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PHENOTYPING OF NILEM (*Osteochilus hasselti*) MANGUT STRAIN CULTIVATED IN CENTRAL AND WEST JAVA

Fenotip Ikan Nilem (Osteochilus hasseltii) Strain Mangut yang Dibudidayakan di Jawa Tengah dan Jawa Barat

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ABSTRACT

Phenotypic characters are one of bases for conducting selective breeding. The phenotypic characters of Nilem Mangut strains cultivated in several region can provide basic information for the development of its cultivation. This study aims was to determine the comparison of the characteristics of the quantitative phenotype with the meristic morphometric and growth pattern of Nilem (Osteochilus hasseltii) Mangut strains cultivated in different regions. This research was conducted using active survey methods in the field and laboratory. 90 fish were taken randomly from 3 different locations, namely Banyumas, Purbalingga and Tasikmalaya, samples were taken 30 fish/location. The results showed that the morphometric diversity coefficient of Mangut Nilem ranged from 4.93-17.99% (Banyumas), 10.35-21.41% (Purbalingga) and 9.11-24.12% (Tasikmalaya) while the coefficient The meristic diversity of Mangut Nilem Fish ranged from 6.89-13.02% (Banyumas), 6.05-9.32% (Purbalingga) and 5.78-10.78% (Tasikmalaya). Morphometric and meristic characters of Mangut Nilem Fish from several locations have positive correlation (have unidirectional relationships between characters) and negative (have opposite relationships between characters). Based on the relationship between length and weight, the Mangut Nilem fish in Banyumas, Purbalingga and Tasikmalaya had a b value respectively, namely 6,0222, 5,42 and 3,39 showing a positive allometric growth pattern (weight gain is more dominant than length gain). The condition factor for Mangut Nilem fish has a value range of 1.32-1.34. Tasikmalaya has the best fish farming pattern.

Keywords: Morphometrics, Meristics, Nilem Mangut , *Osteochilus hasseltii* , Growth Patterns

ABSTRAK

Karakter fenotip merupakan salah satu dasar untuk dilakukan pemijahan selektif. Karakter fenotif ikan nilem strain mangut yang dibudidayakan di beberapa daerah dapat menjadi informasi dasar pengembangan budidayanya. Penelitian ini bertujuan untuk mengetahui perbandingan karakter fenotip kuantitatif dengan morfometrik meristik dan pola pertumbuhan

ikan Nilem (Osteochilus hasseltii) strain Mangut yang dibudidayakan di wilayah Jawa Tengah dan Jawa Barat. Penelitian ini dilakukan dengan metode survey lapang dan laboratorium. Ikan sebanyak 30 ekor diambil secara acak dari Banyumas dan Purbalingga mewakili Jawa Tengah dan Tasikmalaya, Jawa Barat. Hasil penelitian menunjukkan menunjukkan bahwa koefisien keragaman morfometrik Ikan Nilem Mangut berkisar antara 4,93-17,99% (Banyumas), 10,35-21,41% (Purbalingga) dan 9,11-24,12% (Tasikmalaya) sedangkan koefisien keragaman meristik Ikan Nilem Mangut berkisar antara 6,89-13,02% (Banyumas), 6,05-9,32% (Purbalingga) dan 5,78-10,78% (Tasikmalaya). Karakter morfometrik dan meristik Ikan Nilem Mangut dari beberapa lokasi memiliki korelasi positif (memiliki hubungan yang searah antar karakter) dan negatif (memiliki hubungan yang berlawanan antar karakter). Berdasarkan hubungan panjang dan berat, ikan Nilem Mangut di Banyumas, Purbalingga dan Tasikmalaya memiliki nilai b berturut-turut yaitu 6,02, 5,42 dan 3,39 menunjukkan pola pertumbuhan allometrik positif. Faktor Kondisi pada ikan nilem mangut memiliki nilai kisaran 1,32-1,34. Tasikmalaya memiliki pola budidaya ikan yang paling baik.

