

Muscle performance of shrimp for understanding escape response in trawl capture process

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Recent development of underwater observation technology can give us a quality and quantity of knowledge on the capture process of fishing gear, with intensive works on the development of by-catch reducing devices for trawl gear. This remarks the importance on the physiological and behavioral differences of target and by-catch species, for the purpose of improving the selective function of capture process towards the optimal by-catch reduction techniques. The laboratory approach was conducted to examine the escape response of kuruma shrimp (*Peneaus japonicus*) of 11.5-21.1cm TL (3.95-7.29 cm CL), by monitoring the height, distance and duration of the bout behaviour as the tail-flip backward jumping performance induced by the rostrum tapping stimuli. The moving speed of one bout was 2.17m/s at maximum, and 0.94m/s for 0.25cm high in average. The achieved accumulated bout distance by the repeated tapping was 11.9m at maximum, and 4.3m in average. The swimming performance by the oscillation of swimming legs was also monitored in the flume tank. The endurance time according to the given flow speed showed the swimming curve of shrimp for identifying the possible performance of sustainable swimming for 1 hour period, at 0.3m/s flow speed at 20 °C. These results were compared with the possible muscle performance for escape response from the gear, examined by the muscle twitch experiment. The measurements of the muscle power output showed the scale effect as 0.2 kgf for the small shrimp of 4cm CL and 0.6 kgf for the large shrimp of 6cm CL. The temperature effect on muscle contraction time was also confirmed as 90ms in 10 °C, and 50ms in 20 °C. The collected data from the laboratory experiments will be discussed for classifying the locomotive performance of shrimp as two different phases; the tail-flip jumping backward and the swimming forward, for understanding the capture process of fishing gear. The responses of shrimp against the separating grid panel were also observed in the laboratory tank, for considering the behavioural patterns according to the approaching speed, direction and angles against the shrimp positioning on the pass of grid panel.

Keywords: trawl, shrimp, muscle physiology, escape response, by-catch reduction device

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