International Journal of ChemTech Research
CODEN (USA): IJCRGG, ISSN: 0974-4290, ISSN(Online):2455-9555
Vol.10 No.4, pp 651-656, 2017

# Morphological Strain Characteristics of Red Snapper, Lutjanus erythropterus (Family: Lutjanidae) as a Broodstock potential in East Java, Indonesia

**Yuni Widyawati*, Maheno Sri Widodo, Feni Iranawati, Dewa Gede Raka Wiadnya**

**Faculty of Fisheries and Marine Sciences, Universitas Brawijaya, Jl. Veteran, Malang 65145, Jawa Timur Province, Indonesia**

**Abstract :** In supporting the genetic quality betterment practice of the red snapper, taxonomic characteristics information of broodstock and young broodstock is really important to know, so that inbreeding rate on the next red snapper offspring will decrease. The role of morphological variation in the aquaculture is one of the indicators in determining a featured stock for selection and hybridization needs which is advantageous in the aquaculture system. The sample is collected from 2 fishing bases, i.e. Indonesian Brondong Fishing Port and Indonesia Prigi Fishing Port (PPN), each of the bases contribute 5 samples. The standard of comparison used to measure 24 samples of fish is Standard Length (SL) and Head Length (HL) bringing in 23 truss-morphometry. Variation on the Principal Component Analysis (PCA) got from the standard length, total length, and Pre-dorsal length (PreDL).
**Keywords :** cross breading, aquaculture, red-snapper, morphology.

## Introduction

Snappers are kind of economical reef fish which inhabit some of continental waters since 1840s[1]. In addition, snappers are demersal fish who live in a cluster and hide in a reef. This kind of fish is an export commodity of the sub sector of fisheries that the demands continuously increase, so that the catch is excessively high. A high demand product in market affected on the increase of red snapper catches within a single year. Nowadays, the demand to export the fillet of red snapper is high enough[2]. In an effort to preserve red snapper, aquaculture is one of the efforts that can be performed to offset the high rate of catch.

Lutjanidae family has spread widely in tropical and sub-tropical northwest Atlantic, Pacific, and Indian Oceans, which consists of 17 genuses in it, including Lutjanus, there are about 64 species including Lutjanus erythropterus[3].

Natural selection and genetic variation play an important role in the population and fish domestication that commonly refer to the decrease of genetic variation level of fish farming[4]. In the end, this condition will have a negative impact on the conservation of biological resources. Information on morphological variation of nature broodstock is important to know, so as there is no inbreeding, especially in the hatchery[5]. Inbreeding lead to the emergence of harmful recessive alleles, such as immune deficiencies, low survival, growth, egg production and the increase of the number of abnormal fish[6]. Ramaswany and Prasad[7] stated that inbreeding is breeding of individuals or broodstock which are closely related genetically and the result increases homozygosity, and the recessive tendencies often arise in the inbreeding offspring, which can ultimately lead to population decline. For that reason, this study aims to give some information about morphological characteristic of red snapper which can be used as a potential broodstock.

## Materials and method

The fish observed in this study is red snapper took from 2 fishing bases, namely PPN Prigi at Trenggalek district and PPN Brondong at Lamongan district. Both of them are in East Java. The identification refers to Lagler[8]. Length measurement uses a ruler and digital caliper with calibration 0.01. Taxonomy characteristic measured in this study is quantitative morphological characteristics covering morphometrics and meristics[9].

### Morphometrics Measurement Technique

The following is the description of the morphometrics measurement technique used in this research.