Kata Kunci: Morfometrik, Meristik, Nilem Mangut, Osteochilus hasseltii, Pola Pertumbuhan

INTRODUCTION

Nilem fish (*Osteochilus hasseltii*) has long been known and cultivated in West Java and Central Java (Cholik *et al.,* 2005), because it is easy to maintain, the meat is crispy after cooking, and the eggs are delicious types of *caviar* (Soeminto *et al.,* 2000; Winarlin *et al.,* 2006; Bhagawati *et al.,* 2009). Until now, nilem fish still has the potential to be developed and cultivated and become a source of income for the community (Subagja *et al.,* 2007). The Nilem fish cultivation business in the former Banyumas residency area, Central Java is known for several Nilem fish strains, including the Mangut strain (Nuryanto *et al.,* 2001), Seruni (Vebiola *et al.,* 2020), Lukas (Nuryanto *et al.,* 2001), and Gunung (Nuryanto *et al.,* 2001: Pramono *et al.,* 2022), while in the West Java area they are green Nilem, red, were, and beureum panon (Mulysari *et al.,* 2010). The differences between strains of nilem fish are generally characterized by the body color pattern of each strain, such as the Mangut strain which is greenish black, Seruni is brownish black, Lukas is silvery black, and Gunung is orange (Nuryanto *et al.,* 2001; Abulias and Bhagawati 2009; Vebiola *et al.,* 2020; Pramono *et al.,* 2022)

Over time, cultivators by the community are now suspected has experienced a decline in genetic quality, especially genetic variation or diversity. There have been no efforts to improve or increase the genetic quality of other fish such as Sangkuriang catfish and Dumbo catfish (Lathifah *et al.,* 2016; Nugroho *et al.,* 2018), Nile Tilapia and Tilapia Sultana (Faqih *et al.,* 2015; Mulqan *et al.,* 2017) and Patin Lawang and Patin Pedado fish (Pratama *et al.,* 2017). Efforts to determine the level of genetic diversity are carried out by evaluating phenotypic diversity (Arifin *et al.,* 2017). Genetic diversity based on phenotypic characters can be done through measuring morphometric and meristic characters (Matricia, 1990).

Morphometrics are characteristics related to body size or body parts of fish, for example standard length and total. Meanwhile, meristics are characteristics related to the number of parts of a fish, for example number of hard and weak rays on the fins (Affandi *et al.,* 1992). Rik and meristic morphomet characters can be used to distinguish between various types of fish and similar fish from different locations (Mohaddasi *et al.,* 2013). The application of morphometric and meristic measurements in the study of genetic diversity in cultivated Nilem fish has never been carried out, whereas in other cultivated fish that have been carried out , namely G urami fish (*Osphronemus gouramy*) (Arzita & Syandri, 2015), Tangadak fish (*Barbonymus schwanenfeldii*) (Radona, 2016) .

The Mangut strain of Nilem fish grows faster than other types but has weaknesses in its resistance to dissolved oxygen and is easily stressed. (Soeminto *et al.,* 2000; Bhagawati *et al.,*

2009). The growth and condition of farmed fish can be analyzed from the length-weight relationship (Manik, 2009; Muhotimah, 2013). The results of the analysis of the length-weight relationship can then be used as an indication of the status of obesity, gonad maturity and relative health of the fish population (Pramono, 2010).

Information on phenotypic characteristics can be used as a basis for reference in selective spawning (Mulyasari *et al.,* 2010). This study aims to compare the phenotypic characteristics of the mangut strain of nilem fish cultivated in different regions based on morphometric-meristic characters and growth patterns based on the length-weight relationship.

