HNUE JOURNAL OF SCIENCE DOI: 10.18173/2354-1059.2023-0066
Natural Sciences 2023, Volume 68, Issue 3, pp. 104-116
This paper is available online at http://stdb.hnue.edu.vn

LENGTH-WEIGHT RELATIONSHIP, SEXUAL DIMORPHISM, AND CONDITION FACTOR OF FRESHWATER SLEEPER *Sineleotris namxamensis* (ODONTOBUTIDAE) IN NORTHERN VIETNAM

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Abstract. *Sineleotris namxamensis* Chen & Kottelat, 2004 is a species of the family Odontobutidae distributed in freshwater streams. The information on morphological characteristics, sexual dimorphism, length-weight relationships, and condition factors for this freshwater sleeper have been described based on samples collected in Northern Vietnam. The specimens were identified at the species level based on morphometrics combined with the fin, scale counts, and the head lateral line system. To distinguish between both sexes in this species, five morphometric characteristics such as snout to 2nd dorsal fin origin, snout to anus, eye diameter, pelvic-fin length, and pelvic fin origin to anus have been used. The *b* was higher than the isometric value of 3 indicating in both sexes (3.457 for females, 3.439 for males, and 3.443 for all), and this species revealed a positive allometric growth through the length-weight relationships, which was found to be highly significant. For the first time, the obtained *K* values and the *LWR* for this species revealed no significant variation between males and females. The fish community where this goby lives shows that there was little evidence of species competition, allowing it to grow well. These findings provide essential information for resource exploitation and conservation of this species in nature.
Keywords: condition factor, conservation, length-weight relationship, morphometric characters, sexual dimorphism.

1. Introduction

The family Odontobutidae currently in the world has 6 genera with about 23 species [1], while in Vietnam, 5 genera were been reported (except for the genus Terateleotris). Their distribution was recorded in freshwater streams of Northern Vietnam, China, Korea, Japan, and Russia [2]. Most species of this family live in slow-moving waters in the middle and lower reaches of rivers, ponds, and lakes [3, 4].

Received August 24, 2023. Revised October 16, 2023. Accepted October 23, 2023.
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In Vietnam, the genus *Sineleotris* Herre, 1940 has three species (*S. saccharae*, *S. chalmersi*, and *S. namxamensis*) [3, 5]. *Sineleotris namxamensis* Chen & Kottelat 2004 is a freshwater sleeper, which was formerly known as *Percottus dybowsky* [6]. This species is distributed in Northern Vietnam and Laos [4, 7, 8]. This fish plays a commercial role for residents and be potential to be cultured [5]. However, information on the morphological and biological characteristics of the species is deficient [2] therefore needs to be examined.

The length-weight relationship (*LWR*) has been used in fisheries research since the beginning of the 20th century [9]. It provides useful information for fishery management, for both applied and basic purposes [10]. In fisheries biology, *LWR* is employed for determining weight and biomass when only length measurements are available [11]. The *LWR* study assumes a crucial prerequisite in fishery biological investigations and mainly deals with determining the variations within the expected weight from the known length groups, which successively are the indications of fatness, breeding and feeding state, and their suitability within the environment [12]. Besides, the condition factor (*K*) is an index that reflects the interaction of biotic and abiotic factors within fish physiological conditions [13]. As a result, the condition factor may differ between fish species in different locations [14]. A condition factor of one or greater than one indicates that the fish is in good condition, while one less than one indicates that the fish is in poor condition [15]. Furthermore, the *LWR* and *K* are species-specific and differ between sexes and developmental stages [11], so they are significant in the fishing industry because they assist in estimating the ideal length, weight, and harvest time for a certain species of fish [16], especially in nature reserves.

Morphological differences between males and females of the species are important features of the identification process. To elucidate the mode of sex determination utilized in a specific species, an outlined set of experiments should be administered that investigates the influence of environmental factors, the role of genetic factors, and the stability of sex determination under conditions known to affect the process in other species [17]. Using biometric growth patterns analysis of morphological traits, the present study aims to find any sexual dimorphism useful for sexism. Thus, the goals of the present study are to describe the sexual dimorphism, calculate the length-weight relationship, and determine the condition factor of *S. namxamensis* by obtaining their growth pattern between length and weight. This information will be integral to the basic requirements for the sustainable management of fish populations in aquaculture and the protection of natural resources.

