



Digital Receipt

This receipt acknowledges that Turnitin received your paper. Below you will find the receipt information regarding your submission.

The first page of your submissions is displayed below.

Submission author: Dewi Imelda Roesma
Assignment title: DEWI IMELDA ROESMA
Submission title: 2016 Morphological variation of Bad...
File name: 2016_JEVS_April_4_2_43_Rasbora...
File size: 711.9K
Page count: 4
Word count: 2,797
Character count: 12,766
Submission date: 07-Mar-2020 01:02PM (UTC+0800)
Submission ID: 1271014766



2016 Morphological variation of Bada fish (*Rasbora maninjau*, Lumbantobing) in maninjau lake, West Sumatra

by Dewi Imelda Roesma

Submission date: 07-Mar-2020 01:02PM (UTC+0800)

Submission ID: 1271014766

File name: 2016_JEVS_April_4_2_43_Rasbora_manjau.pdf (711.9K)

Word count: 2797

Character count: 12766



E-ISSN: 2320-7078

P-ISSN: 2349-6800

JEZS 2016; 4(2): 541-544

© 2016 JEZS

Received: 06-02-2016

Accepted: 09-03-2016

Etrysha AprilianDepartment of Biology, Faculty
of Mathematics and Natural
Sciences, Andalas University,
Padang, West Sumatra,
Indonesia.**Dewi Imelda Roesma**Department of Biology, Faculty
of Mathematics and Natural
Sciences, Andalas University,
Padang, West Sumatra,
Indonesia.**Djong Hon Tjong**Department of Biology, Faculty
of Mathematics and Natural
Sciences, Andalas University,
Padang, West Sumatra,
Indonesia.**Correspondence****Dewi Imelda Roesma**Department of Biology, Faculty
of Mathematics and Natural
Sciences, Andalas University,
Padang, West Sumatra,
Indonesia.

Morphological variation of Bada fish (*Rasbora maninjau*, Lumbantobing) in maninjau lake, West Sumatra

Etrysha Aprilian, Dewi Imelda Roesma, Djong Hon Tjong

Abstract

Morphological variation study of Bada fish (*Rasbora maninjau*, Lumbantobing) from Maninjau Lake has been conducted. There are two types of *R. maninjau*, the study was aimed to determine the morphological variation between them. The data was analyzed with the Mann Whitney U test. The result showed that there is a morphological variation between *R. maninjau* type-1 and type-2. The characters are Head behind eye length (HBEL), Eye diameter (ED), Depth of caudal peduncle (DCP), Length of caudal peduncle (LCP), Predorsal distance (PDD), Preanal distance (PAD), Dorsal fin length (DoFL), Anal fin length (AFL), Pelvic fin length (PeFL), Pectoral fin length (PFL), Caudal fin upper length (CFUL) and Caudal fin lower length (CFL).

Keywords: morphological variation, *Rasbora maninjau*, morphometric, meristic

1. Introduction

Maninjau Lake is located in West Sumatra (Indonesia) at an elevation of 461.50 meters above sea level (0° 19'LS 100° 12'BT), has a surface area of around 96 km² with a depth of 1 to 175 m [1, 2]. With such extensive, it is possible that the lake will have locations with different conditions. There are many species of fish in that lake. According to Roesma [3] one of them is *Rasbora n.sp* with two types, one with nebulous black spot on the anal fin base while the other one with clear black spot but both of them with no genetic differences and decided as new species. Local people named it as Bada fish. Lumbantobing [4] named it as *Rasbora maninjau*. Although the description of morphological and molecular was done by Roesma [3], information of morphological variations of *R. maninjau* type-1 and type-2 is not available. It is important to know the difference of the characters between those two types in different locations which are assumed to be an adaptation to ecological changes in Maninjau Lake. According to Franssen, Rutaisire and Skoglund [5] variation and differentiation of morphological characters in population can be influenced by environmental conditions during ontogeny, availability of foods and predators, spawning areas, pollution intensity, depth of water and the level of anthropogenic pressure.