METHODS

This research was conducted in the Banyumas and Purbalingga regions representing the Central Java province and Tasikmalaya representing the West Java region in September-November 2021. The objects used were mangut strain fish from fish farmers in the Central Java region, namely the Banyumas region. The average length and weight were 12.26 ± 1.014 cm and 24.49 ± 6.61 grams respectively, while the length from P urbalingga was 12.443 ± 0.990309 and the weight was 25.468 ± 6.768668 grams. For the average length and weight of Nilem fish from Tasikmalaya, West Java, the average length and weight were 12.26 ± 0.967257 cm and 24.93967 ± 5.406296 grams. The number of Nilem fish used for samples from each region was 30 individuals.

Research Design

This research uses active survey methods in the field and laboratory. An active survey is an effort to trace a group of cultivators directly at a specified research location. The aim of active surveys in the field is to obtain sample fish from each region. Meanwhile, research in the laboratory was carried out to measure the morphometrics and meristics of the mangut strain of nilem fish from each region.

Length and Weight Measurement

Length was measured using millimeter blocks of paper and the weight of the Mangut strain nilem fish was carried out using a CHQ digital scale with an accuracy of 0.01 gram. First, the fish is taken from the holding container, then the weight of the fish is first weighed, after that the total length, standard length, and Then, after the measurements are complete, the fish proceed to morphometric measurements.

Morphometric Truss Measurement

a digital caliper with an accuracy of 0.01 mm. Calculation of the truss morphometric characters of the Mangut strain of Nilem fish includes 21 characters (Figure 1, Table 1).

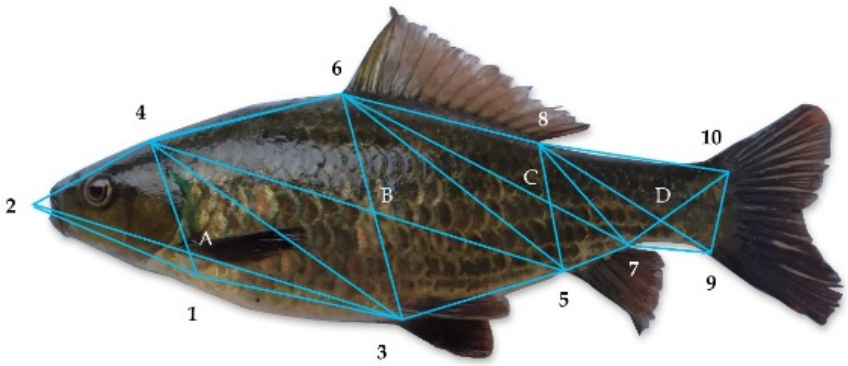

Figure 1. Sketch of Morphometric Truss Measurements for Mangut Nilem Fish

Table 1. Morphometric Truss Mulyasari (2010).

Distance Truss Code	Morphometric Truss Distance Description
A1	The distance between the point at the end of the pelvic fin and the point at the top of the pectoral fin
A2	The distance between the point at the top of the pectoral fin and the point at the tip of the mouth
A3	The distance between the point at the tip of the mouth and the point at the top of the gills
A4	The distance between the point at the top of the gills and the point at the top of the pelvic fins
A5	The distance between the point at the end of the pelvic fin and the point at the end of the mouth
A6	The distance between the point at the top of the gills and the point at the top of the pectoral fin
B1	The distance between the point at the end of the pelvic fin and the point at the beginning of the anal fin
B3	The distance between the point at the top of the gills and the point at the beginning of the dorsal fin
B4	The distance between the point at the beginning of the dorsal fin and the point at the beginning of the anal fin
B5	The distance between the point at the beginning of the anal fin and the point at the top of the gills
B6	The distance between the point at the beginning of the dorsal fin and the point at the end of the pelvic fin
C1	The distance between the point at the beginning of the anal fin and the point at the end of the anal fin
C3	The distance between the point at the beginning of the dorsal fin and the point at the end of the dorsal fin
C4	The distance between the point at the end of the dorsal fin and the point at the end of the anal fin
C5	The distance between the point at the beginning of the dorsal fin and the point at the end of the anal fin
C6	The distance between the point at the beginning of the anal fin and the point at the end of the dorsal fin

