JOURNAL OF THE
ARABIAN AQUACULTURE SOCIETY
Vol. 9 No 2 December 2014

Some Studies Associated with the Problems of Swim Bladder Formation in the Larvae of Gilt Head Sea Bream (*Sparus Aurata*) In the Hatcheries

R.H.Khalil;* T.T.Saad and Ahmed M.A.Osman
Poultry and fish diseases Dept., Fac. of Vet. Med. Alex. University

***Corresponding Author**

ABSTRACT

The present study was concerned on separated investigations of different factors which led to failure of normal swim bladder (SB) primary inflation of Gilthead sea bream larvae and its effects on survivability at EL-Ballah marine fish hatchery which located on Suez Canal at Ismailia governorate, Egypt. Four studies, has been conducted to evaluate the effect of salinity, water degassation, and the brood stock on the SB initial inflation. At first **a preliminary study**, was made where water salinity was 41 ppt, total gas pressure (TGP) was 105%: 107 %, dissolved CO_2 was 40 mg/l. and the brood stock was at 3rd and 4th spawning season; brought from another hatchery. The effect of **decreasing water salinity** from 41 ppt to 35 ppt, the effect of water supersaturation by application of **degassation system** that led to decreasing TGP to 95 %: 98 % and dissolved CO_2 to 18 mg/l were studied. Finally the effect of replacement of the existing brood stock by a wild one newly caught from the Mediterranean Sea was also studied. S.B. initial inflation percentages at 15 dph were found to be 9.45 %, 12.8 %, 30.8 % and 82.7 % for the four studies respectively. At 70 dph we made a floating test for anaesthetized fries samples in hypersaline solution where the float fry indicated that they have functional SB while the sunken one indicated that it hann't functional SB and the results were 28 %, 29 %, 54 %, and 86.6 % float fry (have functional SB) for the four studies respectively. Finally at 90 dph the survival rates were 4.4 %, 5 %, 9.9 %, and 22.1 % for the four studies respectively.

Keywords: **Swim bladder (SB), initial inflation, gilt head sea bream (*Sparus aurata*), salinity, water super saturation, degassation, brood stock, survival rate.**

INTRODUCTION

Mariculture is growing fast on a global scale (CBD, 2004). This is due to the fact that many fish stocks are over fished and catches are declining (Neori et al., 2004). At the same time the world population is rising and with it the need for dietary protein (Wecker, 2006). Some forms of mariculture provide good quality food and the production is more efficient than that of terrestrial animals (CBD, 2004). Gilthead sea bream (*Sparus aurata Linnaeus 1758*) is widely known in the Mediterranean region as a valuable fishery product with very good market price. (Tandler and Helps, 1985; Conides, 1992 and Saka et al., 2004). In Gilthead sea bream larvae, the swimbladder starts inflating when larvae reach 4 mm, at which length the yolk sac is completely reabsorbed. By day 15 (at 5 mm length), the swimbladder primary inflation is completed (Moretti et al., 1999). A functional swim bladder is one of the most important requirements for development of fry. Swim bladder abnormalities cause skeletal abnormalities (Kitajima 1978; Paperna 1978;

© Copyright by the Arabian Aquaculture Society 2014

Chatain, 1982 and Soares and Dinis, 1994), decreased growth (Giavenni and Doimi, 1983; Chatain, 1986 and Soares and Dinis, 1994) and high stress mortalities (Chatain and Dewavrin, 1989 and Soares and Dinis, 1994). Because the lake of the information and knowledge as well as the literatures about the role of swim bladder in incidence of fish deformities and mortality in marine culture under Egyptian conditions this study was carried out to know the causes which led to failure of swim bladder inflation in gilt head sea bream larvae, making a comparison between the effects of each cause as (water salinity, water super saturation and the genetic factors) on the formation of swim bladder and the relationship between swim bladder formation and the survival rate of the larvae of gilt head sea bream in the hatchery.

MATERIALS AND METHODS

Materials

Fish larvae and fries of Gilthead sea bream

In the preliminary examination of SB initial inflation at 15 dph, 100 larvae per tank (20 tanks) were taken. The same numbers of larvae per tank were used in the floating test at 70 dph. Finally at 90 dph, the survival fry in each tank (20 tanks) were recorded, and the same steps were made in three experiments after that.

Gilthead sea bream brood stock fish

The study used 450 brood stock (300 fish already existed at the 3rd and 4th spawning season, equally divided in two tanks, ranged from0.5: 1 kg and was brought from 21km hatchery, Alex. governorate), in addition to 150 wild fishes newly caught from the Mediterranean Sea, ranged from 450: 650 gm.

Area of the study

El Ballah marine fish hatchery is followed to El Wafaa Farm Company, Osman group. The hatchery located at Ismailia governorate on the Suez Canal.

Sea water source

Four Sea water wells were adjacent to Suez Canal. Water salinity was 41 ‰ and its temperature was 23 ˚C.