2. Material and Methods

The study was conducted from April to October 2015. Sampling was done in five locations in Maninjau lake according to Cailliet [6], using cast fishing nets. The locations are Sarajo, Mukomuko, Muara Antokan, Bayur and Sungai Batang (Figure 1). The 10% formalin was used to preserve all the samples, after which they were taken to the laboratory of Genetics and Cell Biology, Department of Biology, Faculty of Mathematics and Natural Sciences, Andalas University, Padang, West Sumatera Indonesia. All specimens were later preserved in 70% ethanol. Measurement and analysis of samples were carried out in the laboratory.

Morphological measurements were conducted with reference to some researchers [8-11] with accuracy of 0.01 mm. The observation consist of 45 characters morphometric and meristic. The morphometric characters are Total length (TL), Standard length (SL), Head length (HL), Head width (HW), Head depth (HD), Head behind eyes length (HBEL), Internares distance (ID), Snout length (SL), Eye diameter (ED), Interorbital distance (ID), Body depth (BD), Body width (BW), Depth of caudal peduncle (DCP), Length of caudal peduncle (LCP), Predorsal distance (PDD), Prepelvic distance (PPD), Preanal distance (PAD), Dorsal fin base length (DFBL), Dorsal fin length (DoFL), Anal fin base length (AFBL), Anal fin length (AFL),

Pelvic fin base length (PeFBL), Pelvic fin length (PeFL), Pectoral fin base length (PFBL), Pectoral fin length (PFL), Caudal fin Upper length (CFUL), Caudal fin middle length (CFML), Caudal fin lower length (CFLL). The meristic characters are Scale along lateral line (SALL), Scales above lateral line (SabLL), Scales below lateral line (SBLL), Dorsal fin rays (DFR), Dorsal fin soft rays (DFSR), Pectoral fin rays (PFR), Pectoral fin soft rays (PFSR), Pelvic fin rays (PeFR),

Pelvic fin soft rays (PeFSR), Anal fin rays (AFR), Anal fin soft rays (AFSR), Caudal fin rays (CFR), Scales before dorsal fin (SBDF), Scales after dorsal fin (SADF), Scales around caudal (SAC), Circular scales caudal peduncle (CSCP), Scales base dorsal fin (SBDF).

All of the data were subjected to the Mann-Whitney U test to identify the morphological differentiation between two different types of *R. maninjau* by using the SPSS ver.16^[12].

