MORPHOMETRIC AND MERISTIC OF COMMON PLECO (LORICARIIDAE)ON CILIWUNG RIVER WATERSHED SOUTH JAKARTA REGION

by Dewi Elfidasari

Submission date: 25-Mar-2020 01:53AM (UTC+0000)
Submission ID: 1281518107
File name: TURNITIN_Morphometic_and_meristic_of_common_pleco.pdf (467.65K)
Word count: 2659
Character count: 13776

Journal Homepage: -www.journalijar.com
INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)
Article DOI:10.21474/IJAR01/2363
DOI URL: http://dx.doi.org/10.21474/IJAR01/2363
ISSN NO. 2320-5407

RESEARCH ARTICLE

MORPHOMETRIC AND MERISTIC OF COMMON PLECO (LORICARIIDAE)ON CILIWUNG RIVER WATERSHED SOUTH JAKARTA REGION.

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Manuscript Info

Manuscript History

Received: 18 October 2016
Final Accepted: 20 November 2016
Published: December 2016

Key words:-
Common pleco, morphometric and meristic, Ciliwung river, Jakarta

Abstract

Common pleco is one of the invasive species that enter Indonesia through the fish trade. The fish can be found onCiliwung river Indonesia. Morphology identification of the common pleco can be done by seeing its abdominal pattern. The identification results showed three different types, *Pterygoplichthyspardalis, Pterygoplichthysdisjunctivus,* and *inter-grade*. This study was conducted to see what kind of common pleco in Ciliwung river area of South Jakarta based on morphometric and meristic characters. Fifty samples were observed. Morphometric characters measured were 27 and meristic characters measured were 9. Results of Principle Component Analysis (PCA) based on morphometric and meristic characters measurement showed there is no significant difference between samples. All samples can be regarded as the same type.

Introduction:-

Pleco already invaded several countries such as Turkey (Ozdilek, 2007), Taiwan (Wu *et al*., 2011), Philippines (Joshi, 2006), Vietnam (Zworykin and Budaev, 2013), Malaysia, Singapore, and Indonesia (Page and Robins, 2006). In Indonesia, these fish can be found in some rivers like the Air Hitam River at Pekanbaru, Riau (Pinem*et al*., 2016); Cangkurawok river, Bogor (Istanti, 2005); Bengawan Solo, Seragen (Nugroho*et al*., 2014); and Ciliwung river, Jakarta. In 2010 the fish diversity decline onCiliwungriver reached 92.5% (Wowor, 2010).

Page & Robins (2006) said there are two species *Pterygoplichthys* in Indonesia, *Pterygoplichthyspardalis* and *Pterygoplichthysdisjunctivus*. Morphological Identification of the fish is done by the abdominal pattern (Wu *et al*., 2011; Bijukumar*et al*., 2015). Results of Qoyyimah*et al*. (2016) research showed there are 3 types of pleco in South Jakarta Ciliwungriver, namely *Pterygoplichthyspardalis*, *Pterygoplichthysdisjunctivus*, and inter-grade. This study was conducted to see what kind of pleco in Ciliwung river area of South Jakarta based on morphometric and meristic characters.

Material and Method:-

The study was conducted from January until May 2016. The object of research is pleco. Fifty samples were observed in this study. Samples were obtained from fisherman along Ciliwungriver [Rindam Jaya-Bidara China].

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The tools used are digital caliper, camera, and ruler. The materials used are formaldehyde 10%, chloroform, and alcohol 70%

Samples that have been obtained are identified by saw the abdominal pattern (Armbruster and Page, 2006; Wu *et al*., 2011; Bijukumar*et al*., 2015; Qoyyimah*et al*., 2016)and the morphometric and meristic characters measured after. Measurement of morphometric characters refer to Ng and Kottelat (2013) by observing 27 morphometric characters. Characters morphometric measured is standard length (SL), total length (TL), predorsal length (PDL), preanal length (PAL), prepelvic length (PPL), prepectoral length (PL), dorsal-spine length (DSL), dorsal-fin length (DFL), length of dorsal-fin base (LDFB), length of anal-fin base (LAFB), pelvic-fin length (PFL), pectoral-fin length (PF), pectoral-spine length (PSL), caudal-fin length (CFL), length of adipose-fin base (LOAFB), maximum height of adipose fin (MHAF), dorsal to adipose distance (DAD), post-adipose distance (PAD), length of caudal peduncle (LCP), depth of caudal peduncle (DCP), body depth at anus (BDA), head length (HL), head width (HW), head depth (HD), snout length (SOL), interorbital distance (ID), eye diameter (ED) (Fig 1).