Facilities , Instruments, Equipments and apparatuses

The hatchery was provided with many facilities that maintain fry and brood stock healthy, live and artificial food and the water in good quality however, there are major facilities and departments which are, degassation system tour (designated according to Dryden Aqua **Co.**)**,** three sand filters (ASTRAL POOL Co., UAE**)** used for sea water filtration, ultra-violet ray station (HANOVIA Co., England**)** for sea water sterilization**,** brood stock tanks (5 concrete circular and of 45 m^3 in size), fry rearing tanks (20 circular fiberglass tanks of 5 m^3 in size and 1m in depth for egg hatching and rearing of larvae till 35 days of age, 20 rectangular concrete tanks in addition to 10 circular fiberglass tanks of 15 m^3 in size and 1 m in depth for fries nursery), portable dissolved oxygen meter, portable (TGP) meter, dissolved CO_2 measuring chemical kits**,** microalgae (*Nannochloropsis oculata* for feeding of larvae, *Tetraselmis suecica and Tetraselmis chui* for feeding of rotifers (SAMS RESEARCH SERVICES LIMITED Co., Scotland**)**), rotifers (*Brachionus plicatilis* fed on microalgae, dry yeast (*Saccharomyces cerevisiae*) and enriched with vitamin B12 and a product called PROTEIN SELCO (INVE HELLAS S.A, GREECE**),** *Artemia* **(***EG Artemia* cysts for production of *EG Artemia* nauplii (260,000 cysts/ gram) with 95 % min. hatchability percentage (INVE HELLAS S.A, GREECE)**,** brood stock feed (frozen Squid, Mackerel and Sardine and dry pellet feed). Fry feed (Live food then they are weaned on dry food of different sizes, its commercial name is (NRD) INVE HELLAS S.A, GREECE) and clove oil (used as anesthetic during the floating test) it’s natural product and is less expensive than other anesthetics (Wagner et al. 2002, Hoskonen and Pirhonen 2004, Mylonas et al. 2005 and Seol et al. 2007).

Methods

After the sea water was degassed, filtered and finally sterilized, it was pumped to the hatchery departments.

All brood stock, larvae and fry rearing, feeding regimes, water change scheme, lighting schedule of fry (16h light and 8h dark), photoperiod program of brood stock, temperature schedule and live food operation systems (Microalgae, Rotifer and *Artemia*) were operated through the cooperation with SELONDA AQUACULTURE S.A, GREECE.

Water analysis Examinations

At the first sea water was analyzed to ensure its availability for marine hatchery, then other parameters were measured in each study and outlined in Table (1).

SB initial inflation Protocols of all experiments

A preliminary study: By using the existing situation (41 ppt water salinity, water super saturation, old brood stock from another hatchery).

1st experiment: Studying the effect of water salinity by changing the existing water salinity from 41 ppt to 35 ppt in the offspring rearing tanks from receiving of eggs till 90 dph with making a control tanks with the old situation as in the preliminary study.

2nd experiment: Studying the effect of water super saturation by building up a degassation system to the water before pumping station with making a control tanks with the old situation as in the preliminary study.

3rd experiment: Studying the effect of the brood stock (hereditary factors) on the offspring by replacement of the existing old brood stock by a newly caught wild one with making a control tanks with the old situation as in the preliminary study.

In each study we made the following

1. Microscopical examination for SB initial inflation at 15 dph.
2. Making a floating test at 70 dph.
3. Recording of survivability and survival rate at 90 dph.

Protocol for examination of the SB initial inflation

A. By use of light microscope at 15 dph according to ***Moretti et al. (1999)*** as follows:

1. A sample of 30 to 50 larvae per tank was taken every time.
2. The larvae were pipetted on a slide with as less water as possible, then they were grouped together.
3. The larvae were covered with the glass lid; excess water was removed with

Table, 1*: Showing the readings of dissolved CO_2, salinity and TGP by using portable apparatuses in each study.*

	Preliminary study	1st experiment experimental change of salinity from 41 ‰ to 35 ‰	2nd experiment water degassation	3rd experiment experimental change of broodstock by wild one
Dissolved CO2	40mg/liter	40mg/liter	18mg/liter	40mg/liter
Salinity	41ppt	35ppt	41ppt	41ppt
TGP	105%: 107%	101%:103%	95%-98%	105%:107%

filter paper, and they were observed at 20 and 40 magnifications.

4. Then, the presence of the swim bladder was looked for.

5. Finally all findings were recorded on a dedicated form.

B. Floating test at 70 dph, Anaesthetized animals with functional S.B. will float while the others will sink to the bottom; the method to separate them is based on the difference in buoyancy in hypersaline water (50 ppt). Proceed was carried out according to ***Moretti et al. (1999)*** but with use of Clove oil as anesthetic according to ***(Mylonas et al., 2005)*** as follows:

1. one tub was filled with tank water and enough sea salt was dissolved to obtain a salinity of 50 ppt; then the fry sieve was placed in it (with an aeration line inside);

2. Water supply in the other two tubs flowed through them. To avoid changes in environmental parameters, water came from the weaning circuit;

3. 10 to 20 ml of 2-phenoxyethanol were added to the first tub (200 to 400 ppm solution depending on fish size) and mixed well.

N.B. Clove oil was used according to ***Mylonas et al., 2005*** as an effective anesthetic in at almost 10-fold lower doses than 2-phenoxyethanol.