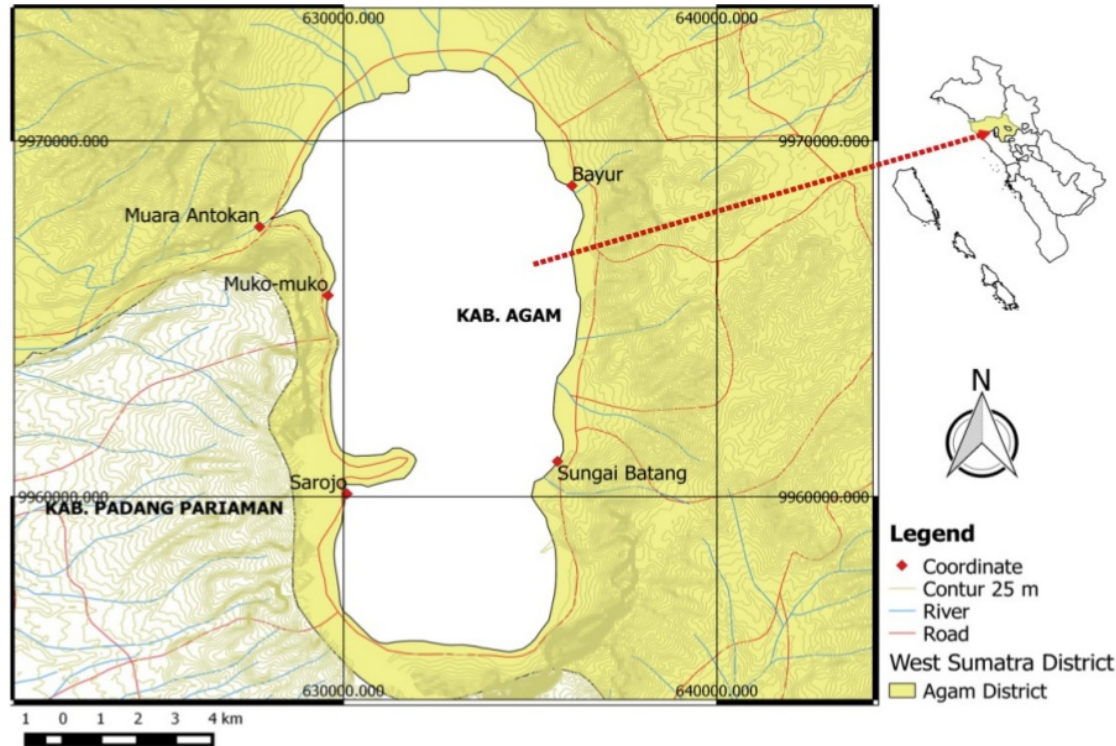


Fig 1: Location of study area in the Maninjau Lake

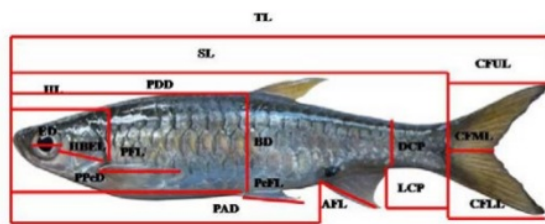


Fig 2: Most of morphometric characters.

3. Results and Discussion

The total of 240 individuals *R. maninjau* were collected at five locations in Maninjau Lake, consisting of 185 individuals of type-1 and 55 type-2. Based on the number of samples we obtained, it was found that the type-1 is more common than type-2. There are two possibilities that may occur. First, the population of type-1 is greater than type-2. Secondly, type-1 is being preferred in the area near the surface of the water while the type-2 in the deeper part of the lake so, there are much more individuals of the type-1 obtained. The body color of type-1 lighter as well as nebulous black spot on the anal fin base while the type-2 darker and clear black spot. According to Mboko^[13], an area which has a little bit of light intensity or shade can affect the color of the fish to be dark.

The results of Mann Whitney U test showed that 12 characters were significantly different between *R. maninjau* type-1 and type-2 (Table.1). Those characters are Head behind eye length (HBEL), Eye diameter (ED), Depth of caudal peduncle (DCP), Length of caudal peduncle (LCP), Predorsal distance (PDD), Preanal distance (PAD), Dorsal fin length (DoFL), Anal fin length (AFL), Pelvic fin length (PeFL), Pectoral fin length (PFL), Caudal fin upper length (CFUL) and Caudal fin lower length (CFLL). In general those characters (eye diameters, caudal peduncle and fins) are related to the eye and motion. The difference in depth and intensity of light may affect to the size of the eyes. The fish that living in shallow waters usually have large eyes, it used to detect the predators^[14, 15]. Based on the intensity of light, some cichlids of Victoria Lake are also found differ in diameter of eyes^[16]. An adaptation response in a population to its environment can be detected from the variation of morphological characters^[17]. Environmental differences during ontogeny, availability of foods and predators, spawning areas, pollution intensity, depth of water and the level of anthropogenic pressure will result in the variation and differentiation of morphological character^[5-7, 18]. In addition, there were morphologicals variation observed in three sympatric morphs of Arctic Charr (*Salvelinus alpinus*) that are ecologically diverged along the shallow-, deep- water resource axis in a subarctic postglacial lake (Norway)^[7].

Table 1: The Mean, Standard deviation, Maximum, Minimum and Mann-Whitney U test of the 45 morphology characters *R. maninjau* at Maninjau Lake. (p significance $\leq 0,05$; N: numbers of sample; ns: non significance test result; *:significance test result)