Distance Truss Code	Morphometric Truss Distance Description
D1	The distance between the point at the end of the anal fin and the point at the beginning of the lower tail fin
D3	The distance between the point at the end of the dorsal fin and the point at the beginning of the upper tail fin
D4	The distance between the point at the beginning of the upper tail fin and the point at the beginning of the lower tail fin
D5	The distance between the point at the end of the dorsal fin and the point at the beginning of the lower tail fin
D6	The distance between the point at the end of the anal fin and the point at the beginning of the upper tail fin

Meristic Measurement

Meristic measurements of the mangut strain of nilem fish were carried out after morphometric measurements using a magnifying glass. Meristic character measurements include the number of weak and hard rays on the dorsal fin, the number of weak and hard rays on the anal fin, the number of weak rays on the tail fin, the number of weak and hard rays on the dorsal fin. hard on the pelvic fins, and a weak number of rays on the pectoral fins. This measurement refers to Mulyasari, (2010).

Comparative Index of Morphometric Truss Characters

Morphometric truss characteristics are measured in units of length (cm). The morphometric truss characters obtained were compared to the morphometric truss characters. The comparison index of morphometric truss characters obtained from the comparison of standard morphometric truss characters consists of 21 comparison indices which are presented in Table 1.

Meristic Character

The meristic characters are calculated next analyzed descriptively using the study method library, namely comparing each meristic character research results with the meristic characteristics of the Nile fish em mangut strain according to the literature or previous research results.

Table 2. Meristik Mulyasari, (2010)

No	Character Morph ometric	Explanation
1	Number of dorsal fin rays	Number of hard and weak dorsal fin rays.
2	Number of pectoral fin rays	Number of hard and weak pectoral fin rays.
3	Number of pelvic fin rays	Number of hard and weak rays of the pelvic fins.
4	Number of anal fin rays	Number of hard and weak anal fin rays.
5	Number of tail fin rays	Number of hard and weak rays of the tail fin.

Condition Factors

The condition factor is a condition that states the fish's plumpness with numbers and values that are influenced by age, sex, food and gonad maturity level (TKG). Calculation of condition factors is based on (Effendie, 2002).

If the fish growth obtained is allometric, then the condition factor is calculated using the Relative Condition Factor (Kn) or Relative Condition Factor which has the following formula (Ricker, 1975). If the condition factor ranges between 3-4, it indicates the fish's body is somewhat flat and if the condition factor ranges between 1-2, it indicates the fish's body is less flat (Effendie, 2002).

Cultivation Patterns

Cultivation pattern analysis was carried out as supporting data which aims to determine the cultivation system of the Mangut strain of nilem fish carried out from different regions.

Data Analysis

The results of the morphometric and meristic truss character measurements were averaged and then analyzed for correlation coefficients and significance to determine phenotypic characteristics of the Mangut strain of Nilem fish from different regions using SPSS version 16 software. Information on fish farming patterns carried out was analyzed descriptively.

RESULTS

Comparative Index of Morphometric Truss Characters

The morphometric truss characteristics of the mangut strain of nilem fish from the Banyumas, Purbalingga (Central Java) and Tasikmalaya (West Java) areas are presented in Table 3.

Table 3. Morphometric Truss Phenotype Characteristics of Mangut Strain Nilem Fish

