Fins Development in the *Osteochilus vittatus* and their regenerative capacity: searching a new model for tissue regeneration

Gratiana E. Wijayanti*, Iis Setyawati, Sugiharto, Bima A. Setiawan, Amanah I. Agustia

Laboratory of Animal Structure and Development, Faculty of Biology, Jenderal Soedirman University, Central Java, Indonesia
*1.bugrat@gmail.com

ABSTRACT

This study described the development of pectoral, dorsal, caudal, anal and pelvic fins in *Osteochilus vittatus* and their regenerative capacity. Fin development was studied in larval and post larval period while fin regeneration was studied in post larvae, juvenile and adult period. This species has two paired fin, the pectoral and pelvic fins, and three single fins, the dorsal, caudal and anal fin. The pectoral fins have been developed at the day of hatching, the dorsal fin start developing in the 2nd week post hatching as indicated by the bending of the most posterior part of the vertebrae, formation of fin fold and proximal fin rays; in the following week the fin become bifurcated and the rays extended to the distal part of the fin. The definitive caudal fin was observed in weeks 4th post hatching. The dorsal fin, anal fin and the pelvic fin start developing in the 2nd week post hatching as indicated by fin fold and rays formation. Upon fin amputation, the regenerative process was evidence by formation of wound epidermal, followed by blastema formation from the mesenchyme originated from inter hemiray tissue. The blastema proliferated and re-differentiated to form the missing part of the fin. Caudal fin regenerative capacity of the post larvae was faster compared to the juvenile and adult. Meanwhile the regenerative capacity of pectoral, pelvic and anal fin in the juvenile and adult were comparable. Fin regenerative capacity indicated that this species has a potency as a model in studying tissue regeneration in vertebrate

Keywords: fin development, fin regeneration, *Osteochilus vittatus*

INTRODUCTION

Fins are important appendages which facilitate fish to swim and maneuver in the aquatic environment. Each fin has a special function, therefore it is interesting to evaluate the chronological development of the fins. Due to their important function, it is understandable that these structures are able to regenerate once they got damage or cut. Tissue regeneration is an interest of developmental biology as well as medical research. Fin regeneration was mainly studied on caudal fin. This study was the first to evaluate regenerative capacity of pectoral, caudal, anal and pelvic fins in *O. vittatus*

OBJECTIVE

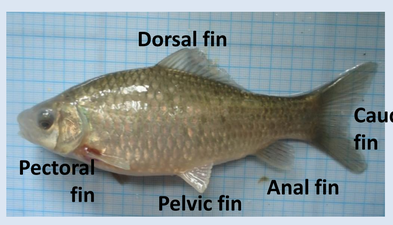
This study was conducted to evaluate morphological development and fin regenerative capacity in a teleost, *Osteochilus vittatus*

METHODS

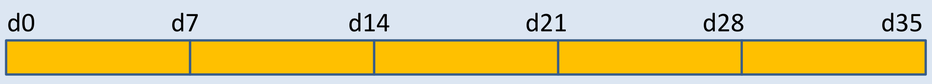
O. vittatus larvae, juvenile and adult were provided by the Laboratory of Animal Structure and Development, Biological Faculty, Jenderal Soedirman University. The fish were kept in plastic aquaria, with natural water and continuous aeration, water temperature were 26-29^{o}C. The fish were kept under natural photoperiod and were fed with commercial fish food in proportion to their mouth opening and body weight.

Fin development was evaluated weekly started from day 0 post hatching up to day 35 post hatching. Post amputated regeneration of pectoral, caudal, anal and pelvic fin were evaluated in juveniles, male adults and female adults up to day 28 post amputation. The fins were transversally amputated at half of their original length.