Calculations of meristic characters conducted on nine characters refer to Bijukumar*et al*. (2015) research. Meristic characters were counted are dorsal fin rays (DFR), anal fin rays (AFR), caudal fin rays (CFR), pectoral fin rays (PFR), pelvic fin rays (PR), lateral line plates (LLP), dorsal plates (DL), postanal plates (PP), plates between dorsal fin base and adipose fin (PDFAF).

Morphometric and meristic data obtained were analyzed manually using Microsoft Excel 2010. The results were also analyzed using Principal Component Analysis (PCA). PCA is used to classify data. The program used is Minitab 15.

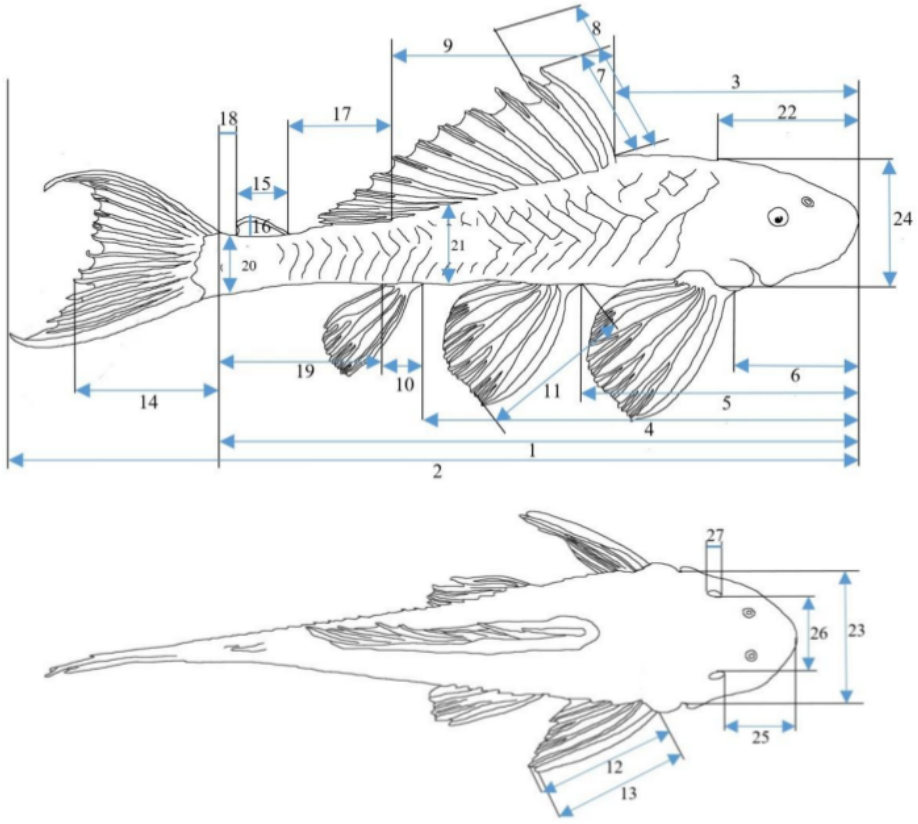

Figure1:- Morphometric characters of common pleco*Pterygoplichthys*[Explanation: 1.SL, 2.TL, 3.PDL, 4.PAL, 5.PPL, 6.PL, 7.DSL, 8.DFL, 9.LDFB, 10.LAFB, 11.PFL, 12.PF, 13.PSL, 14.CFL, 15.LOAFB,

16.MHAF, 17.DAD, 18.PAD, 19.LCP, 20.DCP, 21.BDA, 22.HL, 23.HW, 24.HD, 25.SOL, 26.ID, 27.ED] (personal documentation).

Result and Discussion:-

Morphometric measurements on samples that are considered to have a well-established body size, the fish morphological characters is complete and will not change. All data obtained wasadequate (Rahmatin*et al.*, 2011). Morphometric measurements of the total length on 50 samples*P.pardalis* fish ranged from 22.1 to 39.7 cm. *P.disjunctivus* species only obtained one sample with a length of 26.5 cm. Inter-grade ranging from 18.5 to 41.35 cm (Table 1).