The character being measured	Average		
	BMS	PBG	TSK
A1	2.80 ± 0.22	2.83 ± 0.29	2.78 ± 0.26
A2	2.14 ± 0.19	2.16 ± 0.27	2.12 ± 0.24
A3	1.73 ± 0.18	1.75 ± 0.27	1.71 ± 0.23
A4	3.13 ± 0.22	3.18 ± 0.38	3.07 ± 0.35
A5	4.91 ± 0.24	4.99±0.55	4.85 ± 0.46
A6	1.64 ± 0.11	1.67±0.2	1.62 ± 0.16
B1	1.14 ± 0.2	1.14 ± 0.25	1.07 ± 0.19
B3	2.16 ± 0.19	2.15 ± 0.33	2.16 ± 0.29
B4	3.27 ± 0.18	3.28 ± 0.46	3.19 ± 0.29
B5	4.92 ± 0.29	4.95 ± 0.66	4.76 ± 0.68
B6	2.58 ± 0.21	2.58 ± 0.45	2.39 ± 0.4
C1	1.20 ± 0.18	1.20 ± 0.24	1.25 ± 0.21
C3	2.51 ± 0.24	2.45±0.3	2.51 ± 0.5
C4	1.55±0.22	1.60 ± 0.31	1.52 ± 0.32
C5	3.82 ± 0.26	3.88 ± 0.50	3.72 ± 0.64
C6	1.38 ± 0.1	1.36 ± 0.21	1.31 ± 0.18
D1	0.84 ± 0.15	0.86±0.18	0.79±0.14
D3	1.32 ± 0.2	1.31 ± 0.2	1.27 ± 0.21
D4	1.01 ± 0.07	1.04 ± 0.13	1.03 ± 0.25
D5	1.63 ± 0.15	1.65±0.22	1.65±0.18
D6	1.30±0.12	1.31 ± 0.18	1.27 ± 0.14

(Note: BMS = Banyumas, PBG = Purbalingga, and TSK = Tasikmalaya)

The efficiency of morphometric truss diversity of Mangut strain Nilem fish can be seen in Table 4.

Table 4. Coefficient of Diversity (CV) Morphometric Truss of Mangut Strain Nilem Fish.

The character being measured	**Diversity Coefficient (%)**		
	BMS	PBG	TSK
A1	8.03	10.35	9.26
A2	8.87	12.66	11,12
A3	10.45	15.63	13.39
A4	7.11	11.90	11.27
A5	4.93	10.95	9.55
A6	6.49	11.91	9.76
B1	17.71	21.41*	17.60
B3	8.83	15.55	13.46
B4	5.54	14.00	9,11
B5	5.89	13.42	14,19
B6	8.05	17.56	16.50
C1	15.02	19.70	16.54
C3	9.66	12.30	19.87
C4	13.89	19.14	20.91
C5	6.79	12.79	17.33
C6	7.40	15.52	13.85
D1	17.99*	20.90	18.15
D3	15.23	14.97	16.37
D4	7.13	12.20	24.12*
D5	9.39	13.52	10.93
D6	9.50	13.99	10.80

(Note: BMS = Banyumas, PBG = Purbalingga, and TSK = Tasikmalaya)

Comparative Index of Meristic Characters

Measuring the meristic characters of mangut nilem fish from three different regions was carried out by counting the number of dorsal fins, tail fins, upper pectoral fins, lower pectoral fins, upper pelvic fins, lower pelvic fins and anal fins. The mean and standard deviation of the meristic characters of nilem fish are presented in Table 5.

Table 5. Average Meristic Characteristics of Mangut Strain Nilem Fish in Different Regions

The character beir measured	**Average**		
	BMS	PBG	TSK
Back	16.60±1.2	17.53±1.12	17.93 ± 1.26
Tail	18.23 ± 1.26	18.43 ± 1.12	18.97 ± 0.84
Upper chest	10.47±1.2	9.70 ± 0.82	10.63 ± 1.08
Lower chest	10.73 ± 1.15	9.50±0.89	10.47±1.2
Upper Abdomen	8.73 ± 0.77	8.63 ± 0.71	9.00±0.63
Lower abdomen	9.00±0.63	8.83 ± 0.82	8.73 ± 0.77
Anal	6.50±0.85	6.33 ± 0.54	7.67 ± 0.83

(Note : BMS = Banyumas, PBG = Purbalingga, and TSK = Tasikmalaya)

Table 6. Coefficient of Diversity (CV) of Meristic Characteristics of Mangut Strain Nilem Fish