2. Content

2.1. Material and methods

**** Fish collection and identification***

The study was conducted at sites located in the area of Tuyen Quang and Ha Giang provinces, Northern Vietnam in October 2018 and July 2019, respectively (Figure 1). The sampling site is an area with diverse topographical features including waterfalls, caves, and streams in the forests. Stream habitats predominate in the selected sampling sites and have an average altitude of over 112 m a.s.l. (from 17 to 232 m). The habitat characteristics of the sampling sites predict the distribution of this species stretching from the base of the waterfall to the small and medium streams deep in the forest. In these basins, the flow rate is medium, the bottom is muddy sand mixed with sand, and vegetation grows and covers the sides of the stream. Specimens were collected directly by hand net, gill net, and fishing with local professional fishers and then preserved in formalin 8-10%. The labeled samples (time, place, number of samples) are placed in plastic buckets or polypropylene bags for transportation to the laboratory.

Specimens were identified and descriptions based on external morphology according to Chen and Kottelat (2004) [18], Kottelat (2001a-b) [19, 20], and Nguyen and Nguyen (2008) [7]. Measurements followed Miller (1988) [21], and counts followed Nakabo (2002) [22], which are shown in Fig 2. The sex of *S. namxamensis* was determined by the form of the genital papilla [23].

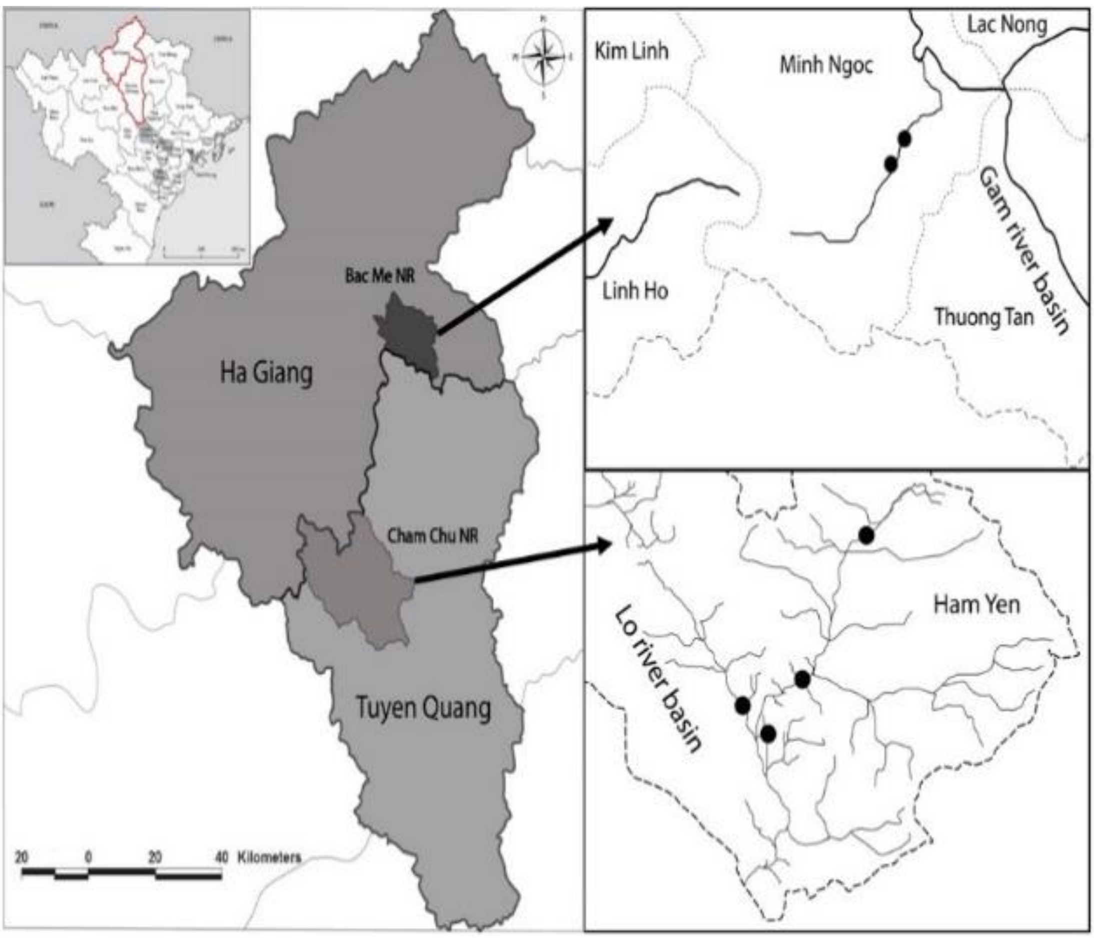

Figure 1. The sampling map where S. namxamensis was collected in Tuyen Quang and Ha Giang provinces

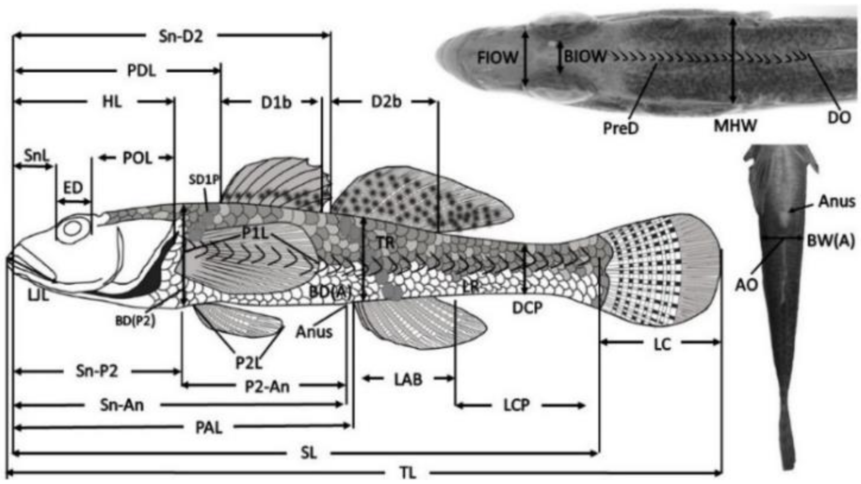

Figure 2. Measuring and counting diagram of S. namxamensis (Modified from Nakabo, 2002)