Characters	<i>R. maninjau</i> Type-1 N= 185	<i>R. maninjau</i> Type-2 N= 55	Mann-Whitney U Test
TL	1,29 $\pm$ 0,03 1,41 – 1,21	1,28 $\pm$ 0,02 1,33 – 1,22	4.664 P = 0.348ns
SL	69.82 $\pm$ 10.32 100.97-42.35	70.17 $\pm$ 5.94 81.58 – 59.47	4.782 P = 0.499ns
HL	0,24 $\pm$ 0,02 0,35 – 0,17	0,24 $\pm$ 0,01 0,26 – 0,22	4.331 P = 0.094ns
HW	0,11 $\pm$ 0,01 0,15 – 0,05	0,11 $\pm$ 0,01 0,13 – 0,10	4.204 P = 0.051 ns
HD	0,14 $\pm$ 0,01 0,23 – 0,08	0,15 $\pm$ 0,01 0,17 – 0,12	4.232 P = 0.058ns
HBEL	0,10 $\pm$ 0,01 0,16 – 0,05	0,10 $\pm$ 0,01 0,12 – 0,08	3.936 P = 0.011*
ID	0,06 $\pm$ 0,01 0,11 – 0,04	0,06 $\pm$ 0,00 0,07 – 0,04	4.550 P = 0.235 ns
SnL	0,06 $\pm$ 0,01 0,11 – 0,05	0,06 $\pm$ 0,01 0,08 – 0,04	4.410 P = 0.134ns
ED	0,07 $\pm$ 0,01 0,10 – 0,06	0,07 $\pm$ 0,00 0,08 – 0,06	3.554 P = 0.001*
IOD	0,09 $\pm$ 0,01 0,11 – 0,06	0,09 $\pm$ 0,00 0,10 – 0,08	4.268 P = 0.070ns
BD	0,21 $\pm$ 0,02 0,24 – 0,16	0,21 $\pm$ 0,02 0,25 – 0,17	4.561 P = 0.244ns
BW	0,11 $\pm$ 0,01 0,14 – 0,08	0,11 $\pm$ 0,01 0,14 – 0,09	4.744 P = 0.448ns
DCP	0,12 $\pm$ 0,01 0,14 – 0,09	0,12 $\pm$ 0,01 0,14 – 0,11	4.187 P = 0.046*
LCP	0,21 $\pm$ 0,01 0,25 – 0,17	0,21 $\pm$ 0,01 0,24 – 0,17	4.188 P = 0.047*
PDD	0,51 $\pm$ 0,02 0,58 – 0,46	0,51 $\pm$ 0,01 0,55 – 0,46	4.023 P = 0.019*
PPD	0,49 $\pm$ 0,02 0,57 – 0,44	0,49 $\pm$ 0,02 0,54 – 0,46	4.221 P = 0.055ns
PAD	0,68 $\pm$ 0,02 0,76 – 0,60	0,68 $\pm$ 0,02 0,72 – 0,64	4.096 P = 0.028*
DFBL	0,10 $\pm$ 0,01 0,12 – 0,04	0,10 $\pm$ 0,01 0,13 – 0,07	4.389 P = 0.122ns
DoFL	0,21 $\pm$ 0,01 0,26 – 0,18	0,21 $\pm$ 0,01 0,23 – 0,18	3.550 P = 0.001*
AFBL	0,10 $\pm$ 0,01 0,12 – 0,07	0,10 $\pm$ 0,02 0,24 – 0,08	4.242 P = 0.061ns
AFL	0,18 $\pm$ 0,01 0,22 – 0,13	0,17 $\pm$ 0,01 0,20 – 0,14	3.710 P = 0.002*
PFBFL	0,03 $\pm$ 0,01 0,05 – 0,02	0,03 $\pm$ 0,01 0,12 – 0,02	4.930 P = 0.727ns
PeFL	0,17 $\pm$ 0,01 0,20 – 0,12	0,16 $\pm$ 0,01 0,18 – 0,14	3.628 P = 0.001*
PFBFL	0,04 $\pm$ 0,01 0,07 – 0,03	0,04 $\pm$ 0,01 0,06 – 0,03	4.560 P = 0.244ns
PFL	0,20 $\pm$ 0,01 0,23 – 0,16	0,19 $\pm$ 0,01 0,22 – 0,16	3.754 P = 0.003*
CFUL	0,28 $\pm$ 0,02 0,33 – 0,22	0,28 $\pm$ 0,02 0,32 – 0,22	4.106 P = 0.030*
CFML	0,12 $\pm$ 0,01 0,18 – 0,09	0,13 $\pm$ 0,02 0,18 – 0,08	4.347 P = 0.101ns
CFL	0,29 $\pm$ 0,02 0,35 – 0,18	0,28 $\pm$ 0,03 0,32 – 0,13	3.577 P = 0.001*
SLL	27,60 $\pm$ 0,53 29 – 27	27,51 $\pm$ 0,57 29 – 26	4.694 P = 0.317ns
SabLL	4,02 $\pm$ 0,11 4,50 – 4,00	4,01 $\pm$ 0,07 4,50 – 4,00	4.932 P = 0.322ns
SBLL	1,01 $\pm$ 0,05 1,50 – 1,00	1 $\pm$ 0 1 – 1	5.032 P = 0.440ns
DFR	1 $\pm$ 0 1 – 1	1 $\pm$ 0 1 – 1	5.088 P = 1ns