The results of PCA analysis of the morphometric characters showed that all the samples did not show significant differences (Figure 2). The results showed the group dispersed and there is no grouping in one quadrant. Currently abdominal pattern is the main diagnostic characteristics for species identification. However, based on PCA result on morphometric characters shows that the three species identified are the same variable.

Table 1:- Morphometric measurement result.

Character	*P.pardalis* (n=10)			*P.disjunctivus* (n=1)	*Inter-grade* (n=39)		
	Range	Average	SD		Range	Average	SD
SL	16.200–31.150	22.430	0.590	19.8	13.550–31.200	22.110	0.131
TL	22.100–39.700	28.890	0.730	26.5	18.500–41.350	28.973	0.157
PDL	6.216–11.820	8.445	0.194	8.088	5.192–11.840	8.461	0.048
PAL	10.330–21.260	14.735	0.397	12.973	9.436–21.010	14.785	0.084
PPL	6.887–13.530	9.540	0.236	8.796	6.023–13.330	9.585	0.052
PL	3.726–7.000	4.989	0.123	4.645	2.992–7.170	4.966	0.027
DSL	3.653–5.941	4.518	0.076	4.089	3.281–6.593	4.697	0.019
DFL	3.386–5.275	4.103	0.064	4.001	2.734–5.825	4.255	0.018
LDFB	5.715–10.430	7.732	0.197	6.578	4.762–10.670	7.605	0.043
LAFB	0.729–1.710	1.110	0.037	0.951	0.628–1.970	1.072	0.008
PFL	3.240–5.300	4.104	0.078	3.905	2.699–5.510	4.160	0.019
PF	3.934–6.435	4.997	0.087	4.533	3.184–6.970	5.159	0.024
PSL	4.487–6.855	5.475	0.084	4.572	3.859–7.731	5.639	0.024
CFL	3.192–5.780	4.190	0.093	4.175	2.693–6.740	4.513	0.024
LOAFB	0.965–2.400	1.411	0.057	1.207	0.801–2.410	1.392	0.010
MHAF	0.947–1.260	1.111	0.013	1.074	0.599–1.840	1.064	0.006
DAD	2.542–5.130	3.532	0.109	3.117	2.050–5.770	3.658	0.026
PAD	0.956–1.841	1.364	0.038	1.389	0.636–2.190	1.534	0.011
LCP	4.749–8.890	6.499	0.180	5.497	3.893–9.900	6.588	0.042
DCP	1.322–2.640	1.888	0.050	1.565	1.065–2.640	1.901	0.011
BDA	2.146–3.790	2.817	0.058	2.684	1.673–3.620	2.727	0.014
HL	3.849–6.704	4.798	0.119	4.829	3.450–7.182	5.046	0.026
HW	3.514–6.100	4.623	0.106	4.279	3.002–6.061	4.635	0.023
HD	2.577–4.580	3.394	0.076	3.166	2.227–4.540	3.395	0.016
SL	2.424–4.360	3.137	0.078	2.937	1.982–4.345	3.182	0.017
ID	2.175–3.530	2.723	0.059	2.491	1.854–3.769	2.720	0.013
ED	0.718–1.044	0.839	0.012	0.775	0.638–1.110	0.839	0.003

Result from PCA analysis is corresponded with Zworykin *et al.* (2013) result, which analyzes the pleco's PCA. The results showed that all morphometric characters do not have a significant difference in the character. PCA plot results did not show a clear group. Zworykin *et al*. (2013) also revealed no significant differences between *P.pardalis* and *P.disjunctivus* based on morphometric and meristic characters.

Meristic is a calculation of the body thatcan be calculated. Meristic calculation is generally performed on the external parts of the body such as the number of fin hard bones (fin rays), the amount of soft fin bones and scales (Sajina*et al.*, 2013). The result of9 meristic character calculation to 50 samples showed no difference between

species. The calculation of number of anal and pelvic fins in the whole sample gave similar results (Table 2). It is also corresponded to studies conducted by Alvarez-Pliego*et al*. (2015), Muralidharan*et al*. (2015), and Ozdilek (2007).