4. The fries were harvested to be tested and kept inside the net at the water surface;

5. With the hand net, 100 fish were taken at time and placed into the screened cylinder;

6. A couple of minutes should be waited until they separated completely.

7. The floating fries were carefully collected with a hand net; recorded, and then stocked in the other two large tubs; water was renewed, until complete recovery from the anaesthesia;

8. The sieve was taken out and the fish without swim bladder were recorded that have sunk to the bottom of the sieve.

Protocols of sea water salinity change (1st experiment)

Adjustment of salinity at 35 ppt has been done only in 10 fry rearing tanks before receiving of eggs till 90 dph, while the other 10 fry rearing tanks receive 41 ppt sea water (control tanks).

Protocols of sea water degassation (2nd experiment)

The hatchery used wells water which was supersaturated with gases so we built up a degassation system according to ***(Bouck et al., 1984; Colt and Bouck, 1984; Marking, 1987a,b; Spotte, 1992; Hargreaves and Tucker, 1999)*** to decrease TGP fewer than 100% where the sea water passes down through to degassing column percolating over a plastic media design for gas exchange applications**,** and then the air was drawn counter current up flow again the flow of water. This was achieved at a reduced internal atmospheric pressure. In order to degas water effectively it is important to compensate for water vapor pressure, and this can only be achieved by applying a slight negative pressure inside the column through suction of the air inside the degasser by use of air blower with narrowing the valve of air inlet. However when the slight internal negative pressure was applied, the external forces on the structure was considerable, so the tour body was built up from high density fiberglass.

The degasser was located on a level secure base adjacent to a sump tank, in the up-right position. Once the column is secure, the bottom water out-let of the degasser connected on to a pipe and a 90 degree elbow to take the discharge pipe down into the water of the sump tank. It is important that the degasser discharges under water, and the water supply pipe was connected to the top flange connection on the side of the column.

The degassed water is then filtered and finally sterilized to feed only 10 fries rearing tanks before receiving eggs till 90 dph, the other 10 fries rearing tanks is fed directly by filtered and sterilized sea water without degassation which act as control tanks.

Designation of this system was taken from http://www.drydenAqua.com/ website.

Protocol for replacement of the old brood stock by newly wild one (3rd experiment)

Replacement of one old brood stock tank by a new wild one and the other tank is left without replacement. Eggs produced from the two tanks were cultured in separated tanks till 90 dph.

RESULTS AND DISCUSSION

Fig.1 compared the results of microscopical examination of S.B. initial inflation at 15 dph for the four studies, Fig.2 compared the results of the floating test for the four studies at 70 dph and Fig.3 compared the survival rate of the 4 studies at 90 dph. The lowest results were at the preliminary study, where S.B. initial inflation, the float fries at the floating test (have functional S.B.) and the survival rate recorded 9.45%, 28% and 4.4% respectively represented by columns no.1 in the three figures. These results explained by *Chatain and Dewavrin, 1989* who studied the mortality of sea bass, *Dicentrarchus labrax*, during weaning in groups reared under semi-intensive conditions and characterized by different proportions of fish without a functional swim bladder. Also *Modica et al., 1993* found that there is a relationship between absence of functional swim-bladder, calculosis and larval mortality of hatchery-reared sea bream, *Sparus aurata L*. Also *Woolley and Qin, 2010* examined the initial swimbladder inflation in cultured finfish larvae and the mechanisms controlling body buoyancy and the distribution of larvae during the critical early development stages. They found that the body buoyancy of larvae affects their distribution in the tank and fish with low buoyancy are likely to sink to the bottom leading to mortality. Parallel results also found by *Woolley et al., 2013* who mentioned that Management strategies that maintain larvae within the water column and enhance swimbladder inflation are required to improve survival of SBT larvae reared in hatcheries.

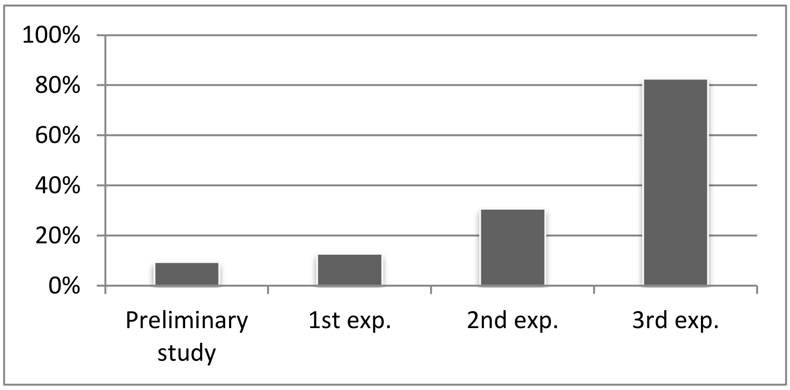

Fig.1: Average percentages of SB initial inflation at the different studies.

