycis blennoides*

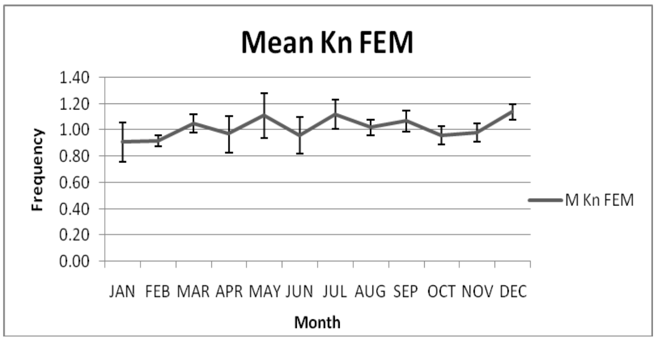

Figure 6: Condition index (Kn) with standard error according to the season in *Phycis blennoides* females

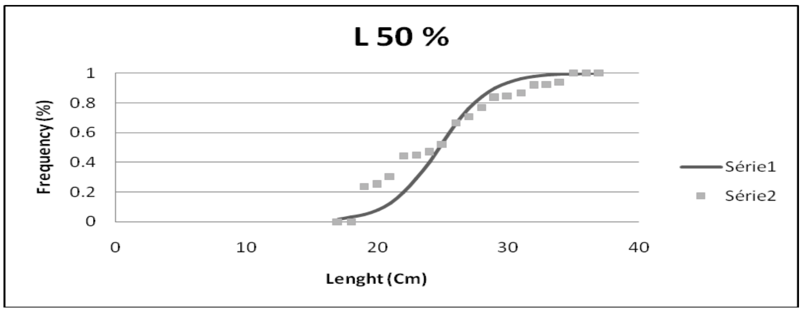

Figure 7: Size of first sexual maturity in *Phycis blennoides*

7. TABLES

MATURITY STAGES	DESCRIPTION
1. Immature/Resting	Small ovaries, with firm consistence and minimal visualization, transparent or pink grey, without opaque or hyaline oocytes.
2. Developing/Maturing	Medium or large ovaries, pink or yellow to orange, with visualization variable, present and obvious. Opaque oocytes present but without hyaline oocytes.
3. Spawning	Hydrated-Large ovaries, with firm consistence and visualization, pink or reddish orange. Opaque and hyaline oocytes present.
4. Post-spawning	Small or medium ovaries, flaccid, dark pink, orange or purple. Opaque and hyaline oocytes absent or residual.

Table 1: Different stages of maturity of *P. Blennoides* females

Sex	Total	Percentage
Females	225	48.70%
Males	236	*51.30%
Total	461	100%

Table 2: Percentage of sexes in *P. Blennoides* (*$p<0,05$).

Authors	Area	Males (cm)	Females (cm)
Cohen *et al.*, 1990	Atlantic	18	33
Rotllant *et al.*, 2002	Mediterranean	19.32	20
Present work 2014	West Algeria	*	24.73

Table 3: Summary of first sexual maturity length (L50) of *P. blennoides* females and males from different areas (* only females were studied to determine the size at sexual maturity)

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Full Length Reproduction

Mysterious Eyes

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Toronto (Canada)

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MYSTERIOUS EYES

A perfect art are those eyes
Striking and confusing
To judge if imaginary or reality
But alas how real it is so
An abstract filled with wonders
Innocence mixed with much love
A striking art that keeps one awake
For eons with no clue to fix a say
But with confusion that touches all
Every wonderful meaning that gives even more
Beyond what dictionaries have told
Limits there are not to those eyes
As the rainbows of crystals and colors
Sparkle vision of what can be told not
How can the definition fit
When words are but a disappointment
To have a close say to express
The extraordinary beauty that pulls the tears

June 1, 2014

Key words: literature, poetry, linguistics, romantics, metaphysics

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