



akhmad taufiq mukti <akhmad-t-m@fpk.unair.ac.id>

IOP 426

1 message

International Conference on Fisheries and Marine Sciences Universitas Airlangga
<incofims@fpk.unair.ac.id>Thu, Oct 31, 2019 at
6:29 AM

To: akhmad taufiq mukti <akhmad-t-m@fpk.unair.ac.id>, atm.mlg@gmail.com

Dengan hormat,

Sehubungan dengan akan disubmit dan publikasikan artikel "2nd International Conference on Fisheries and Marine Sciences (InCoFIMS)" dimohon pada Author/Correspondence untuk segera merevisi artikel yang telah ditelaah oleh reviewer. Mohon artikel yang telah direvisi dikirimkan kembali melalui email incofims@fpk.unair.ac.id paling lambat tanggal 03 November 2019 pukul 23.59 WIB.

--

#Warm Regards

Secretariat
(InCoFIMS) International Conference on Fisheries and Marine Sciences*"Fisheries and Marine Science in Supporting Sustainable Development Goals (SDG's) Achievement"*Faculty of Fisheries and Marine
Universitas Airlangga
Campus C Universitas Airlangga, Mulyorejo, Surabaya, East Java, Indonesia 60115

Contact

Mail: incofims@fpk.unair.ac.id

Tel: +62 31 5911451

Fax: +62315965741

4 attachments**SURAT KEPADA AUTHOR.jpeg**
118K **426_INCOFIMS_rev.docx**
55K **Panduan Edit IOP.doc**
209K **426_INCOFIMS.docx**
55K

The different effects of heat shock duration and embryo age on embryonic development and hatching lengths of spotted barb (*Puntius binotatus*) fish

I Rizal¹, A T Mukti^{2,5}, A S Mubarak³, W H Satyantini², Widjiati⁴

¹ Study Program of Aquaculture, Faculty of Fisheries and Marine, Universitas Airlangga, Surabaya 60115, Indonesia

² Department of Fish Health Management and Aquaculture, Faculty of Fisheries and Marine, Universitas Airlangga, Surabaya 60115, Indonesia

³ Department of Marine, Faculty of Fisheries and Marine, Universitas Airlangga, Surabaya 60115, Indonesia

⁴ Department of Veterinary Anatomy, Faculty of Veterinary Medicine, Universitas Airlangga, Surabaya 60115, Indonesia

⁵ Corresponding author: akhmad-t-m@fpk.unair.ac.id

Abstract. The study aimed to determine the different effects of heat shock duration and embryo age on embryonic development and hatching lengths of spotted barb fish. The method was used the experimental method using a factorial completely randomized design with two factors of treatment, namely heat shock duration (1, 1.5, and 2 min) and embryo age (3, 4, and 5 min after fertilization). The fish embryos were shocked at temperature of 40°C. Each combination was repeated three times. One treatment was conducted without heat shock as control. The results showed that treatments of heat shock duration and embryo age have affected embryonic development and hatching lengths of spotted barb embryo.

1. Introduction

Temperature is one of several determinant environmental variables that affect the development of fish embryos. Temperature causes embryonic mortality at extreme levels and affects metabolic speed, including the maintenance and growth of fish embryos and larvae [1]. Temperature is one of the critical factors and controls during the development of the embryonic and larval phases in fish [2]. Several studies have been conducted related to the effect of temperature on hatching [3, 4]. The water temperature of the media during fish embryogenesis can affect the time and age of the embryo when it hatches [5].

Many studies about the effect of incubation temperature on embryonic development in fish have been conducted. However, the influence of temperature shock, especially heat shock in the polyploidization process on fish embryonic development has not been much studied. Until now, only few studies on embryonic death due to polyploidization have been reported include successful ploidy, such as [6-11]. Although, the effect of cold shock triploidy induction on cell cleavage of spotted sand bass embryo has been carried out [12], however, the influence of heat shock on embryonic development has not been reported. Therefore, this study aimed to determine the effect of heat shock

duration and embryo age on embryonic development and hatching lengths of spotted barb (*Puntius binotatus*) embryo.