DFSR	6,99 $\pm$ 0,13 8 – 6	6,98 $\pm$ 0,13 7 – 6	5.023 P = 0.520ns
PFR	1 $\pm$ 0 1 – 1	1 $\pm$ 0 1 – 1	5.088 P = 1ns
PFSR	9,05 $\pm$ 0,66 11 – 8	8,91 $\pm$ 0,52 10 – 8	4.548 P = 0.166ns
PeFR	1 $\pm$ 0 1 – 1	1 $\pm$ 0 1 – 1	5.088 P = 1ns
PeFSR	7,11 $\pm$ 0,44 9 – 6	7,04 $\pm$ 0,19 8 – 7	4.934 P = 0.431ns
AFR	1 $\pm$ 0 1 – 1	1 $\pm$ 0 1 – 1	5.088 P = 1ns
AFSR	5,03 $\pm$ 0,19 6 – 4	5 $\pm$ 0 5 – 5	4.950 P = 0.297ns
CFR	18,98 $\pm$ 0,19 20 – 17	18,96 $\pm$ 0,19 19 – 18	4.960 P = 0.295ns
SBDF	11,40 $\pm$ 0,56 13 – 10	11,45 $\pm$ 0,54 12 – 10	4.808 P = 0.478ns
SADF	11,96 $\pm$ 0,62 13 – 11	12,05 $\pm$ 0,41 13 – 11	4.686 P = 0.287ns
SAC	5,42 $\pm$ 0,50 6 – 5	5,36 $\pm$ 0,49 6 – 5	4.792 P = 0.443
CSCP	11,98 $\pm$ 0,71 13 – 11	11,95 $\pm$ 0,58 13 – 11	4.972 P = 0.778ns
SBDI	3,05 $\pm$ 0,22 4 – 3	3,02 $\pm$ 0,13 4 – 3	4.932 P = 0.322ns

The morphological characters that varies is a form of adaptation within a population to their environment [17]. The phenotype of variation can occur without being followed by the genetic changes but only a form of plasticity as a manifestation of ecological differences such as geographical isolation and environmental factors [19, 20].

4. Acknowledgements

We would like to express our sincere thanks to Dr. Syaifullah, Dr. Efrizal and Dr. Indra Junaidi Zakaria for their valuable comments and discussions. We are grateful to all people who contributed to this research, specially to our lab team.

5. References

1. Erlania, Rusmaedi, Anjang BP, Joni H. Dampak manajemen pakan dari kegiatan budidaya ikan Nila (*Oreochromis niloticus*) di keramba jaring apung terhadap kualitas perairan danau maninjau. Prosiding forum inovasi teknologi akuakultur 2010; 621-631.
2. LIPI. Ringkasan kegiatan danau oleh pusat penelitian LIPI. Limnotek 2008; 16(2):74-87.
3. Roesma DI. Diversitas spesies dan kekerabatan genetik ikan - ikan Cyprinidae di danau-danau dan sungai-sungai di sekitarnya di kawasan Sumatera Barat. PhD Dissertation. Andalas University. Padang, 2011.
4. Lumbantobing DN. Four new species of *Rasbora* of the Sumatrana group (Teleostei: Cyprinidae) from northern Sumatra Indonesia. Zootaxa 2014; 3764 (1):001-025.
5. Franssen NR, Stewart LK, Schaefer JF. Morphological divergence and flow-induced phenotypic plasticity in a native fish from anthropogenically altered stream habitats. ecology and evolution 2013; 3(14):4648-4657.
6. Rutaisire J, Booth AJ, Mosambe C, Nyakaana S, Muwanika VB. Morphometric and genetic differentiation of *Labeo victorianus* populations in Lake Victoria. African Zool 2005; 40(2):309-317.
7. Skoglund S, Siwertsson A, Amundsen PA, Rune K. Morphological divergence between three Arctic charr morphs the significance of the deep-water environment. Ecology and Evolution 2015; 5(15):3114-3129.