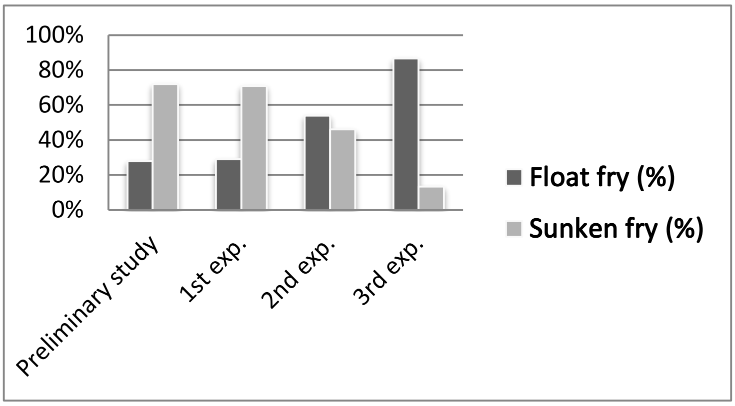

Fig.2: Average percentages of float and sunken fry in the floating test at the different studies.

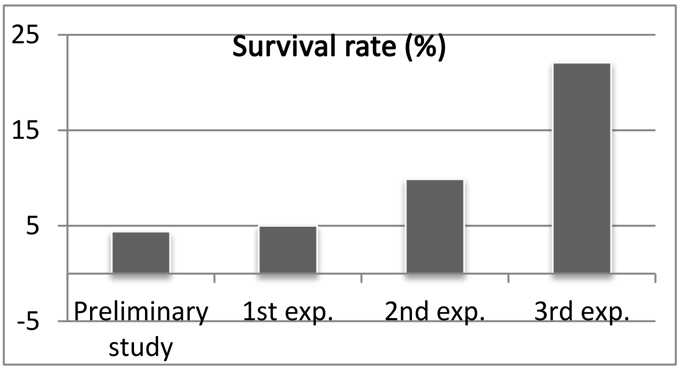

Fig.3: Survival rate at the different studies at 90 dph.

With decreasing the water salinity from 41 ppt to 35 ppt, SB initial inflation increased and recorded 12.8%, represented by column no.2 in Fig.1 but that increasing was insignificant because the float fries at the floating test at 70 dph recorded only 29% represented by column no.2 in Fig.2 and the survival rate at 90 dph recorded 5% represented by column no. 2 in Fig.3. These results was agreed to data obtained by *Tandler et al., 1995* who recorded the survival rate of 5.3% for gilthead seabream, *Sparus aurata*, at 40 ppt water salinity. Other factors with salinity affecting the swim bladder inflation that conclusion was insured by *Battaglene and Talbot, 1993* who compared survival and initial swim bladder inflation in Australian bass *(Macquaria novemaculeata)* larvae at salinities of 0–35‰, and they mentioned that swim bladder inflation in the salinity range of 15–30‰ was only 6.4% when high aeration (>1,000 mL/ min per 60-L aquarium) was used, compared with 81.0% when low aeration (<50 mL/min) was used.

While water degassation had a significant effect on SB initial inflation which recorded 30.8% represented by column no. 3 in Fig.1 and the float fries at the floating test recorded 54% represented by column no.3 in Fig.2 which reflected positively on the survival rate that recorded 9.9% represented by column no.3 in Fig.3. These results is strongly related to the results obtained by *Jensen, 1988* who exposed Steelhead eggs, larvae, and fry to combinations of atmospheric gas super saturation (102–111% total gas pressure, 'TGP') and dissolved oxygen, 'O_2' (48–98% O_2 saturation) at 10°C, and he found that a small percentage of fry (2.6%) exposed to 111% TGP and 48% O_2 exhibited signs of gas bubble trauma involving burst swim bladders. These results was agreed also with *Abernethy et al., 2001* who mentioned that the gas supersaturation level that causes acute gas bubble disease (GBD) varies among species, they also mentioned that Bluegills, and presumably most physoclistous fish, are extremely susceptible to swim bladder rupture when exposed to the sudden pressure change during turbine passage. Also these results confirmed by *Cornacchia and Colt, 1984* who reported that in larval fishes supersaturation can increase the swimbladder volume at gas pressures as low as 102.9 %, Also they mentioned that overinflation of the swim bladder and associated over buoyancy imposes additional swimming demands and the resulting stress causes mortality. Also these results were agreed with *Marking, 1987b* who reported that treatment of gas-supersaturated water by packed-column aeration, vacuum degassing, or oxygen injection alleviates the problem. The results was agreed with *Hargreaves and Tucker, 1999* who reported that packed column aerators was used as a simple and effective way to manage gas supersaturation problems. Also Spotte, *1992* mentioned that Gas supersaturation in hatchery rearing systems can easily reach 105% particularly in seawater supply systems. These levels are harmful to fish larvae but can readily be controlled and reduced by the installation of a vacuum degassing system with a capacity to treat the whole incoming supply. Gas saturation in supply to the site should be reduced to 97-98% TGS and within the rearing systems it should be maintained at or below 100% but no lower than 97%.