The character being measured	**Diversity Coefficient (%)**		
	BMS	PBG	TSK
Back	7.23	6.37	7.04
Tail	6.89	6.05	4.41
Upper chest	11.50	8.48	10.15
Lower chest	10.74	9.32	11.50
Upper abdomen	8.84	8.18	7.03
Lower abdomen	7.03	9.28	8.84
Anal	13.02	8.49	10.83

(Note : BMS = Banyumas, PBG = Purbalingga, and TSK = Tasikmalaya)

The Relationship of Length, Weight and Condition Factors

The length and weight of Nilem Mangut fish from Banyumas ranges between 10.5-15.5 cm and 14.62-44.64 gr, and from the Purbalingga area it ranges between 11-15.5 cm for length and weight ranges from 16.28 -44.64 gr, while for the Tasikmalaya region the length ranges between 9.7-13.6 cm and 16.28-37.46 gr for weight. Analysis of the length-weight relationship and condition factors for each region is presented in the graphs in Figures 2, 3, and 4 and Table 7.

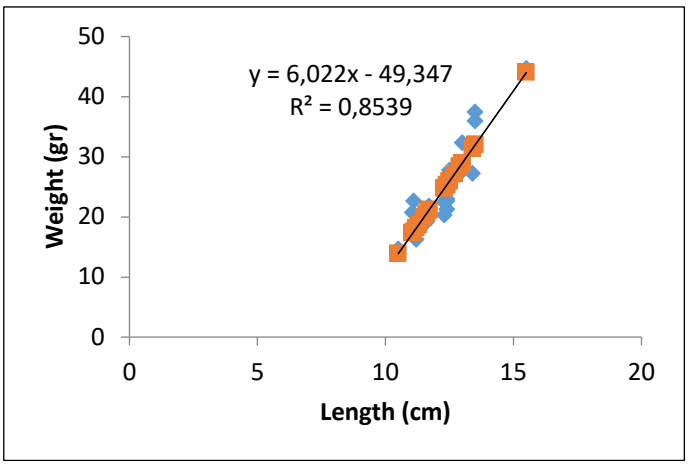

Figure 2. Graph of the Relationship between Fish Length and Weight in Banyumas

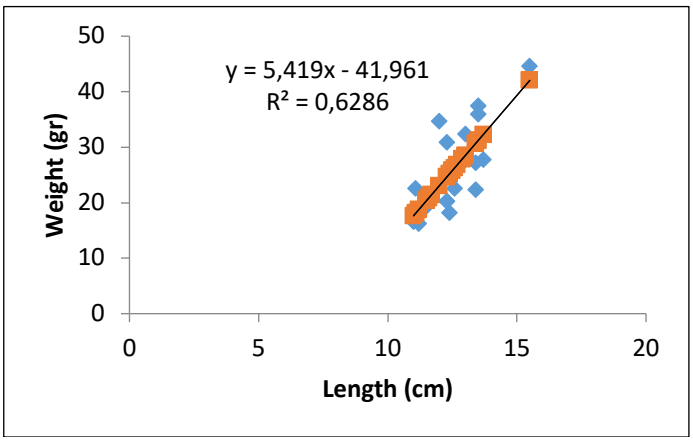

Figure 3. Graph of the Relationship between Fish Length and Weight in Purbalingga