2. Materials and methods

Commented [D1]: Time and place of research

2.1. Artificial fertilization

Eggs and sperm of spotted barb were collected at a clean and dry container separately, especially sperm was added physiological NaCl of 0.9% with ratio 1:9. Then, eggs were added sperm solution of 2-3 drops, stirred gently for 1 min, and added 1-2 mL freshwater at temperature of 27°C and stirred slowly for 1 min. On the other hand, fertilization rate was measured to determine egg quality of spotted barb fish before the treatment of heat shock.

2.2. Heat shock treatment

A number of 50 eggs were distributed in different filter according to each treatment and the number of 50 eggs were spread in control filter. The embryo age of 3, 4, and 5 min after fertilization (maf) were shocked at a water bath of 40°C temperature [13] for 1.0, 1.5, and 2.0 min, respectively.

2.3. Artificial incubation of embryo

The spotted barb embryos were incubated artificially at aquaria of 60×40×40 cm size. The water temperature was set around 27-28°C using thermostat. When 30-60 min after fertilization (maf), fish embryos were observed to initial embryonic development. Then, embryo sample was collected to observe the embryonic stage. The first hatched embryos were also observed.

2.4. Data analysis

Data were analyzed statistically and descriptively. Statistically analysis was used analysis of variance (ANOVA). The treatment differences were determined using Duncan's multiple range test. The statistics are analyzed using SPSS 10 (statistical software). The significant level was determined at $p < 0.05$.

3. Results and discussion

The results showed that the fish eggs used were of good quality with an egg diameter of 0.1 to 0.25 mm and a fertilization rate of 76.92 to 89.38% and there were no significant differences between treatments and control ($p > 0.05$). This proves that the eggs used in this study are relatively homogeneous in terms of quality, so synchronization of egg fertility can be controlled properly. Fertilization observations were made at 4 h after the eggs were fertilized by sperm from the parent spotted barb fish. Determination of the success rate of egg fertilization is seen in the color change, ie the fertilized egg is transparent in color while the unfertilized egg is turbid white [14]. Genetic factors, feed, stress, and poor water quality are the causes of damage to egg quality [15] and can have an impact on survival during the early phases of life of several fish species [1].

Heat shock results in temperature fluctuations from low temperature to high temperature. Temperatures that are too high or too low can inhibit the hatching process, even those that are too extreme can cause embryonic death and hatching failure [16]. The results of microscopic observations note that the development of spotted barb fish consists of several stages, namely: cleavage, morula, blastula, gastrula, organogenesis, and hatching stages. The division stage starts from the first mitosis division to the fifth division. Nelsen [17] states that division is a process of development in embryonic cells, which are cells increasingly becoming smaller or smaller units called blastomers.

The results showed significant differences ($p < 0.05$) between treatments of heat shock duration and embryo age, and their interaction on embryonic development and hatching lengths of spotted barb embryo (Table 1).

Table 1. The embryonic development and hatching lengths of spotted barb embryo after treated heat shock

HSD+EA (min+maf)	Cleavage (h)	Morula (h)	Blastula (h)	Gastrula (h)	Organogenesis (h)	Hatching (h)
1.0 – 3	0.88±0.05 ^{cd}	2.56±0.08 ^{cd}	5.82±0.06 ^{ab}	6.97±0.24 ^a	18.10±0.46 ^a	21.63±0.25 ^a
1.0 – 4	0.87±0.04 ^{cd}	2.53±0.07 ^{bcd}	6.85±0.11 ^c	7.25±0.13 ^b	19.48±0.17 ^{bc}	22.00±0.97 ^{ab}
1.0 – 5	1.00±0.07 ^f	2.65±0.10 ^d	6.00±0.26 ^b	7.17±0.09 ^{ab}	19.30±0.28 ^b	21.81±0.81 ^{ab}
1.5 – 3	0.75±0.04 ^b	2.40±0.11 ^{ab}	5.85±0.87 ^{ab}	6.95±0.11 ^a	20.63±0.65 ^{de}	22.92±1.03 ^{ab}
1.5 – 4	0.81±0.08 ^{bcd}	2.48±0.72 ^{abc}	5.75±0.24 ^{ab}	7.00±0.13 ^a	18.50±0.43 ^a	22.00±1.00 ^{ab}
1.5 – 5	0.90±0.05 ^{de}	2.56±0.06 ^{cd}	5.92±0.15 ^{ab}	7.13±0.12 ^{ab}	18.20±0.16 ^a	20.73±1.18 ^a
2.0 – 3	0.66±0.61 ^a	2.38±0.04 ^a	5.58±0.33 ^a	6.97±0.08 ^a	20.83±0.14 ^c	22.59±0.89 ^{ab}
2.0 – 4	0.80±0.02 ^{bc}	2.50±0.09 ^{abc}	5.83±0.16 ^{ab}	7.00±0.05 ^a	20.00±0.70 ^{cd}	22.50±0.90 ^{ab}
2.0 – 5	0.83±0.04 ^{bcd}	2.46±0.05 ^{abc}	5.80±0.14 ^{ab}	6.97±0.11 ^a	19.28±0.12 ^b	21.77±0.84 ^{ab}
Control	0.92±0.03 ^{ef}	2.58±0.04 ^{cd}	5.83±0.09 ^{ab}	7.08±0.03 ^{ab}	19.25±0.15 ^b	22.42±0.28 ^b