Finally brood stock replacement by a new wild one had the highest effect on S.B. initial inflation which recoded 82.7% represented by column no.4 in Fig.1 and the float fries in the floating test recorded 86.6% represented by column no.4 in Fig.2 and that reflected on the survival rate and we obtained the highest survival rate that recorded 22.1 % represented by column no.4 in Fig.3. The clearest evidence for the hereditary determination of diseases in Convict cichlids, *Cichlasoma nigrofasciatum,* reported by *Winemiller and Taylor, 2006,* when inbred for four and five generations exhibited moderate and severe morphological deformities. On the same manner *Andrades et al. (1996)* recorded congenital or postnatal origin of lordosis, skeletal deformities in larval, juvenile and adult stages of fish from a Spanish experimental culturing center. About 27% of sea bream larvae at hatching showed different types of axial deformations that were related to notochord alterations during embryogenesis. About 22% died soon after hatching, but 5% survived and reached juvenile and adult stages. These fish were mostly lordotic. Juvenile lordotic fish displayed uninflated swim bladders but all lordotic adults possessed an inflated functional swim bladder.

CONCLUSION AND RECOMMENDATIONS

From the results of the present work, it can be concluded that:-

1. Swim bladder is one of the most important requirements for development of fry.

2. In addition to swim bladder critical function in determining the orientation of fish in the water column, the swimbladder also seems to play an important, but poorly understood, role in the successive development of other organs. If inflation of the swimbladder during early larval development is prevented, larvae subsequently display developmental abnormalities and have reduced survival rates in a variety of teleost species**.**

3. Swim bladder must be investigated in the hatchery to obtained good quality fries by light microscope and floating test.

4. Swim bladder abnormalities leads to Problems associated with dysfunctional swim bladder such as mortality, skeletal malformations and slowing growth.

In the marine hatcheries, the different causes of dysfunctional swim bladder such as hereditary or inbreeding causes, Presence of physical obstacles at the air/water interface, Insufficient and irregular feeding, Salinity, Light intensity, photoperiod, tank colour and aeration, water super saturation, high dissolved CO_2 level and acidified water, microgravity and early disease outbreaks must be identified.

REFERENCES

Abernethy, C. S.; Amidan, B. G.; Čada, G. F.; (2001): Laboratory studies of the effects of pressure and dissolved gas supersaturation on turbine-passed fish. Final Report FY 2000. Pacific Northwest National Laboratory, Richland, Washington. 61 p.

Andrades, J. A.; Becerra, J. and Fernández-Llebrez, P. (1996): Skeletal deformities in larval, juvenile and adult stages of cultured gilthead sea bream (Sparus aurata L.). Aqua. 141, 1-11.

Battaglene, S. C. and Talbot, R. B. (1993): **Effects of Salinity and Aeration on Survival of and Initial Swim Bladder Inflation in Larval Australian Bass. The Progressive Fish-Culturist. Vol. 55, 35-39.**

Bouk, G. R.; King, R. E. and Bouck-Schmidt, G. (1984): Comparative removal of gas supersaturation by plunges, screens and packed columns. Aqua. Eng. 3, 159-176.

Chatain, B. (1982): Contribution à l'étude de l'élevage larvaire de la dorade japonaise *(Chrysophrys major).* Thèse de 3ème cycle, Univ. Aix-Marseille II, 121 pp.

Chatain, B. (1986): La vessie natatoire chez *Dicentrarchus labrax* et *Sparus auratus* I. Aspects morphologiques du développement. Aqua. 53, 303-311.

Chatain, B. and Dewavrin, G. (1989): Influence des anomalies de développement de la vessie natatoire sur la mortalité de *Dicentrarchus labrax* au cours du sevrage. Aquaculture 78, 55-61.

Colt, J. and Bouck, G. (1984): Design of packed columns for degassing. Aqua. Eng. 3, 251-273.

Conides, A. (1992): Effects of salinity on growth, food conversion and maintenance of young gilthead sea bream, Sparus aurata. PhD Thesis, Univ. Athens Greece, 185 pp.

Cornacchia, J. W. and Colt, J. E. (1984): The effects of dissolved gas saturation on larval striped bass. J. Fish Disease. 7, 15-27.

Giavenni, R. and Doimi, M. (1983): Formazione, differenziamento istologico ed aspetti patologici della vescica natatoria in larve di branzino (*Dicentrarchus labrax L., 1758*). Riv. Ital. Piscic. Ittiop. A, XVIII (2), 71-80.

Hargreaves, J. A., and Tucker, C. S. (1999): Design and construction of degassing units for catfish hatcheries.Southern Regional Aquacultural Center Publication No. 191, Mississippi State Univ. 8 p.

Hoskonen, P. and Pirhonen, J. (2004): Temperature effects on anaesthesia with clove oil in six temperate-zone fishes. J. Fish Biol. 64, 1136-1142.

Jensen, J. O. T. (1988). Combined effects of gas supersaturation and dissolved oxygen levels on steelhead *(Salmo gairdneri)* eggs, larvae, and fry. Aqua. 68(2), 131-139.

Kitajima, C. (1978): Acquisition of fertilized eggs and mass culture of juvenile of red sea bream Pagrus major. Special report Nagasaki prefecture institute of Fisheries 5, 92 pp.

Marking, L. L. (1987a): Evaluation of gas supersaturation treatment equipment at fish hatcheries in Michigan and Wisconsin. Progressive Fish-Culturist 49, 208-221.