1. Standard Length (SL) is the measurement from the tip of the snout (landmark 1) to the posterior end of the last vertebra (landmark 6)
2. Total Length (TL) is the measurement from the tip of the snout (landmark 1) to the tip of the longer lobe of the caudal fin (landmark 7)
3. Pre-dorsal Length (PredDL) is the distance between the tip of the upper jaw (landmark 1) and inseryion/origin of first dorsal fin (landmark 3)
4. Head Length (HL) is the distance from tip of the snout (landmark 1) to the furthest bony edge of the operculum (landmark 15)
5. Snout length (SNL) is the distance from the tip of the snout or anteriormost margin of the upper lip (with mouth closed) (landmark 1) to the front margin of the orbit (landmark 22)
6. Body depth (BD) is the greatest vertical distance along a straight line from the midline of the dorsal surface of the body (landmark 3) to the midline of the ventral surface (landmark 14)
7. Eye length (EY) is the greatest distance between the margins of the orbit (landmark 21 and landmark 22)
8. Post Orbital Head Length (PHOL) is the greatest distance between the rear of the eye cover (landmark 21) with the edge of the gill cover or operculum (landmark 15)
9. Pre-pectoral length (PPL) is the straight-line measurement taken from front of snout (landmark 1) to origin of pectoral fin (landmark 13)
10. Pre-anal length (PAL) is the straight-line measurement taken from tip of snout (landmark 1) to posterior edge of the anus (landmark 11)
11. Upper Caudal Peduncle Length (UCPL) is the distance from the end of anal fin base (landmark 4) to the outset of the upper caudal dorsal (landmark 5)
12. Lower Caudal Peduncle Length (LCPL) is the straight-line between the end of anal fin base (landmark 10) to the outset of the lower caudal dorsal (landmark 8)
13. Caudal peduncle Depth (CPD) is the least vertical distance across the caudal peduncle (landmark 4 until 9)
14. Dorsan Fin Base (DFB) is the straight line distance from front of ridge strays (landmark 3) to soft rays of the rear dorsal (landmark 4)
15. Anal Fin Base is the straight-line of the rigid rays base of anal fin (landmark 11) to the soft rays of the rear anal (landmark 10)
16. Dorsal Fin Length (DFL) is the distance between the anteriormost and posteriormost edges of the dorsal fin base
17. Anal Fin Length (AFL) is the distance between the anteriormost and posteriormost edges of the anal fin base
18. Pectoral Fin Length (PFL) is the distance from the base of the outermost or anteriormost ray to the most distant tip of the pectoral fin
19. Caudal Peduncle Length (CPL) is the distance from the end of anal fin base to the midbase of caudal fin.
20. Head depth (HD) is a vertical distance from dorsum (landmark 2) to ventrum (landmark 17) passing through the center of the eye.
21. Dorsal Body Depth (DBD) is a vertical line towards the measure part from the anterior part of the dorsal fin (landmark 3) towards ventral position
22. Anal Body Depth (ABD) is eristic vertical line measured from anterior anal fin (landmark 11) to the eristic dorsal

23. Jaw Length (JL) is the length of a fish from the tip of the snout (landmark 1) to the end of the middle caudal fin rays (landmark 19)
24. Pre-pelvic length is the straight-line measurement taken from front of snout (landmark 1) to insertion point of pelvic fin (landmark 14)

## Result and Discussion

Meristic measurement is used through formulation of (dorsal fin; D), (anal fin; A) and an amount of scale in the lateral line (LL). The result of meristic measurements of samples of fish, there are eleven (XI) rigid rays and 13-15 soft rays, while on the anal fin there are three (III) rigid rays and 8-10 soft rays. Meristic characters are a character which relates to the body part that cannot be calculated, such as vertebrae, scales, soft rays, and fin spines[10]. Modification of meristic characters can be influenced by several environmental factors, among others: temperature, dissolved oxygen, salinity, and food availability[11]. The result of meristic measurement presented in the Table 1.

**Table 1. The Result of Meristic Measurement**

| No | Species | Dorsal fin formulation | Anal fin formulation | An amount on scales in the lateral line | Carpenter (2001) |
|---|---|---|---|---|---|
| 1 | *L. erythropterus* | D.XI.14 | A.III.8 | 12 | D.XI.12-14 |
| 2 | *L. erythropterus* | D.XI.13 | A.III.8 | 10 | A.III.8-9 |
| 3 | *L. erythropterus* | D.XI.14 | A.III.9 | 13 | |
| 4 | *L. erythropterus* | D.XI.15 | A.III.10 | 11 | |
| 5 | *L. erythropterus* | D.XI.14 | A.III.8 | 13 | |
| 6 | *L. erythropterus* | D.XI.14 | A.III.8 | 10 | |
| 7 | *L. erythropterus* | D.XI.14 | A.III.8 | 12 | |
| 8 | *L. erythropterus* | D.XI.14 | A.III.9 | 11 | |
| 9 | *L. erythropterus* | D.XI.14 | A.III.8 | 10 | |
| 10 | *L. erythropterus* | D.XI.14 | A.III.8 | 11 | |

The result of morphometric measurements is provided in the table 2. The standard of comparison used in the measurement of the sample is standard length (SL) and head length (HL), thus it results 23 truss-morphometry. This kind of technique is one of the ways to draw the shape of fish by measuring parts of his body on the basic of the points of benchmark. Morphometrics mesurement by using truss-morphometry provides more comprehensive picture[12].