Note: HSD = heat shock duration, EA = embryo age, maf = min after fertilization, h = hours. Different superscripts in the same column show no significant differences ($p < 0.05$).

The treatment of heat shock duration and embryo age have a significant effect ($p < 0.05$) on the initial division of two cells (cleavage). The treatment of heat shock duration of 2.0 min and embryo age of 3 maf being the fastest treatment in reaching the division stage of two cells (cleavage), while the treatment of heat shock duration of 1.0 min and embryo age of 5 maf became the longest treatment in reaching stage of two cells (cleavage). Iswahyudi [18] reports that the first hour after fertilization in spotted barb fishes, while the first mitotic division in common carp (*Cyprinus carpio*) occurred within 20 maf [19].

The results of the ANOVA test for the treatment of heat shock duration and embryo age showed no significant difference ($p > 0.05$), with the time of hatching embryo of 20.73-22.92 h after fertilization. Iswahyudi [18] states that the hatching stage of spotted barb was achieved 24 h after fertilization. Meanwhile according to Haniffa *et al.* [19] showed that eggs of common carp hatch in 71 h 20 min after fertilization at 28°C temperature of incubation. The survival of the 4-day-old caked spotted barb fish larvae resulted from lower temperature shock treatment compared to controls. This is because the haploid embryo will die during hatching and only a small portion can survive [20]. Rustidja [21] states that the death of larvae is caused not only by the presence of defective larvae, but can also be caused by other factors such as water quality media, fungal attack, and inappropriate feeding. The difference in survival between controls and treatments may be due to differences in density in each treatment. Arai [22] states that differences in survival in fish given heat shock treatment, descriptively is not due to heat shock treatment given but rather is determined by the maintenance process carried out for example differences in larval density in each treatment, the nature of cannibalism or larval abnormalities.

4. Conclusion

Treatment of heat shock duration and embryo age influenced embryonic development and hatching lengths of spotted barb fish.

Commented [D2]: What the effect? Must answer the aims of study

5. References

- [1] Mukti A T 2016 *Triploidy and Sex Dimorphisms, Their Reproductive and Production Performances in Nile Tilapia (Oreochromis niloticus) Dissertation* (Bogor: IPB University) p 100 (in Indonesian)
- [2] Kamler E 2002 *Rev. Fish Biol. Fish.* **12**, 79-103
- [3] Cook M A, Guthrie K M, Rust M B and Plesha P D 2005 *Aqua. Res.* **36**, 1298-1303
- [4] Uehara S and Mitani T 2009 *Fish. Sci.* **75**, 159-165
- [5] Petereit C, Haslob H, Kraus G and Clemmensen C 2008 *Mar. Biol.* **154**, 295-306
- [6] Piferrer F, Cal R M, Gómez C, Bouza C and Martínez P 2003 *Aquaculture* **200**, 821-831
- [7] Peruzzi S, Kettunen A, Primiticero R and Kauric G 2007 *Aqua. Res.* **38**, 926-932