Marking, L. L. (1987b): Gas supersaturation in fisheries: causes, concerns, and cures. Fish and Wildlife Leaflet 9, U.S. Fish and Wildlife Service, Washington D.C. 10 p.

Modica, A.; Santulli, A.; Curatolo, A.; Cusenza, L.; Palillo, L.; D.Amelio, V. (1993):

Relationships between absence of functional swim-bladder, calculosis and larval mortality in hatchery-reared gilthead sea bream, Sparus aurata L. Aqua. & Fish. Manag. 24, 517-522.

Moretti, A.; Pedini Fernandez-Criado, M.; Cittolin, G. and Guidastri, R. (1999)*:* Manual on hatchery production of seabass and gilthead seabream. FAO. Vol.1, 194.

Mylonas, C. G.; Cardinaletti, G.; Sigelaki, I. and Polzonetti-Magni, A. (2005): Comparative efficacy of clove oil and 2-phenoxyethanol as anaesthetics in the aquaculture of European sea bass *(Dicentrarchus labrax)* and gilthead sea bream *(Sparus aurata)* at different temperatures. Aqua. 246, 467-481.

Neori, A.; Chopin, T.; Troell, M.; Buschmann, A.H.; Kraemer, G.P.; Halling, C.; Shpigel, M. and Yarish, C. (2004): Integrated aquaculture: rationale, evolution and state of the art emphasizing seaweed biofiltration in modern mariculture. Aqua. 231, 361-391.

Paperna, I. (1978): Swimbladder and skeletal deformation in hatchery bred *Sparus auratus*. J. Fish. Biol. 12, 109-114.

Saka, Ş.; Çoban, D. and Kürşat Fırat E.U. (2004): The Study on the Technology of Producing Sea Bream (Sparus aurata L., 1758) Larvae in Marine Fish Hatcheries in Turkey, J. of Fish. & Aquatic Sci. Vol. 21, 215– 218.

CBD (Secretariat of the Convention on Biological Diversity) (2004): Solutions for sustainable mariculture-avoiding the adverse effects of mariculture on biological diversity, CBD Technical Series No. 12.

Seol, D. W.; Lee, J.; Im, S. Y. and Park, I. S. (2007): Clove oil as an anaesthetic for common octopus (*Octopus minor*, Sasaki). Aqua. Research. 38, 45–49.

Soares, F. and Dinis, M. T. (1994): Development of the swim bladder of cultured Sparus aurata L.: a histological study. Aqua. and Fish. Manag. 25, 849-851.

Spotte, H. S. (1992): Captive Seawater Fishes: Science and Technology. John Wiley & sons Inc.

Tandler, A.; Anav, F. A.; Choshniak, I. (1995): The effect of salinity on growth rate, survival and swimbladder inflation in gilthead seabream, *Sparus aurata*, larvae. Aqua. 135, 343-353.

Tandler, A. and Helps, S. (1985): The effects of photoperiod and water exchange rate on growth and survival of gilthead sea bream (Sparus aurata, Linnaeus: Sparidae) from hatching to metamorphosis in mass rearing systems. Aqua. 48, 71-82.

Wagner, G. N.; Arndt, R. and Hilton, B. (2002): Physiological stress responses, egg survival and sperm mortality for rainbow trout broodstock anaesthetized with clove oil, tricaine methanesulfonate or carbon dioxide. Aqua. 211, 353-366.

Wecker, B. (2006): Nutrient flow in a closed circuit system with integrated process water clarification algae filter - model and reality. Christian-Albrechts-Univ. of Kiel, Leibniz Institute of Marine Sciences Department of Marine Ecology.

Winemiller, K. O. and Taylor D. H. (2006): Inbreeding depression in the convict cichlid, *Cichlasoma nigrofasciatum* (Baird and Girard). J. of Fish. Biol. 21, 399-402.

Woolley, L. D.; Fielder, D. S. and Qin, J. G. (2013): Swimbladder inflation associated with body density change and larval survival in southern bluefin tuna *Thunnus maccoyii.* Aquacult. Int. 21, 1233-1242.

Woolley, L. D. and Qin, J. G. (2010): Swimbladder inflation and its implication to the culture of marine finfish larvae. Rev. in Aquaculture. 2, 181–190.

بعض الدراسات المتعلقة بمشاكل تكوين المثانة الهوائية في

يرقات أسماك الدنيس في المفرخات

رياض خليل – طلعت طلعت سعد – أحمد محمد عثمان
قسم أمراض الدواجن والاسماك – طب بيطرى اسكندرية

عدم تكون المثانة الهوائية بصورة سليمة في يرقات أسماك الدنيس له دور هام جدا في حدوث تشوهات ونفوق جماعي للأسماك المستزرعة تحت الظروف المصرية. وقد أجريت هذة الدراسة بمفرخ البلاح للأسماك البحرية الواقع على قناة السويس في محافظة الإسماعيلية والذي كان يعاني من نسب منخفضة لتكون المثانة الهوائية في يرقات أسماك الدنيس ومعدلات إحياء منخفضة لهذة الأسماك المنتجة. ولقد حاولنا في هذة الدراسة معرفة الأسباب الممكنة وراء فشل الإنتفاخ الأولي للمثانة الهوائية في يرقات أسماك الدنيس وتأثيرها على إعاشة هذة الأسماك ومعدلات إحيائها.