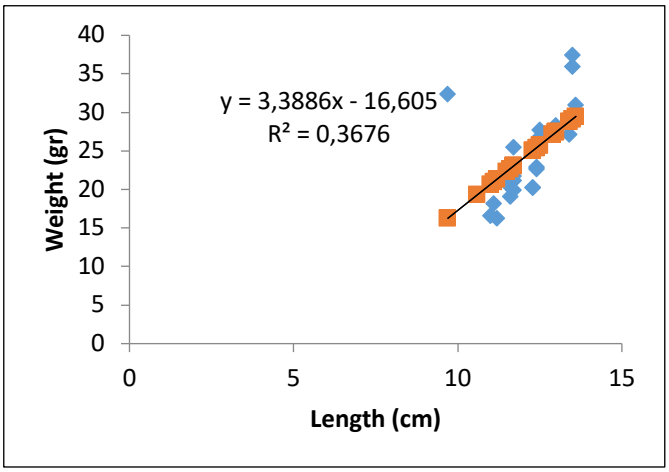

Figure 4Graph of the Relationship between Fish Length and Weight in Tasikmalaya

Table 7. Fish Condition Factors

No	Region	Condition Factors
1	Banyumas	1,328
2	Purbalingga	1,321
3	Tasikamalaya	1,339

Pattern Mangut Nilem Fish Cultivation in Several Regions

Information regarding the management of Nilem fish cultivation in each region is presented in Table 8.

Table 8. Nilem Mangut Fish Cultivation Pattern

Parameter	**Location**		
	Banyumas	**Purbalingga**	**Tasikmalaya**
Cultivation System			
Cultivation Pattern	2	2	2
Cultivation Container	3	3	3
Type of Feed	2	2	2
Stocking Dense	3	3	3
Fertilization	2	2	3
Breeding Program			
Parent Source	2	2	2
Number of Parent Pairs	1	1	1
Master Certification	0	0	0
Spawning Method	1	1	1
Seeding Business	3	3	3

DISCUSSION

Comparative Index of Morphometric Truss Characters

The morphometric truss characteristics of the Mangut strain of Nilem fish in the Banyumas, Purbalingga and Tasikmalaya areas in this study ranged between 4.93-17.99%, 10.35-21.41% and 9.11-24.12% respectively. The highest fish diversity coefficient from the Banyumas area was seen in character D1 (17.99%) and the lowest in character A5 (4.93%). Meanwhile, Nilem fish from Purbalingga had the highest diversity coefficient of 21.41% and the lowest of 10.35%, namely B1 and A1 characters. For nilem fish originating from West

Java, Tasikmalaya, the highest and lowest diversity coefficients were characters D4 (24.12%) and B4 (9.11%).

The results of the correlation analysis of the diversity coefficient of 21 characters of Mangut Nilem Fish from different locations showed that there were positive and negative correlations. A positive correlation value confirms that each character has a unidirectional relationship with each other, while a negative correlation value indicates that each character has an opposite relationship with each other. The positive correlation value for nilem fish from different regions (Banyumas, Purbalingga and Tasikmalaya), namely the characters A2 with A3, A2 with A6, A4 with B6 and A5 with C6, is 1,000. Characters that have a negative correlation value are characters B1 with D3, which is -0.663 and characters A6 with D3, which is -0.057.

In this study, based on 21 morphometric characters of mangut nilem fish from various regions, there were 18 characters that were significantly different ($P<0.05$) and 3 characters that were not significantly different ($P>0.05$), namely B3 (distance between the point at the top of the gill and the point at the beginning of the dorsal fin), B5 (The distance between the point at the beginning of the anal fin and the point at the top of the gill) and C4 (The distance between the point at the end of the dorsal fin and the point at the end of the anal fin).

The differences in the morphometric characters of the mangut strain of nilem fish in this study were caused by environmental factors, in this case the origin of the Banyumas, Purbalingga and Tasikmalaya areas. Mulyasari (2010), stated that the differences in characters in this study do not indicate genetic differences in a population. The coefficient of diversity also appears to be different in these regions and is mostly due to different cultivation methods. The value of the morphometric truss character diversity coefficient indicates the variability of the character in question in a population. This value can help in the effectiveness of selection. Robisalmi *et al.,* (2019) and the ability to adapt to the environment (Radona *et al.,* 2017).