TL, total length; SL, standard length; SnL, snout length; Sn-D2, snout to 2nd dorsal fin origin; Sn-An, snout to anus; Sn-P2, snout to pelvic fin origin; PAL, snout to anal fin origin; LJL, lower-jaw length; HL, head length; ED, eye diameter; FIOW, fleshy interorbital width; BIOW, bony interorbital width; POL, postorbital length; P2L, pelvic-fin length; LC, caudal fin length; P1L, pectoral-fin length; D1b, 1st dorsal-fin base; D2b, 2nd dorsal-fin base; LAB, anal-fin base; LCP, caudal peduncle length; DCP, caudal peduncle depth; PDL, predorsal length; BD(P2), body depth in pelvic-fin origin; BD(A), body depth in anal fin origin; BW(A), body width in anal fin origin; P2-An, pelvic fin origin to anus; MHW, maximal head width; AO, anal fin origin; DO, dorsal fin origin; TR, transverse scale series; LR, longitudinal scale rows; PreD, predorsal scale rows; SD1P, scale series from the origin of the first dorsal fin to upper pectoral origin.

**** Data analysis***

The relationship between total length (TL) and weight (W) of fish were examined using the formula to assess fish growth: $W = a\mathrm{TL}^b$ (Le Cren, 1951), where W is body weight (g), TL is the total length of the fish (cm), and *a* and *b* are the intercept and slope value of the *LWR*, respectively. The correlation coefficient R2 and the LWR parameters a and b were calculated by using the method of linear regression analysis for the equation $\ln(W) = \ln a + b\ln TL$ based on natural logarithms of the formula $W = aTL^b$. R^2 is a measure of the linear association between two quantities, both of which are subject to random variation [24]. The growth patterns of morphometric variables were determined by comparing the slopes and isometric values of one using t-tests. The *b* value derived from linear regression was tested using a one-sample t-test to see if it differed significantly from an isometric value ($b = 3$) [25].