- [8] Mukti A T, Arsianingtyas H and Subekti S 2009 *J. Ilmiah Perikanan dan Kelautan* **1**, 163-168
- [9] Mukti A T, Rustidja, Sumitro S B and Djati M S 2001 *J. Ilmu-Ilmu Hayati BIOSAIN* **1**, 111-123
- [10] Piferrer F, Cal R M, Alvarez-Blazquez B, Sanchez L and Martinez P 2000 *Aquaculture* **188**, 79-90
- [11] Mukti A T, Carman O, Alimuddin and Zairin Jr M 2016 *Caryologia* doi: 10.1080/00087114.2016.1152112
- [12] Alcántar-Vázquez J P, Dumas S, Peña R and Ibarra A M 2016 *Ciencias Marinas* **42**, 111-122
- [13] Mukti A T 2005 *Berkala Penelitian Hayati* **10**, 133-138
- [14] Nainggolan R, Monijung R D and Mingked W 2015 *J. Budidaya Perairan* **3**, 131-140
- [15] Brooks S, Tyler C R and Sumpter JP 1997 *Rev. Fish Biol. Fish.* **7**, 387-416
- [16] Andriyanto W, Slamet B and Ariawan I M D J 2013 *J. Ilmu dan Teknologi Kelautan Tropis* **5**, 192-203
- [17] Nelsen O E 1953 *Comparative Embriology of Veterbrata* (New York: Mc. Graw Hill-Book Co Inc)
- [18] Iswahyudi M, Marsoedi and Widodo M S 2014 *J. Life Sci. Biomed.* **4**, 53-56
- [19] Haniffa M A, Benziger P S A, Arockiaraj A J, Nagarajan M and Siby P 2007 *Taiwania* **52**, 93-99
- [20] Purdom C E 1983 *Aquaculture* **33**, 287-300
- [21] Rustidja 2004 *J. Perikanan UGM* **6**, 1-8
- [22] Arai K 2001 *Aquaculture* **197**, 205-228



akhmad taufiq mukti <akhmad-t-m@fpk.unair.ac.id>

International Conference on Fisheries and Marine Sciences Universitas Airlangga1 message

International Conference on Fisheries and Marine Sciences Universitas AirlanggaTue, Feb 25, 2020 at
9:19 AM

<incofims@fpk.unair.ac.id>

To: a_hariati@ub.ac.id, mahadedi@gmail.com, "Dr. Drs. Abinawanto M.Si." <abinawanto.ms@sci.ui.ac.id>, adriana monica sahidu <adriana-m-s@fpk.unair.ac.id>, agustono agustono <agustono@fpk.unair.ac.id>, ahmad.bayhaqi@lipi.go.id, Aji Bayu Pamungkas <ajibayupmngks@gmail.com>, akhmad taufiq mukti <akhmad-t-m@fpk.unair.ac.id>, moch amin alamsjah <alamsjah@fpk.unair.ac.id>, Almiramarini23@gmail.com, Annur Abdillah <annur.ahadi@fpk.unair.ac.id>, Antonius Rumengan <antonius_rumengan@unsrat.ac.id>, aira riswana <ardian_turen@yahoo.co.id>, Idil Ardi <ardiidil@yahoo.com>, ari_080885@yahoo.com, ARIF HABIB <arifhabibfasya@fpk.unair.ac.id>

Dear Participants,

Greeting from Faculty of Fisheries and Marine, Universitas Airlangga, Surabaya

We are delighted to announce that the article has published in IOP volume 441.

Please check the online version

<https://iopscience.iop.org/issue/1755-1315/441/1>

We encourage you to join in the 3rd International conference on Fisheries and Marine this year. See you soon in September 2020.

The detail announcement will be published soon

Thank you for your kind participation

--

#Warm Regards

Secretariat

(InCoFIMS) International Conference on Fisheries and Marine Sciences

"Fisheries and Marine Science in Supporting Sustainable Development Goals (SDG's) Achievement"

Faculty of Fisheries and Marine

Universitas Airlangga

Campus C Universitas Airlangga, Mulyorejo, Surabaya, East Java, Indonesia 60115

Contact

Mail: incofims@fpk.unair.ac.id

Tel: +62 31 5911451

Fax: +62315965741