8. Cailliet GM, Love MS, Ebeling AW. Fishes. A field and laboratory manual on their structure, identification and natural history. Edn 1, Vol. I Waveland Press, Inc, 1986.
9. Strauss RE, Bookstein FL. The truss: body form reconstruction in morphometrics. *Syt. Zool.* 1982; 31(2):113-135.
10. Kottelat M, Whitten AJ, Kartikasari SN, Wirjoatmodjo S. Freshwater fishes of western Indonesia and Sulawesi. Periplus Eds. (HK) Ltd and EMDI. Indonesia, Singapore, 1993.
11. Costa JL, de Almeida JR, Costa MJ. A morphometric and meristic investigation of Lusitanian toadfish *Halobatrachus didactylus* (Bloch and Schneider): Evidence of population fragmentation on Portuguese Coast. *Sci. Mar* 2003; 67(2):219-231.
12. Sprent P. Applied Non Parametric Statistical Methods. Chapman and Hall New York, 1989.
13. Mboko SK, Kohda M. Pale and dark dichromatism related to microhabitats in a herbivorous tanganyikan cichlid fish, *Telmatochromis Temporalis*. *Journal of Ethology.* 1995; 13:77-83.
14. Jordan J, Hawe D, Kellogg K, Juanes F, Stauffer JrJ. Small-scale morphological differentiation in a cichlid may provide clues about rapidly diversifying systems. *Afr J Ecol.* 2007; 46:107-109.
15. Kerschbaumer MP, Mitheroecker Stumbauer C. Evolution of Body Shape in Sympatric Versus Non-Sympatric *Tropheus* Populations of Lake Tanganyika. *Heredity* 2014; 112:89-98.
16. Bouton N, De Visser J, Barel CDN. Correlating head shape with ecological variables in rock-dwelling haplochromines (Teleostei: Cichlidae) from Lake Victoria. *Biol J Linnean Soc.* 2002; 76(1):41-48.
17. Swain DP, Foote CJ. Stocks and chamaleons: the use of phenotypic variation in stock identification. *Fisheries Research* 1999; 43(1-3):113-128.
18. Krabbenhoft TJ, Collyer ML, Quattro JM. Differing Evolutionary Patterns Underlie Convergence on Elongate Morphology in Endemic Fishes of Lake Waccamaw, North Carolina. *Biol J of the Linn Society.* 2009; 98:636-645.
19. Naesje TF, Vourinen JA, Sandlund OT. Genetic and morphometric differentiation among sympatric spawning stocks of whitefish (*Coregonus lavaretus* L.) in Lake Femund, Norway. *J Limnol* 2004; 63(2):233-243.
20. Poulet NY, Royjol H, Collier Lok S. Does fish scale morphology allow the identification of population *Leuciscus burdigalensis* in river viaur (sw france). *Aquat. Sci.* 2005; 67(1):1223-127.

2016 Morphological variation of Bada fish (Rasbora maninjau, Lumbantobing) in maninjau lake, West Sumatra

ORIGINALITY REPORT

4%

SIMILARITY INDEX

4%

INTERNET SOURCES

3%

PUBLICATIONS

3%

STUDENT PAPERS

PRIMARY SOURCES

1

citeseerx.ist.psu.edu

Internet Source

4%

Exclude quotes On

Exclude bibliography On

Exclude matches < 3%