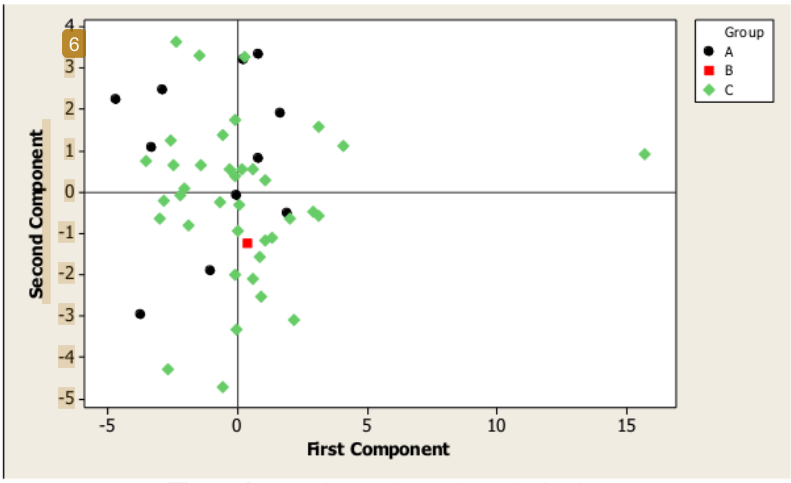

Figure 2:- Result morphometric analysis pleco.

Characters meristic calculation of*P.pardalis* to 10 samples had a results with the Alvarez-Pliego*et al*. (2015)and Mularidharan*et al*. (2015) results. Alvarez-Pliego*et al*. (2015) result showed that DFR and PFR has a number of 11-12 and 5-6. Muralidharan*et al*. (2015) result showed DFR, CFR, PFR, and LLP has a number 12, 14, 6, and 26-32. Calculation meristic to 1 sample *P.disjunctivus* also had no differences with the Alvarez-Pliego*et al*. (2015) and Ozdilek (2007) research. Alvarez-Pliego*et al*. (2015) showed that the number of characters DFR and PFR *P.disjunctivus* is 11-12 and 6. Ozdilek (2007) calculate DFR, CFR, PFR, LLP, PP, and PDFAF meristic characters on 1 *P.disjunctivus*specimen and generate 10, 14, 5, 29, 14, and 7. The results of the calculation of the inter-grade meristic characters also showed no differences with the other two species (Table 2).

Table 2:- Meristic result group based on abdominal pattern.

No	Merisitic characters	Alvarez-Pliego*et al.* (2015)		Muralidharan*et al.* (2015)	Ozdilek (2007)	Elfidasari*et al.* (2016)		
		P.pardalis	*P.disjunctivus*	*P.pardalis*	*P.disjunctivus*	*P.pardalis*	*P.disjunctivus*	*Inter-grade*
1	DFR	11-12	11-12	12	10	11-12	12	11-13
2	AFR	4	4	4	4	4	4	4
3	CFR	-	-	14	14	13-14	14	13-15
4	PFR	5-6	6	6	5	6	6	5-6
5	PR	5	5	5	5	5	5	5
6	LLP	-	-	26-32	29	28-30	28	27-29
7	DL	-	-	-	-	3	3	3
8	PP	-	-	-	14	13-14	13	12-14
9	PDFAF	-	-	-	7	6-7	6	5-7

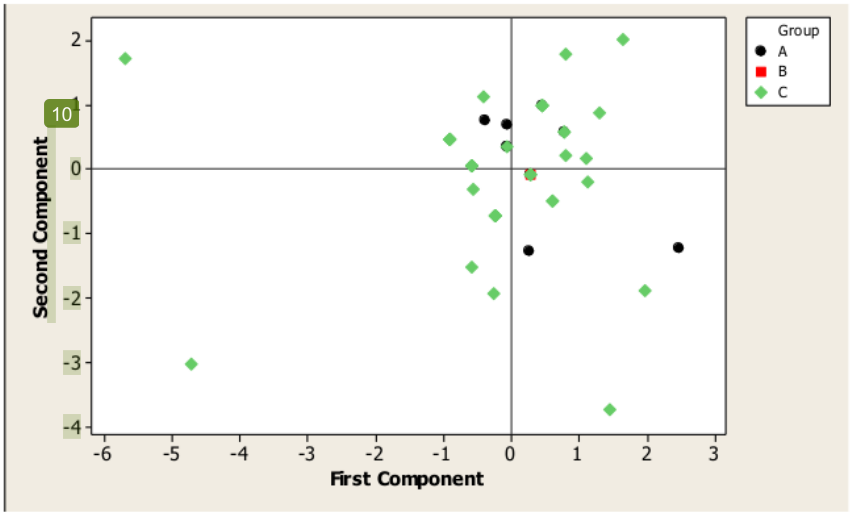

Figure 3:- Result meristic analysis pleco

Meristic analysis using PCA is based on the correlation between the characters, except AFR, PR, and DL. This is caused by the calculation results of the whole sample is same. The analysis showed no visible groups (Figure 3). The data obtained are spread on all quadrants, so there is no clustering. It shows the same results with morphometric analysis. Analysis based on the results of morphometric and meristic showed that three species that have been identified is one same species.