D0 post hatching larvae



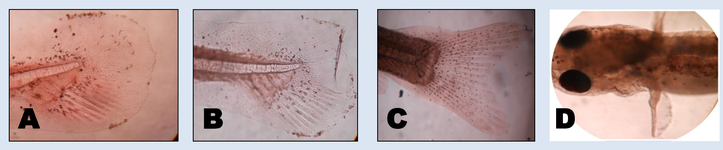
juvenile



RESULTS

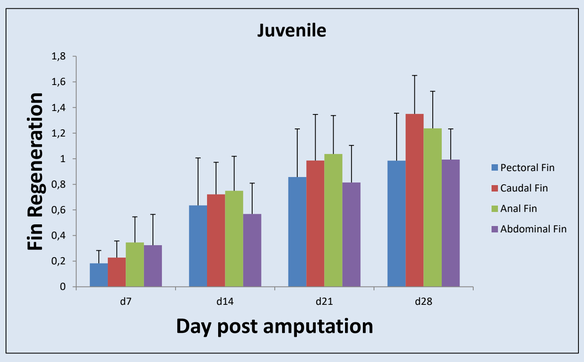
Fin Development

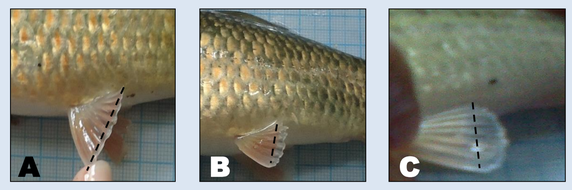
FIN	D0-d7	D8-d14	D15-d21	D22-d28	D29-d35
Pectoral Fin	developed				
Dorsal Fin		Fin fold, rays	Fin fold, rays	differentiate	developed
Caudal Fin		Round , v rays	Fork, d+v ray	differentiate	developed
Anal Fin			Fin fold	rays	differentiate
Pelvic Fin			Fin fold	rays	differentiate



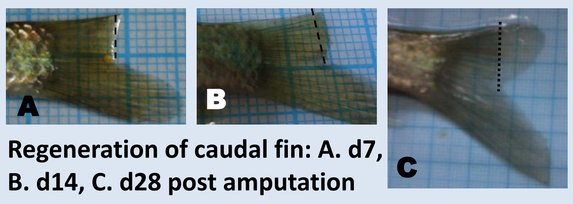
Morphology of caudal fin (A-C) and pectoral fin (D) in *O. vittatus*:
A. d7, B d14, c d 28, D d0 post hatching

Fin Regeneration

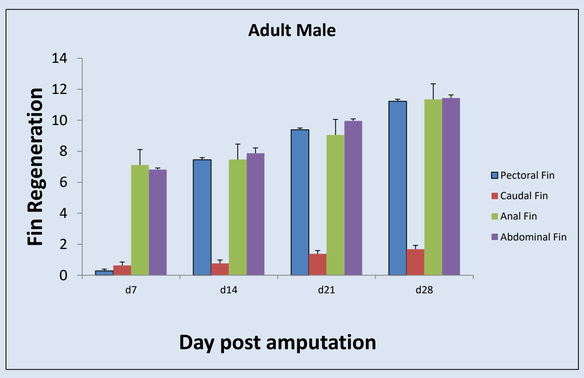


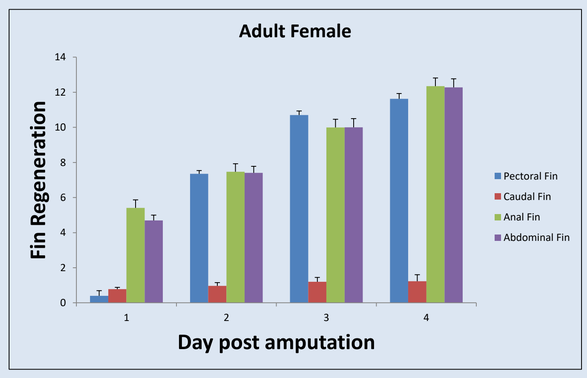


Regeneration of abdominal fin in *O. vittatus*: A. d7, B. d14, C. d28 post amputation



Regeneration of caudal fin: A. d7, B. d14, C. d28 post amputation





CONCLUSION

Fin development in *O. vittatus* is initiated by formation of pectoral fin followed by caudal, dorsal, anal and pelvic fin. Caudal fin regenerative capacity of the post larvae was faster compared to the juvenile and adult. Meanwhile the regenerative capacity of pectoral, abdominal and anal fin in the juvenile and adult were comparable.

ACKNOWLEDGEMENT

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