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Haematological Response of Catfish *Mystus singaringan* Exposed to Captive Condition

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Abstract

Mystus singaringan is one of valuable fresh-water fish commodity which is endangered and declining population due to incessant exploitation. Domestication is necessary, however they may lead to the change of habitat which may induced stress in fish. This study was carried out to compare hematologicalresponseof *M singaringan* in their natural habitat and in captivity. The neutrophil and lymphocyte counts of *M singaringan* in the natural habitat and those in captivity over a period of 14 days did not differ significantly (P<0.05), however the monocyte counts was significantly different. Fluctuations in the neutrophil, lymphocyte and monocyte counts indicates the response *M singaringan* as form of adaptation pattern when reared in captivity.

Key words : bagrid fish, stress, adaptation, non specific immune, domestication

Over exploitation to *Mystussingaringan* should become a concern (Pramono *et.al.*, 2019) and one of solutions to address this is the domestication program ((Teletchea and Fontaine, 2014). The consequences of domestications is the change of habitat, which ultimately will lead to stress (Schreck *et.al.,* 2001). Fish shows their response to stress on hematology (Maheswaran *et.al*., 2008; Tort, 2011) to adapt and reach homeostasis for survival (Mastorakos *et.al.*, 2005).This study aimed to understand haemotological response of *M. singaringan* corresponds to the change of habitat from the wild to captivity.

Materials and Methods

Fourty individuals of *M. singaringan* was taken from Klawing River, Central Java Province. The blood sample of *M. singaringan* was takenshortly after the capture, and the blood from captivity were taken on every two days. The blood was collected in 1 ml syringe coated with 10% EDTA. Blood smear were fixed in methanol solution for 5-10 min and dried, stained in a 10% Giemsa for 15 minutes (Tavares-Dias and Moraes, 2006). Afterwards, the preparations were rinsed with distilled water and left to dry. Leukocytes counting was performed for 100 cells. The ratio of leukocytes of *M. singaringan*in natural habitat to those in captivity was analyzed by one way ANOVA, while the response in captivity was analyzed descriptively.

Results and Discussion

The statistical analysis revealed no significant difference on the neutrophil and lymphocyte counts of *M. singaringan* in the wild and in captivity over a period of 14 days.However, a significant result was found in the monocyte counts ($p < 0.05$). The monocyte countsin captivity differ significantly on day 2, day 10 and day 12($p < 0.05$). (Table I).

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Fig 1. Lymphocytes (Giemsa Staining 400x)

Table I. The percentage of *M singaringan*neutrophils, lymphocytes and monocytes in this study (Mean ±SD)

Day	Neutrophils (%)	Lymphocytes (%)	Monocytes (%)
0 (Wild)	8.125±1.32^{a}	90.6±1.32^{a}	0.625±0.1^{d}
2	8.6±1.32^{a}	91.25±1.32^{a}	0.8±0.01^{c}
4	8.5±1.32^{a}	91±1.32^{a}	0.5±0.00^{e}
6	8.5±0.00^{a}	91.5±1.32^{a}	0.00^{e}
8	8.5±0.00^{a}	91±1.32^{a}	0.5±0.05^{e}
10	8.5±0.00^{a}	90±1.32^{a}	1.5±0.00^{a}
12	9±1.32^{a}	90±1.32^{a}	1±0.00^{b}
14	8.5±1.32^{a}	91.5±1.32^{a}	0.00^{e}

Means bearing different superscript in a column differs significantly (P<0.05)

Habitat change prompted a rise in neutrophil count on day 2, which declined on the fourth day in captivity. Since then until day 10, the count remained constant. The increase in the neutrophil count was linked to neutrophil's role in the front-line defense against pathogens through phagocytosis (Rustikawati, 2012; Utami *et al.,* 2013). Meanwhile, the decline was assumed to be attributed to extravasation or tissue adaptation due to the presence of penetrating antigen-presence in cells and apoptosis (Kiron, 2012). The following constant neutrophil count reflected that *M. singaringan* managed to overcome their stress due to the displacement from the nature to captivity. The neutrophil count then fluctuated from day 10 to 12 day and down on day 14, indicating that the neutrophil was working to achieve equilibrium. The influence of rearing environment difference on neutrophil count fluctuation was also identified in *Anguilla bicolor* (Fatimah *et al*., 2017).

After the *M. singaringan* was displaced from the nature to captivity, the lymphocyte count generally tended to increase from the day 2 to day 6 in captivity. The increase in the lymphocyte count indicated that the fish were stressed out and they were trying to adopt and acclimatize with the environment with penetrating antigens. Asides from the stress, and the activation of non-specific immune response (Sakai, 1999). From day 6 to day 10, the lymphocyte count has decreased suggesting that the fish started adapting and there was a lymphocyte. From day 12 to day 14, there was a slight increase, showing the presence of lymphocyte proliferation to form new antibodies. Voight and Swist (2011) stated that lymphocyte assumes a vital role in immune response.

Lastly, the monocyte count of *M. singaringan*on the 2nd day of captive-rearing sprang up. This was reflective of the non-specific immune system's preliminary response. Then, from day 2 to day 6, the count showed a fluctuation which was linked to monocyte's extravasation. From

Fig 2. Neuthrophils (Giemsa Staining 400x)

Fig 3. Monocyte (Giemsa Staining 400x) day 6 to day 10, their count rose gradually, suggesting that macrophages have differentiated and started phagocytic activity. During the 14 days of captive-rearing, the presence of the penetrating antigens have induced the production of macrophages and the immune system had reached stability. Monocytes play a critical role in phagocytosis foreign objects causing disease (Utami *et.al., loc. cit*).

Summary

From this research it can be concluded that habitat change can influence leucocyte differentiation composition as an adaptive response to stress. Understanding the mode of action leucocyte differentiation in captivity will be helpful for developing strategies to domestication program.

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