Conclusion:-

The results of morphometric analysis, calculation, and meristic analysis showed no difference in the whole pleco sample from the Ciliwungriver. From this research suggested to be revised the determination of morphological characters for pleco identification.

Acknowledgment:-

This research was supported by University of Al Azhar Indonesia as a research funder from Grant UAI Research 2015 through The Research and Community Service Institution based on Internal Working Implementation Agreement 2015 No. 005/SPK/A-01/UAI/III/2012.We also thank Kodam Jaya for their assistance, especially Lieutenant General AgusSutomo (Ex Kodam Jaya Leader), Major General Teddy Lhaksamana (Kodam Jaya Leader), ColonelArudji Anwar, Lieutenant Colonel Edi Martadinata, Lieutenant Colonel FirdausAgustiana and all Indonesian Army personal for the assistance on the field.

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Introduction:- Pleco already invaded several countries such as Turkey (Ozdilek, 2007), Taiwan (Wu et al., 2011), Philippines (Joshi, 2006), Vietnam (Zworykin and Budaev, 2013), Malaysia, Singapore, and Indonesia (Page and Robins, 2006). In Indonesia, these fish can be found in some rivers like the Air Hitam River at Pekanbaru, Riau (Pinemet al., 2016); Cangkurawok river, Bogor (Istanti, 2005); Bengawan Solo, Seragen (Nugrohoet al., 2014); and Ciliwung river, Jakarta. In 2010 the fish diversity decline onCiliwungriver reached 92.5% (Wowor, 2010). Page & Robins (2006) said there are two species Pterygoplichthys in Indonesia, Pterygoplichthyspardalis and Pterygoplichthysdisjunctivus. Morphological Identification of the fish is done by the abdominal pattern (Wu et al., 2011; Bijukumaret al., 2015). Results of Qoyyimahet al. (2016) research showed there are 3 types of pleco in South Jakarta Ciliwungriver, namely Pterygoplichthyspardalis, Pterygoplichthysdisjunctivus, and inter-grade. This study was conducted to see what kind of pleco in Ciliwung river area of South Jakarta based on morphometric and meristic characters. Material and Method:- The study was conducted from January until May 2016. The object of research is pleco. Fifty samples were observed in this study. Samples were obtained from fisherman along Ciliwungriver [Rindam Jaya-Bidara China]. Corresponding Author:-Dewi Elfidasari. Address:-Biology Course, Faculty of Science and Technology, University of Al Azhar Indonesia, Masjid Agung Al Azhar, Sisingamangaraja St, KebayoranBaru, Jakarta. The tools used are digital caliper, camera, and ruler. The materials used are formaldehyde 10%, chloroform, and alcohol 70% Samples that have been obtained are identified by saw the abdominal pattern (Armbruster and Page, 2006; Wu et al., 2011; Bijukumaret al., 2015; Qoyyimahet al., 2016)and the morphometric and meristic