Comparative Index of Meristic Characters

In this study, the coefficient of diversity of meristic characters of mangut nilem fish from the Banyumas region ranged from 6.89-13.02%, Purbalingga was 6.05-9.32% and Tasikmalaya ranged from 5.78-10.78%. The anal fin character of the Nilem mangut strain in Banyumas had the highest coefficient of diversity, namely 13.02%, while the tail fin character had the lowest coefficient of diversity, namely 6.89%. Meanwhile, in the mangut strain of nilem fish from Purbalingga and Tasikmalaya, the lower pectoral fin character had the highest coefficient of diversity, namely 9.32% and 11.50%, while the tail fin character had the lowest coefficient of diversity, namely 6.05% and 4.41%.

positive correlation value for the meristic characteristics of nilem fish from the three regions is between the tail fin and the upper pelvic fin, namely 1.000, while the lowest positive correlation value is between the dorsal fin and the tail fin, namely 0.028. The highest negative correlation value is between the lower pelvic fin and the anal fin, namely -0.937, while the lowest negative correlation value is between the lower pelvic fin and the lower pectoral fin, namely -0.351. The results of the significance test showed that of the 7 meristic characters tested, the characters of the tail fin, upper pelvic fin, upper pectoral fin and anal fin had significant differences ($P<0.05$), while the characters of the dorsal fin, lower pectoral fin and lower pelvic fin there was no significant difference ($P>0.05$).

The Relationship of Length, Weight and Condition Factors

The *b* value of the relationship between length and weight of mangut nilem fish from Banyumas is 6.022, Purbalingga, the *b value* is 5.419 and from Tasikmalaya it is 3.3886 (Figures 2,3 and 4). In general, the b value for all regions has a *b value* > 3. This means that the growth pattern is positive allometric, that is, the increase in weight is more dominant than

the increase in length. The different b values are thought to be caused by different rearing environments and cultivation patterns. This agrees with Efendiansyah (2018) who stated that environmental factors, species differences, differences in fish stocks, gender, fish development and gonad maturity levels are in the growth pattern and are temporary.

f factor (FK) value of mangut nilem fish from several areas in this research has a value in the range of 1.321-1.339. This value shows that the environmental conditions for rearing mangut nilem fish from Banyumas, Purbalingga and Tasikmalaya are in the good category. Lempoy *et al.,* (2020), added that a condition factor value between 1-3 means that the fish is in good condition and plump. Differences in condition factor values are influenced by several factors such as gonad maturity level, food, sex, population and age of fish (Effendie, 2002).

Pattern Mangut Nilem Fish Cultivation in Several Regions

The implementation of the hatchery program and cultivation system for nilem mangut fish in areas such as Banyumas, Purbalingga and Tasikmalaya can be seen in Table 8. The fish cultivation system applied by fish farmers from Banyumas, Tasikmalaya and Purbalingga is generally monoculture. During maintenance, nilem fish are given manufactured pellet feed with a frequency of 2 (two) times a day. The density of fish stocked is based on fish size and pond area. Environmental factors such as food availability and fish stocking density can influence the morphometric characters of nilem fish (Mulyasari, 2010).

Hatchery efforts are carried out traditionally, namely by natural spawning in ponds. The rearing of larvae and fry is maximized. The parent nilem fish used come from their respective regions. However, this is somewhat difficult to ascertain, because distribution is relatively fast. Each fish farmer in the area generally has < 25 pairs and does not have a certificate. A limited number of parents can cause a decrease in seed performance and allow inbreeding to occur. Mulyasari (2010), emphasized that the consequences of consanguineous marriage can cause a decrease in regeneration, resistance to disease and stunted growth. Therefore, a strategy to increase nilem fish production with a technological approach is needed (Syakuti *et al.,* 2024)

CONCLUSION

Coefficient of diversity for fish morphometric characters was in the Tasikmalaya region at 9.11-24.12%, while the highest meristic characters were in Banyumas at 6.03-13.02%. Mangut Nilem fish in Banyumas, Purbalingga and Tasikmalaya have *b values* respectively 6.0222, 5.419 and 3.3886 indicating an Allometric growth pattern.

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