**Table 2. Characteristic comparison of morphometric with SL and HL[12]**

| No | side | TL | PDL | HL | SNL | BD | OBL | PHOL | PPL | PAL | UCPL | LCPL | CPD | DFB | AFB | DFL | AFL | PFL | CPL | HD | DBD | ABD | JL | PVL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | S_Brondong | 1.19 | 0.33 | 0.36 | 0.32 | 0.38 | 0.08 | 0.43 | 0.33 | 0.70 | 0.44 | 0.47 | 0.38 | 0.49 | 0.43 | 0.32 | 0.32 | 0.28 | 0.31 | 0.29 | 0.40 | 0.34 | 0.34 | 0.36 |
| 2 | S_Brondong | 1.19 | 0.22 | 0.36 | 0.34 | 0.37 | 0.06 | 0.44 | 0.36 | 0.65 | 0.41 | 0.43 | 0.40 | 0.49 | 0.42 | 0.41 | 0.41 | 0.27 | 0.46 | 0.28 | 0.39 | 0.33 | 0.31 | 0.35 |
| 3 | S_Brondong | 1.23 | 0.35 | 0.36 | 0.36 | 0.40 | 0.08 | 0.48 | 0.34 | 0.67 | 0.43 | 0.46 | 0.43 | 0.51 | 0.44 | 0.32 | 0.42 | 0.30 | 0.51 | 0.30 | 0.40 | 0.34 | 0.35 | 0.37 |
| 4 | S_Brondong | 1.22 | 0.35 | 0.37 | 0.47 | 0.40 | 0.06 | 0.48 | 0.35 | 0.68 | 0.40 | 0.43 | 0.40 | 0.50 | 0.42 | 0.37 | 0.42 | 0.29 | 0.45 | 0.29 | 0.39 | 0.33 | 0.25 | 0.39 |
| 5 | S_Brondong | 1.26 | 0.29 | 0.32 | 0.35 | 0.33 | 0.08 | 0.50 | 0.32 | 0.59 | 0.41 | 0.48 | 0.42 | 0.43 | 0.40 | 0.42 | 0.41 | 0.25 | 0.53 | 0.28 | 0.33 | 0.29 | 0.39 | 0.36 |
| 6 | S_Prigi | 1.23 | 0.32 | 0.38 | 0.33 | 0.38 | 0.10 | 0.43 | 0.36 | 0.66 | 0.34 | 0.47 | 0.40 | 0.53 | 0.43 | 0.39 | 0.46 | 0.29 | 0.56 | 0.23 | 0.38 | 0.33 | 0.43 | 0.39 |
| 7 | S_Prigi | 1.21 | 0.39 | 0.38 | 0.35 | 0.40 | 0.11 | 0.43 | 0.35 | 0.65 | 0.44 | 0.51 | 0.36 | 0.49 | 0.40 | 0.38 | 0.49 | 0.28 | 0.53 | 0.31 | 0.39 | 0.33 | 0.42 | 0.39 |
| 8 | S_Prigi | 1.24 | 0.32 | 0.37 | 0.35 | 0.40 | 0.11 | 0.44 | 0.34 | 1.12 | 0.44 | 0.60 | 0.37 | 0.52 | 0.38 | 0.41 | 0.55 | 0.31 | 0.65 | 0.28 | 0.38 | 0.36 | 0.43 | 0.33 |
| 9 | S_Prigi | 1.33 | 0.26 | 0.37 | 0.36 | 0.38 | 0.10 | 0.46 | 0.34 | 0.65 | 0.42 | 0.52 | 0.37 | 0.48 | 0.43 | 0.34 | 0.46 | 0.29 | 0.57 | 0.24 | 0.37 | 0.31 | 0.43 | 0.36 |
| 10 | S_Prigi | 1.22 | 0.38 | 0.39 | 0.35 | 0.39 | 0.09 | 0.42 | 0.35 | 0.69 | 0.37 | 0.41 | 0.37 | 0.47 | 0.39 | 0.37 | 0.43 | 0.30 | 0.52 | 0.27 | 0.38 | 0.33 | 0.43 | 0.42 |

**Description:**

Side:Side: places where the sample of fish took; S_Brondong: Strain Brondong; S_Prigi: Strain prigi, TL: Total Length; PDL: Pre-dorsal length; HL: Head Length; SNL: Snout Length; POHL: Post Orbital Head length; PPL: Pre Pectoral Lenth; PAL: Pre Anal Length; UCPL: Upper Caudal Peduncle Length; LCPL: Low Caudal Peduncle Length; CPD: Caudal pedancle depth; DFB: Dorsal fin base; AFB: Anal fin base; DFL: Dorsal fin length; AFL: Anal fin length; PFL: Pectoral fin length; CPL: Caudal peduncle length; HD: Head depth; DBD: Dorsal body depth; ABD: Anal body depth; JL: Jew length; PVL: Prepelvic lengt

Dendogram formation (Figure 3.) resulted from morphometric measurement shows that the sample of fish number 5 has farther morphometry variation betwen the other fishes.