في البداية قمنا بعمل **دراسة أولية** حيث قمنا بتسجيل بعض **القياسات والمعلومات** التي يعتقد أن لها دورا في فشل الإنتفاخ الأولي للمثانة الهوائية وأيضا قمنا بعمل بعض **الفحوصات والإختبارات** للكشف عن نسب تكون المثانات الهوائية السليمة وتأثيراتها على إعاشة هذة الأسماك ومعدلات إحيائها.

القياسات والمعلومات:

١. درجة ملوحة المياه والتي سجلت ٤١ جزء في الألف .

٢. الضغط الكلي للغازات الذائبة في الماء المستخدم للإستزراع (TGP) سجلت ١٠٥%: ١٠٧ %
.

٣. ثاني أكسيد الكربون المذاب في الماء سجل ٤٠ مللجم/لتر.

٤. ولقد إستخدمنا ٣٠٠ سمكة من الأمهات الموجودة بالمفرخ ووزعت على تنكين بالتساوي¸ هذة الامهات كانت في الموسم الثالث والرابع من الإنتاج وأوزانها تتراوح ما بين ٠،٥ :١ كجم تم شراؤها من مفرخ تابع لهيئة تنمية الثروة السمكية الواقع في الكيلو ٢١ – محافظة الأسكندرية على شاطئ البحر المتوسط . هذة الأمهات إستخدمت كمصدر للبيض المخصب لإستخدامه في عملية التفريخ والحصول على اليرقات اللازمة للدراسة.

الفحوصات والإختبارات:

١. تم أخذ عينات من يرقات أسماك الدنيس عند عمر ١٥ يوم بعد الفقس (عمر إكتمال الإنتفاخ الأولي) من ال ٢٠ تنك من تنكات رعاية الزريعة بواقع ١٠٠ يرقة/ تنك لعمل فحص للإنتفاخ الأولي للمثانة الهوائية بإستخدام الميكروسكوب الضوئي . وقد كان المتوسط العام لتكون الإنتفاخ الأولي للمثانة الهوائية ٩،٤٥%.

٢. تم أخذ عينات أخرى لزريعة أسماك الدنيس عند عمر ٧٠ يوم بعد الفقس من نفس ال ٢٠ تنك السابقة بواقع ١٠٠ يرقة/تنك لعمل إختبار الطفو في محلول عالي الملوحة (٦٠ جزء في الألف وفي هذا الإختبار تم تخدير الزريعة تحت الفحص بإستخدام زيت القرنفل ، وطفو الزريعة على سطح الماء دليل على أنها تملك مثانة هوائية سليمة أما الزريعة التي تغطس في القاع أو معلقة في عمود الماء فهذا دليل على أنها لاتملك مثانة هوائية أو أنها ليست سليمة . وقد وجدنا المتوسط العام لنتائج هذا الإختبار ٢٨% زريعة طافية و٧٢% زريعة غطست إلى القاع.

٣. عند عمر ٩٠ يوم بعد الفقس تم تسجيل عدد الزريعة التي بقيت على قيد الحياة وتم حساب معدلات الإحياء لنفس ال ٢٠ تنك المستخدمة لرعاية الزريعة تحت الدراسة . وقد كان المتوسط العام لمعدلات الإحياء هو ٤،٤% من إجمالي اليرقات التي فقست.

بإستخدام دفعات أخرى لبيض التفريخ تم عمل ثلاثة تجارب حيث تم تحسين العوامل التي يعتقد بأن لها تأثيرات على تكون الإنتفاخ الأولي للمثانة الهوائية حيث تم تحسين عامل واحد فقط من هذة العوامل في كل تجربة مع بقاء العوامل الأخرى كما كانت في الدراسة الأولية. وأيضا في هذة التجارب قمنا بعمل نفس الفحوصات والإختبارت السابقة التي أجريت في الدراسة الأولية بنفس الطريقة ولكن كان الإختلاف في أننا قسمنا ال ٢٠ تنك المخصصة لرعاية الزريعة إلى ١٠ تنكات لإجراء التجربة عليها مع تحسين عامل واحد فقط وهذة كانت **"التنكات المعاملة"** و ١٠ تنكات أخرى بدون أي تحسين لأي من العوامل والتي بقيت كما كانت في الدراسة الأولية وهذة كانت **"تنكات الحكم"**.

أ. التجربة الأولى : أجريت لدراسة تأثير درجة ملوحة المياه على تكون الإنتفاخ الأولي للمثانة الهوائية. ولذلك فقد قمنا بتقليل درجة ملوحة مياه التنكات المعاملة فقط من ٤١ جزء في الألف إلى ٣٥ جزء في الألف منذ إستقبال بيض التفريخ المخصب حتى عمر ٩٠ يوم بعد الفقس، على الجانب الآخر لم نقم بتغيير درجة ملوحة مياه تنكات الحكم.