The condition factor (*K*) of the fish was calculated using the equation: $K = W/a\mathrm{TL}^b$, where *W* is the fish weight (g), *TL* is the total length (cm), and *a* and *b* are the regression coefficients proposed by Le Cren (1951) [26]. The *K* value of each sex was compared with the ideal value of one ($K = 1$) using a one-sample t-test, and values were compared among fish groups by a two-sample t-test. For statistical studies, R software version 4.1.0 was used for data analysis [27]; the FSA package was used to do regression analysis [28]; and the ggplot2 package was used to generate the figures [29].

2.2. Results

**** Identification***

Based on morphological examination of 30 individuals, this study identified these collections as *S. namxamensis* [18]. Compared with the description of Chen and Kottelat (2004) [18] and Nguyen and Nguyen (2008) [7], the data of the present research have a certain similarity in the number of fin rays (Table 1). The range of longitudinal scale rows was wider in the study than those in the previous works (34 to 43 vs. 36 to 39). The number of transverse scale series, predorsal scale rows, and scale series from the origin of the first dorsal fin to upper pectoral origin scales did not differ significantly (Table 1).

Table 1. Fin rays and scale counts of S. namxamensis

	Chen and Kottelat (2004)	**Nguyen and Nguyen (2008)**	**Present study**
D	VIII, I/11	VIII, I/11	VIII, I/11
A	I/9	I/9	II/7-8
P1	14-15	14-15	14-15
LR	36-39	36-39	34-43(mod 37)
TR	12-14	-	10-13
PreD	20-23	-	19-21
SD1P	9-10	-	8-9

Information on morphometrics of 13 males and 17 females of *S. namxamensis* is presented in Table 2. Based on this data combined with the fin, scale counts, and the head lateral-line system *a*, *b*, *c*, and *d* (Fig 4, [18]), the specimens obtained in the study were identified as *S. namxamensis*. This is the first record of ichthyofauna in the Red River basin (Fig 3) [8].

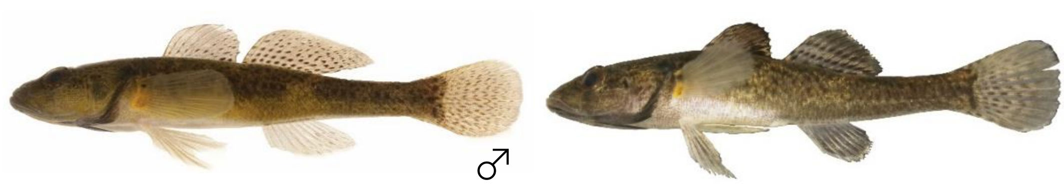

Figure 3. S. namxamensis, alcohol preserved (male, 94.9 mm SL; female 46.3 mm SL)

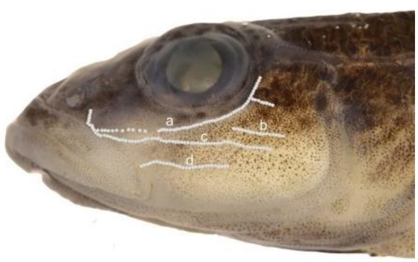

Figure 4. Sensory papillae of Sineleotris namxamensis collected from northern Vietnam