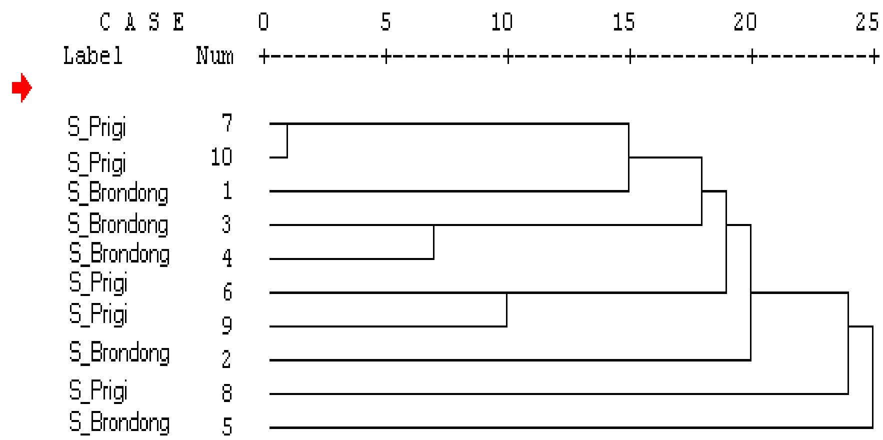


**Figure 3. Similarity relationship of morphometric characters based on the similarity data of fish species (L.erythropterus) in each location.**

Principle Component (PC1) of L.erythroperus morphological caharacteristics over the PC2 in the two locations, i.e PPN Brondong and PPN Prigi presented in the figure 4. Variation on PCA are gotten from the result of comparison between lenght standart, lenght total and pre-dorsal length. Plot between PC1 and PC 2 shows that there is morphometry variation based on the habit, that is strain Brondong and strain Prigi

## Conclusion

According to the meristic measurement on the dorsal fin of all samples of fish, there is XI rigid rays and 13-15 soft rays, while on the anal fin there are III rigid rays and 8-10 soft rays. The measurement of the standard of comparison of morphometric used in the measurement of sample of fish is length standard and head length, so as resulting in 23 truss-morphometry.

## Acknowledgements

We thank to the team of "Research Group Aquatic Biofloc" of Universitas Brawijaya, Indonesia, for providing beneficial insights for the conclusion of this study.

## References

1. Hood, P. B., A. J. Strelcheck and P. Steele. 2007. *A history of red snapper management in the Gulf of Mexico*. Pp. 267-284 *in* W. F. Patterson, III, J. H. Cowan, Jr., G. R. Fitzhugh, and D. L. Nieland, editors. *Red snapper ecology and fisheries in the U.S. Gulf of Mexico*. American Fisheries Society Symposium 60, Bethesda, Maryland
2. Zhang J.B, Huang LM dan Huo HQ 2004. *Larval identification of Lutjanus Bloch in Nansha coral reefs by AFLP molecular method*. Journal Bio Ecology. 298: 3-20.
3. Kobelkowsky A, 2013 *Morphology and Dissection Technique of the Kidney of the Grey Snapper Lutjanus (Teleostei: Lutjanidae)*, Laboratorio de Peces, Departamento de Biología, Unidad Iztapalapa, Universidad Autónoma Metropolitana, México D.F., México. 553p
4. Meng Z.N, S. yang, B. Fan, L. Wang and H.R Lyn. 2012. *Genetic variation and balancing selection at MHC class II exon 2 in cultured stocks and wild populations of orange-spotted grouper* (*Epinephelus coioides*), School of Life Sciences, Sun Yat-Sen University, Guangzhou, China, 13p

5. Benzie, J.A.H., S.T. William and M.J. Macaranas., 1993. *Allozyme electrophoretic method for analyzing genetic variation in Giant clams (Tridacnidae).* Australia centre for International Agriculture Research Canberra No. 23: 5
6. Tave D., 1995 *Selective breeding programmes or medium-sized fish farms,* Urania Unlimited Coos Bay, Oregon USA
7. Ramaswany dan Prasad., 2015 *Fisheries and Auaculture biotechnology,* New Delhi, 171p
8. Lagler, K. F., J. E., Bardach, R. R. Miller, & D.R.M Passino (1977). Systematic and Nomenclature. Icttyology. New York, John Wiley&Son. second Edd: 397-401p
9. Cailliet, G.M., M.S Love and A. W. Ebeling, 1986. Fishes, A field and laboratory manual on their structure, identification and natural history. Wadsworth publishing company. Belmont, California. 194p
10. Hossain M.A.R., Nahiduzzaman., Saha D. 2009. Landmark-base Morphometric and meristic of the endangered carp, from stocks of two isolated rivers, the jamuna and Halda and hathery, Zoology studies 49(4): 556-563
11. Hebert, P.D.,. Cywinska, A., Ball, S.L. 2003. *Biological identifications through DNA barcodes.* Proceedings of the Royal Society of London. Series B : *Biological Sciences,* 270 (151), 313-321
12. Mayr emest, 2002. Principles of systematic zoology. Tata McGraw-Hill publishing company, New Delhi, 20.

*****