characters measured after. Measurement of morphometric characters refer to Ng and Kottelat (2013) by observing 27 morphometric characters. Characters morphometric measured is standard length (SL), total length (TL), predorsal length (PDL), preanal length (PAL), prepelvic length (PPL), prepectoral length (PL), dorsal-spine length (DSL), dorsal-fin length (DFL), length of dorsal-fin base (LDFB), length of anal-fin base (LAFB), pelvic-fin length (PFL), pectoral-fin length (PF), pectoral-spine length (PSL), caudal-fin length (CFL), length of adipose-fin base (LOAFB), maximum height of adipose fin (MHAF), dorsal to adipose distance (DAD), post-adipose distance (PAD), length of caudal peduncle (LCP), depth of caudal peduncle (DCP), body depth at anus (BDA), head length (HL), head width (HW), head depth (HD), snout length (SOL), interorbital distance (ID), eye diameter (ED) (Fig 1). Calculations of meristic characters conducted on nine characters refer to Bijukumaret al. (2015) research. Meristic characters were counted are dorsal fin rays (DFR), anal fin rays (AFR), caudal fin rays (CFR), pectoral fin rays (PFR), pelvic fin rays (PR), lateral line plates (LLP), dorsal plates (DL), postanal plates (PP), plates between dorsal fin base and adipose fin (PDFAF). Morphometric and meristic data obtained were analyzed manually using Microsoft Excel 2010. The results were also analyzed using Principal Component Analysis (PCA). PCA is used to classify data. The program used is Minitab 15. Figure1:- Morphometric characters of common plecoPterygoplichthys[Explanation: 1.SL, 2.TL, 3.PDL, 4.PAL, 5.PPL, 6.PL, 7.DSL, 8.DFL, 9.LDFB, 10.LAFB, 11.PFL, 12.PF, 13.PSL, 14.CFL, 15.LOAFB, 16.MHAF, 17.DAD, 18.PAD, 19.LCP, 20.DCP, 21.BDA, 22.HL, 23.HW, 24.HD, 25.SOL, 26.ID, 27.ED] (personal documentation). Result and Discussion:- Morphometric measurements on samples that are considered to have a well-established body size, the fish morphological characters is complete and will not change. All data obtained wasadequate (Rahmatinet al., 2011). Morphometric measurements of the total length on 50 samplesP.pardalis fish ranged from 22.1 to 39.7 cm. P.disjunctivus species only obtained one sample with a length of 26.5 cm. Inter-grade ranging from 18.5 to 41.35 cm (Table 1). The results of PCA analysis of the morphometric characters showed that all the samples did not show significant differences (Figure 2). The results showed the group dispersed and there is no grouping in one quadrant. Currently abdominal pattern is the main diagnostic characteristics for species identification. However, based on PCA result on morphometric characters shows that the three species identified are the same variable. Table 1:- Morphometric measurement result. Character Range P.pardalis (n=10) Average SD P.disjunctivus (n=1) Range Inter-grade (n=39) Average SD SL 16.200–31.150 22.430 0.590 19.8 13.550–31.200 22.110 0.131 TL 22.100–39.700 28.890 0.730 26.5 18.500–41.350 28.973 0.157 PDL 6.216–11.820 8.445 0.194 8.088 5.192–11.840 8.461 0.048 PAL 10.330–21.260 14.735 0.397 12.973 9.436–21.010 14.785 0.084 PPL 6.887–13.530 9.540 0.236 8.796 6.023–13.330 9.585 0.052 PL 3.726–7.000 4.989 0.123 4.645 2.992–7.170 4.966 0.027 DSL 3.653–5.941 4.518 0.076 4.089 3.281–6.593 4.697 0.019 DFL 3.386–5.275 4.103 0.064 4.001 2.734–5.825 4.255 0.018 LDFB 5.715–10.430 7.732 0.197 6.578 4.762–10.670 7.605 0.043 LAFB 0.729–1.710 1.110 0.037 0.951 0.628–1.970 1.072 0.008 PFL 3.240–5.300 4.104 0.078 3.905 2.699–5.510 4.160 0.019 PF 3.934–6.435 4.997 0.087 4.533 3.184–6.970 5.159 0.024 PSL 4.487–6.855 5.475 0.084 4.572 3.859–7.731 5.639 0.024 CFL 3.192–5.780 4.190 0.093 4.175 2.693–6.740 4.513 0.024 LOAFB 0.965–2.400 1.411 0.057 1.207 0.801–2.410 1.392 0.010 MHAF 0.947–1.260 1.111 0.013 1.074 0.599–1.840 1.064 0.006 DAD 2.542–5.130 3.532 0.109 3.117 2.050–5.770 3.658 0.026 PAD 0.956–1.841 1.364 0.038 1.389 0.636–2.190 1.534 0.011 LCP 4.749–8.890 6.499 0.180 5.497 3.893–9.900 6.588 0.042 DCP 1.322–2.640 1.888 0.050 1.565 1.065–2.640 1.901 0.011 BDA 2.146–3.790 2.817 0.058 2.684 1.673–3.620 2.727 0.014 HL 3.849–6.704 4.798 0.119 4.829 3.450–7.182 5.046 0.026 HW