Table 2. Measurements of Sineleotris namxamensis in Northern Vietnam

Sex	**Male**			**Female**		
No	***13***			***17***		
	Minimum	*Maximum*	*Average*	*Minimum*	*Maximum*	*Average*
%SL						
Head length	30.4	34.5	32.1	29.4	33.4	31.1
Pre dorsal length	36.1	39.3	37.5	34	39.5	36.5
Snout to 2nd dorsal fin origin	54.3	57.5	56.0	53.2	56.8	55.2
Snout to anus	52.2	58.8	54.8	52	55.2	53.4
Snout to anal fin origin	56.7	63.3	60.1	57.5	62.2	59.2
Snout to pelvic fin origin	28.9	34.2	32.2	30.9	34.7	32.3
Caudal peduncle depth	8.0	10.9	9.3	7.8	10.2	8.6
Caudal peduncle length	23.6	28.9	26.5	25.5	29.6	27.6
1 St dorsal fin base	10.6	17.7	14.6	13.2	17.3	14.8
2nd dorsal fin base	16.4	21.1	18.6	15.9	21.0	18.7
Anal fin base	10.6	15.2	13.0	11.0	14.1	12.6
Pectoral fin length	21.6	26.4	23.5	19.9	26.4	23.6
Caudal fin length	20.7	25.8	23.4	21.1	24.0	22.3
Pelvic fin length	23.2	25.4	24.1	20.8	25.5	23.5
Body depth in pelvic fin origin	16.5	18.2	17.5	16.1	18.7	17.2
Bodv depth in anal fin origin	14.0	18.3	15.5	13.9	15.8	15.2
Body width in anal fin origin	8.9	11.9	10.5	9.1	11.7	10.2
Pelvic fin origin to anus	21.8	29.1	24.6	22.6	26.5	24.6
%HL						
Snout length	28.2	32.4	30.2	28.0	31.3	28.9
Eye diameter	19.0	26.2	22.5	20.2	33.9	24.3
Postorbital length	45.2	53.1	49.7	48.7	56.6	50.7
Maximal head width	45.7	59.0	51.4	46.1	53.1	49.0
Fleshy interorbital width	29.2	34.3	31.9	30.6	34.9	32.7
Bony interorbital width	15.1	16.9	16.3	15.8	16.8	16.3
Lower jaw length	32.3	37.9	35.1	32.1	39.7	34.3
Caudal peduncle depth/ caudal peduncle length	27.9	42.7	35.1	27.7	36.8	31.3
Pelvic fin length/pelvic fin origin to the anus	84.0	111.0	98.8	78.5	109	96.0

**** Morphometric characters about the total length***

The coefficient values of the correlation line between each morphometric measurement with the total length of fish in the two sexes are shown in Table 3. Most of the characteristics examined strongly correlated to the total length, with a high R-square value (R^2 > 0.9) in both sexes, except for 1st dorsal-fin base, anal-fin base, and eye diameter in males (R^2 < 0.9).

The results of comparisons between regression slopes and an isometric value of 1 showed that in males, four dimensions (caudal peduncle depth, body width in anal-fin origin, snout length, maximal head width) had the regression slopes $b > 1$ (+A, t-test, $p < 0.05$, Table 3). Six dimensions, including snout to 2nd dorsal-fin origin, snout to the pelvic-fin origin, caudal peduncle length, pectoral-fin length, eye diameter, and lower-jaw length showed slopes b < 1(-A, t-test, $p < 0.05$, Table 3). Meanwhile, in females, two dimensions (pelvic fin origin to anus, body width in anal fin origin) had the regression slopes $b > 1$ (+A, t-test, $p < 0.05$, Table 3), six dimensions (caudal peduncle length, anal-fin base, pelvic-fin length, eye diameter, fleshy interorbital width, bony interorbital width) had regression slopes $b < 1$(-A, t-test, $p < 0.05$, Table 3). The slopes of regression between total length and the sixteen remaining dimensions in males, and eight teen remaining dimensions in females are equal to 1 (t-test, $p > 0.05$).

Table 3. Morphometric variables vs. total length (TL) (all measurements were transformed to logarithmic scale before computation) of wild female and male S. namxamensis