ثم قمنا بعمل الفحوصات والإختبارات وكانت نتائجها كالآتي:

١. المتوسط العام لنتائج فحص تكون الإنتفاخ الأولي للمثانة الهوائية عند عمر ١٥ يوم بعد الفقس كان ١٢،٨% و ٨،٥% في التنكات المعاملة والتنكات الحكم على التوالي.

٢. المتوسط العام لنتائج إختبار الطفو عند عمر ٧٠ يوم بعد الفقس كان ٢٩% يرقات طافية و ٧١% يرقات غاطسة في التنكات المعاملة وكانت ٣٠% يرقات طافية و ٧٠% يرقات غاطسة في التنكات الحكم.

٣. المتوسط العام للأسماك التي بقيت على قيد الحياة ومعدلات إحيائها عند عمر ٩٠ يوم بعد الفقس في التنكات المعاملة والتنكات الحكم كان ٥% و ٥،٣% على التوالي.

ب. التجربة الثانية : أجريت لدراسة تأثير درجة تشبع الماء الزائد بالغازات على تكون الإنتفاخ الأولي للمثانة الهوائية لذلك فقد قمنا بصنع نظام لنزع هذة الغازات المشبعة للماء وطردها من ماء التنكات المعاملة وقد أدى هذا النظام إلى خفض الضغط الكلي للغازات الذائبة في الماء (TGP) من ١٠٥% : ١٠٧% إلى ٩٥% : ٩٨% ، بالإضافة إلى أنه أدي أيضا إلى تقليل كمية ثاني أكسيد الكربون المذاب من ٤٠ مللجم/لتر إلى ١٨ مللجم/لتر في التنكات المعاملة ، على الجانب الآخر بقيت التنكات الحكم كما هي تستقبل مياه زائدة التشبع بالغازات (TGP ١٠٧%) وكمية ثاني أكسيد الكربون المذاب بها ٤٠ مللجم/لتر. بعد ذلك قمنا بعمل نفس الفحوصات والإختبارات السابقة وكانت نتائجها كالتالي:

١. المتوسط العام لنتائج فحص تكون الإنتفاخ الأولي للمثانة الهوائية عند عمر ١٥ يوم بعد الفقس كان ٣٠،٨% و ٨،٣% في التنكات المعاملة والتنكات الحكم على التوالي.

٢. المتوسط العام لنتائج إختبار الطفو عند عمر ٧٠ يوم بعد الفقس كان ٥٤% يرقات طافية و ٤٦% يرقات غاطسة في التنكات المعاملة وكانت ٢٩% يرقات طافية و ٧١% يرقات غاطسة في التنكات الحكم.

٣. المتوسط العام للأسماك التي بقيت على قيد الحياة ومعدلات إحيائها عند عمر ٩٠ يوم بعد الفقس في التنكات المعاملة والتنكات الحكم كان ٩،٩% و ٥% على التوالي.

ج. التجربة الثالثة : لدراسة التأثيرالوراثي للأمهات على تكون الإنتفاخ الأولي في اليرقات وإحتمال أن يكون تشوه عدم إنتفاخ المثانة الهوائية يرجع لعوامل جينية ، لذلك فقد إستبعدنا تنك واحد فقط من تنكات الأمهات القديمة (١٥٠ سمكة) وإستبدلت ب ١٥٠ سمكة دنيس برية وأوزانها تتراوح ما بين ٤٥٠ : ٦٥٠ جم وقد تم إصطيادها حديثا من البحر المتوسط في منطقة دمياط وظلت تحت الأسر لمدة عام حتى أصبحت جاهزة لإنتاج البيض اللازم للتفريخ وإنتاج اليرقات اللازمة للدراسة ،تم إستقبال البيض المنتج من الأمهات البرية الجديدة في تنكات رعاية منفصلة (التنكات المعاملة) وتم رعاية الزريعة حتى عمر ٩٠ يوم بعد الفقس، بينما التنكات الحكم كانت تلك تنكات الرعاية التي أستقبلت بيض التفريخ المخصب من تنك الأمهات الآخر المتبقي(والذي كان مصدره مفرخ آخر، وأوزانها تتراوح من ٠،٥ : ١ كجم وفي الموسم الثالث والرابع من إنتاج البيض) . بعد ذلك قمنا بعمل الفحوصات والإختبارات اللازمة على الزريعة وكانت النتائج كالآتي:

١. المتوسط العام لنتائج فحص تكون الإنتفاخ الأولي للمثانة الهوائية عند عمر ١٥ يوم بعد الفقس كان ٨٢،٧% و ١١% في التنكات المعاملة والتنكات الحكم على التوالي.

٢. المتوسط العام لنتائج إختبار الطفو عند عمر ٧٠ يوم بعد الفقس كان ٨٦،٦% يرقات طافية و ١٣،٤% يرقات غاطسة في التنكات المعاملة وكانت ٢٨% يرقات طافية و ٧٢% يرقات غاطسة في التنكات الحكم.

٣. المتوسط العام للأسماك التي بقيت على قيد الحياة ومعدلات إحيائها عند عمر ٩٠ يوم بعد الفقس في التنكات المعاملة والتنكات الحكم كان ٢٢،١% و ٥،٢% على التوالي.