3.514–6.100 4.623 0.106 4.279 3.002–6.061 4.635 0.023 HD 2.577–4.580 3.394 0.076 3.166 2.227–4.540 3.395 0.016 SL 2.424–4.360 3.137 0.078 2.937 1.982–4.345 3.182 0.017 ID 2.175–3.530 2.723 0.059 2.491 1.854–3.769 2.720 0.013 ED 0.718–1.044 0.839 0.012 0.775 0.638–1.110 0.839 0.003 Result from PCA analysis is corresponded with Zworykin et al. (2013) result, which analyzes the pleco's PCA. The results showed that all morphometric characters do not have a significant difference in the character. PCA plot results did not show a clear group. Zworykin et al. (2013) also revealed no significant differences between P.pardalis and P.disjunctivus based on morphometric and meristic characters. Meristic is a calculation of the body thatcan be calculated. Meristic calculation is generally performed on the external parts of the body such as the number of fin hard bones (fin rays), the amount of soft fin bones and scales (Sajinaet al., 2013). The result of9 meristic character calculation to 50 samples showed no difference between species. The calculation of number of anal and pelvic fins in the whole sample gave similar results (Table 2). It is also corresponded to studies conducted by Alvarez-Pliegoet al. (2015), Muralidharanet al. (2015), and Ozdilek (2007). Score Plot of TL, ..., ED 4 3 2 Second Com ponent 1 0 -1 -2 -3 -4 -5 -5 0 5 10 15 First Component Figure 2:- Result morphometric analysis pleco. Group A B C Characters meristic calculation ofP.pardalis to 10 samples had a results with the Alvarez-Pliegoet al. (2015)and Mularidharanet al. (2015) results. Alvarez-Pliegoet al. (2015) result showed that DFR and PFR has a number of 11- 12 and 5-6. Muralidharanet al. (2015) result showed DFR, CFR, PFR, and LLP has a number 12, 14, 6, and 26-32. Calculation meristic to 1 sample P.disjunctivus also had no differences with the Alvarez-Pliegoet al. (2015) and Ozdilek (2007) research. Alvarez-Pliegoet al. (2015) showed that the number of characters DFR and PFR P.disjunctivus is 11-12 and 6. Ozdilek (2007) calculate DFR, CFR, PFR, LLP, PP, and PDFAF meristic characters on 1 P.disjunctivusspecimen and generate 10, 14, 5, 29, 14, and 7. The results of the calculation of the inter-grade meristic characters also showed no differences with the other two species (Table 2). Table 2:- Meristic result group based on abdominal pattern. No Merisitic characters Alvarez-Pliegoet al. (2015) Muralidharanet al. (2015) Ozdilek (2007) Elfidasariet al. (2016) P.pardalis P.disjunctivus P.pardalis P.disjunctivus P.pardalis P.disjunctivus Inter- grade 1 DFR 11-12 11-12 12 10 11-12 12 11-13 2 AFR 4 4 4 4 4 4 4 3 CFR - - 14 14 13-14 14 13-15 4 PFR 5-6 6 6 5 6 6 5-6 5 PR 5 5 5 5 5 5 5 6 LLP - - 26-32 29 28-30 28 27-29 7 DL - - - - 3 3 3 8 PP - - - 14 13-14 13 12-14 9 PDFAF - - - 7 6-7 6 5-7 2 1 Second Com ponent 0 -1 -2 -3 -4 -6 -5 -4 -3 -2 -1 0 1 2 3 First Component Figure 3:- Result meristic analysis pleco Group A B C Meristic analysis using PCA is based on the correlation between the characters, except AFR, PR, and DL. This is caused by the calculation results of the whole sample is same. The analysis showed no visible groups (Figure 3). The data obtained are spread on all quadrants, so there is no clustering. It shows the same results with morphometric analysis. Analysis based on the results of morphometric and meristic showed that three species that have been identified is one same species. Conclusion:- The results of morphometric analysis, calculation, and meristic analysis showed no difference in the whole pleco sample from the Ciliwungriver. From this research suggested to be revised the determination of morphological characters for pleco identification. Acknowledgment:- This research was supported by University of Al Azhar Indonesia as a research funder from Grant UAI Research 2015 through The Research and Community Service Institution based on Internal Working Implementation Agreement 2015 No. 005/SPK/A-01/UAI/III/2012.We also thank Kodam Jaya for their assistance, especially Lieutenant General AgusSutomo (Ex Kodam Jaya Leader), Major General Teddy Lhaksamana (Kodam Jaya Leader), ColonelArudji Anwar, Lieutenant Colonel Edi Martadinata, Lieutenant Colonel FirdausAgustiana and all Indonesian Army personal for the assistance on the field. References:- 1. Alvarez-Pliego, N., Sancez, A.J.,

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