Dimension	Male					Female					*P*
	a	*b*	R^2	SE_b	SE_e	*a*	*b*	R^2	SE_b	SE_e	
SL	0.847	0.979	0.998	0.014	0.031	0.766	1.028	0.998	0.013	0.025	0.030
HL	0.237	1.034	0.994	0.028	0.062	0.253	1.003	0.983	0.036	0.070	0.921
PDL	0.270	1.043	0.992	0.033	0.073	2.753	1.013	0.985	0.034	0.066	0.689
Sn-D2	0.461	0.988	0.997	0.019	0.043	0.396	1.066	0.997	0.014	0.028	0.000
Sn-An	0.394	1.057	0.993	0.030	0.068	0.373	1.078	0.998	0.012	0.024	0.000
PAL	0.468	1.020	0.991	0.034	0.077	0.428	1.061	0.995	0.019	0.038	0.013
Sn-P2	0.291	0.948	0.962	0.066	0.149	0.256	1.012	0.987	0.031	0.060	0.775
DCP	0.051	1.154	0.939	0.104	0.232	0.071	0.999	0.914	0.082	0.160	0.986
LCP	0.258	0.923	0.963	0.064	0.143	0.248	0.938	0.971	0.043	0.085	0.193
D1b	0.103	1.059	0.845	0.160	0.358	0.121	0.994	0.903	0.087	0.171	0.956
D2b	0.135	1.053	0.968	0.068	0.152	0.147	1.023	0.934	0.073	0.142	0.732
LAB	0.102	1.003	0.868	0.138	0.309	0.107	0.979	0.931	0.071	0.139	0.814
P1L	0.231	0.904	0.964	0.062	0.138	0.177	1.039	0.945	0.067	0.131	0.536
LC	0.185	0.992	0.970	0.061	0.138	0.186	0.999	0.976	0.042	0.082	0.979
P2L	0.178	1.037	0.991	0.035	0.078	0.239	0.890	0.976	0.037	0.073	0.004
P2-An	0.182	1.061	0.969	0.067	0.149	0.151	1.134	0.979	0.045	0.087	0.010
BD(P2)	0.115	1.091	0.987	0.044	0.099	0.131	1.035	0.986	0.032	0.064	0.308
BD(A)	0.110	1.061	0.966	0.070	0.156	0.120	1.009	0.965	0.052	0.101	0.861
BW(A)	0.063	1.144	0.978	0.061	0.136	0.064	1.126	0.921	0.088	0.172	0.113
SnL	0.059	1.120	0.984	0.051	0.114	0.065	1.067	0.975	0.046	0.089	0.141
ED	0.159	0.541	0.853	0.079	0.177	0.089	0.794	0.922	0.062	0.121	0.003
POL	0.129	0.997	0.974	0.058	0.130	0.130	0.992	0.978	0.040	0.079	0.858
MHW	0.082	1.214	0.975	0.069	0.154	0.106	1.086	0.971	0.051	0.099	0.114
FIOW	0.082	1.000	0.975	0.057	0.127	0.087	0.976	0.969	0.046	0.091	0.604
BIOW	0.040	1.019	0.992	0.033	0.073	0.044	0.975	0.976	0.041	0.081	0.505
LJL	0.101	0.961	0.973	0.057	0.128	0.083	1.019	0.969	0.049	0.095	0.690

The comparisons of regression slopes between the two sexes showed that five morphometric characteristics (snout to 2nd dorsal-fin origin, snout to anus, pelvic-fin origin, pelvic fin origin to anus, and eye diameter) had higher growth rates in females than in males, in contrast, one dimension (pelvic-fin length) were higher in males (t-test, $p < 0.01$ for all cases, Table 3).

**** Length-weight relationships***

The range of values for the weight (0.2-20.4 g) and total length (3.51-13.1 cm) was obtained from the individuals. The coefficients of determination were highly significant ($p < 0.001$), with R^2 values being greater than 0.988 (Table 4). The strong relationship between length and weight indicates that *S. namxamensis* weights could be estimated from fish length ($LogW = 0.0027 + 3.443*LogTL$). The b was higher than the isometric value of 3, indicating that *S. namxamensis* revealed a positive allometric growth, which implies the high adaptability of the species to the environment. A strong correlation between length and weight based on high regression coefficients is also shown for both sexes ($LogW = 0.0026 + 3.457*LogTL$, $R^2 = 0.990$, $p < 0.001$ for females, $LogW = 0.0029 + 3.439*LogTL$, $R^2 = 0.985$, $p < 0.001$ for males). T-testing of one sample for all cases resulted in the regression line value being significantly higher than the isometric value (the cubic value of three) with $p < 0.05$ (for all fish, males, and females). The value of the regression slope has a similarity between the sexes.

Table 4. Length, weight range and regression coefficient of wild Sineleotris namxamensis over the sampling period

The values given are from the equation $W = aTL^b$; n, number of samples; TL, total length; W, weight; a is intercept and b is slope value of regression; R^2, correlation coefficient

Sex	n	TL (cm)		Weight (g)		$W=aTL^b$			Compared sexes		
		Min	Max	Min	Max	a	b	R^2	*t*	*df*	*P*
F	23	3.51	13.1	0.2	17.4	0.0026	3.457	0.990	0.667	3/33	0.00
M	14	4.68	12.7	0.5	20.4	0.0029	3.439	0.985			
A	37	3.51	13.1	0.2	20.4	0.0027	3.443	0.988			

* ***Condition factor (K)***

The condition factor of the specimens (23 females and 14 males) is shown in Figure 4. The mean K values of *S. namxamensis* in the study area were found to be 0.998±0.151 SD for males, 1.01±0.031 SD for females, and 1.006±0.021 SD for combined sexes. The range of condition factors for this species was 0.795-1.237 in males and 0.824-1.28 in females. However, non-significant differences were found between males and females for K (t-test, t = 0.25679, $p > 0.05$).

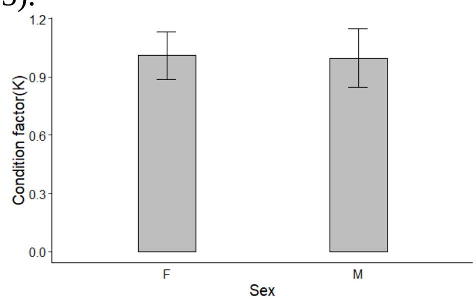

Figure 5. Condition factor (K) between female (F) and male (M) of S. namxamensis

2.3. Discussion

Morphometrics of *S. namxamensis* obtained in the present study are similar to those in Chen and Kottelat (2004) [18]. Differences in most of the measurements between the two sexes are significant, with males being larger and heavier than females, but the ratio of measurement did not show any changes during their growth. On the other hand, distances from snout to 2nd dorsal-fin origin, eye diameter, pelvic-fin length, and pelvic-fin origin to the anus are different between males and females in *S. namxamensis* (Table 3). Dimorphisms are also found in other gobies, such as *Bostrychus sinensis* [23], *Glossogobius sparsipapillus*, and *G. giuris* [30]. The above differences between males and females will be valuable for further work on this species, especially in population study and aquaculture.

A hypothesis about dimorphism has been stated for species in the Odontobutidae family. Based on 19 measurements, Fan *et al.* (2009) [31] revealed sexual dimorphism during the reproductive season in *Odontobutis obscurus* collected in Caoejiang River, Shangyu City, Zhejiang Province. They found that the number of adult males was greater than that of females, and the body length of adult females was significantly shorter than that of adult males [31]. Females of *Odontobutis obscurus* had significantly shorter head length, head width, head depth, interorbital width, caudal peduncle depth, and dorsal fin coxal length [31]. Adult females had a significantly lower carcass mass than adult males, while the former had significantly bigger body depth, dorsal fin spacing, and distance between the pelvic fin and anal fin. Moreover, individual fertility in *O. obscurus* was shown to be significantly positively correlated with body length and mass, adult females enhance individual fecundity by expanding their size (particularly by increasing their body mass) and abdominal cavity capacity, resulting in increased reproductive output. Male-male competition, environmental causes, social function, and reproductive behaviors have all been proposed as inductions for dimorphic morphometric traits [32]. However, due to similar reproductive behavior with *Odontobutis obscurus*, there are still differences in sexual dimorphism that distinguish the two sexes. As a result, more general investigations need to determine the specific reason for sexual dimorphism, including ecological factors, allowing for correct assessments for each species.

A total of 23 species were found in the family Odontobutidae [2], but information on the length-weight relationship of them has not completed, with some exceptions, as follows *Odontobutis interrupta* (n = 29), b = 3.8 and R^2 = 0.99; *Odontobutis platycephala* (n = 51), b = 3.24 and R^2 = 0.99 [33]; *Odontobutis obscura* (n = 29), b = 3.2 and R^2 = 0.991 [34]; *Odontobutis potamophila* (n = 266), b = 3.459 and R^2 = 0.961 [35]; *Odontobutis sinensis* (n = 481), b = 3.16 and R^2 = 0.94 [36]. The above studies did not discuss the growth pattern, and only mentioned the b slope value, except for *Odontobutis sinensis*, the growth is allometric in males (b > 3), but it is isometric in females (b = 3.07) [36]. Differences within the b value from an equivalent fish species are often suffering from many factors, sampling size, sex, gonad maturity, habitat, season, stomach fullness, diet, and the length ranges used [23, 37, 38]. Thus, the assessment of the suitability of the environment for the growth patterns of fish through the regression coefficient b should be considered in further studies. In Vietnam, the genus *Sineleotris* includes 3 species *S. chalmersi*, *S. saccharae*, and *S. namxamensis* [3], however, prior to this study, there has been no information about the length-weight relationship. Thus, this study provides the first data of *LWR* of *S. namxamensis*, and this result is similar to the Bayes length-weight, predicted by FishBase [2], with growth parameters *b* of the species being usually between 2.5 and 3.5. The independent effects of sexes on *LWR* were not significant in the present study. All regressions are of high significance in both sexes and combination fish, suggesting that the fish length can be used to estimate fish weight with ideal accuracy. Furthermore, the regression slope calculated for the individual genders and the associated specimens was significantly higher than that of isometric growth ($b > 3$), showing that the environmental conditions in the study region were appropriate for the growth of this fish. However, the assessment of the environmental impact on the growth and development of species requires more related studies and, collecting more samples. In addition, the above data will be beneficial in future ecological research, and the findings of this study can provide detailed information for species conservation and management.

The *K* value as a condition factor is recommended for populations or species [11] and can provide information on the general condition of fish species in habitat and changes in density. This is the first study that has estimated the condition factors for this species. Thus, the estimated *K* value can provide a powerful tool and form an important database for future studies to compare, test, and evaluate the overall growth and indicators of habitat quality for each species.

S. namxamensis can grow and develop more effect if various fish species in the same area have different food compositions. Such as *Anabas testudineus* consumes green algae, insects, and copepods, whereas *Barbodes semifasciolatus* consumes benth, crust, detritus, insects, worms and *Macropodus opercularis* consumes zooplankton, zoobenthos, and nekton [2]. In contrast, the absence of other goby species (such as those in the genus *Rhinogobius*) helped *S. namxamensis* face less competition for food supplies. The presumption is that competition for food is minimal for fish in the Odontobutidae family. The single occurrence from this family goby in the study site showed no signs of competition between species, which facilitated the vigorous growth of this species. Records of this species in the study area imply that the habitats suit its growth and development. Current changes in ecosystems and function highlight the importance of understanding the relationships between environmental conditions and organism fitness and tolerance [38]. However, we have not been able to accurately assess the suitability of the habitat for these species due to the lack of ecological projections. This research should be broadened to contribute to the development of fishery resources in the area.

3. Conclusions

The present study identified and determined the distribution of *S. namxamensis* in Tuyen Quang and Ha Giang provinces, Northern Vietnam. In both sexes, most measurements were substantially associated with the overall length, with a high R-square value. Females and males have different growth patterns for four morphometric features, indicating morphometric sexual dimorphism for distinguishing between both sexes. *S. namxamensis* weights can be estimated from fish length. The regression slope *b* value (calculated for both sexes and in the combined samples) was higher than the isometric value of 3, but there is still insufficient information to conclude about the impact of the habitat on the growth of the species. The *K*-values and *LWR* are the first data for this goby, showing no significant differences between males and females. The findings of this study will be used to contribute a database for the conservation and development of species in the nature reserves under the impacts of human activities, as well as the development of aquaculture in this area.

Acknowledgment. This study was primarily financially supported by The Nagao Natural Environment Foundation (NEF). We affirm that the use of fish specimens in this study was done in accordance with current legislation and ethical standards for using animals in research.

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