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Morphological variations of epaulette soldierfish, *Myripristis kuntee* in Tuka Bay, Kiamba, Sarangani Province

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Key words: Geometric Morphometrics, Holocentridae, Myripristis kuntee, Determinants.

Abstract

Kiamba, Sarangani Province is one of the tourist spots in Mindanao because of its bountiful marine resources which contribute to the economic aspects of the place. Because of the indisputable abundance of its marine resources, there are many species that are still unidentified due to the differences in their features. One of the marine species is the *Myripristis kuntee* or the 'baga" fish. The researchers used net fishing technique in gathering the specimen samples, took pictures of the specimen and spot the differences in the specimen. In this study, the researchers analysed the morphological variation of *Mypristis kuntee* in order to determine the difference between the male and female types in terms of its shape and form. The MANOVA shows result of p=1 which indicates that there is no significant difference between the male and female *M.kuntee*. Hence, the overall result shows that the female specimen appears to have more curvature in their posterior margin through midline with a total RW: 80.76% compared to the male specimen with a total RW: 80.71%. In line with this, the researchers therefore conclude that although there are a lot of species under the family of *holocentridae*, there are still specific determinants that will distinguish the *M. kuntee* from the other species

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Introduction

The inflation in the fish population is significantly high in many tropical country shores, however our current knowledge about them is still very limited (Kublicki *et al* 2005). There are cases that species are unidentified because of the differences in their features. (Silva and Liyanage 2009) stated that determining the morphological variability of fishes is said to be essential as an adaptive strategy for populations experiencing diverse environmental conditions, which could have a huge influence in the variation of species in terms of their forms and structures. This problem can be addressed using a method called land-marked based Geometric Morphometric or GM. Through GM, the nature of morphological variation in fishes can be properly understood. According to the analysis of (Adams *et al* 2004), this advanced method provides us more reliable statistical analysis in the specimen`s morphology and serves as a technique in interpreting data. This innovative approach may impact the progress of systematic ichthyology. Since morphometric is the study of shape, size, form, symmetry and the factors affecting it among different species here on earth, it only means that its major goal is to measure the morphological variation of species such as M. kuntee (Polly 2012).

Myripristis kuntee is commonly known as Epaulette Soldierfish or Baga-baga in Cebuano term. They are among those conspicuous species in the nocturnal reef fish community (Dornburg, 2012). It is identified by some natives as an edible fish. This nocturnal species is characterized by its rough scales, large eyes and a forked caudal fin. There is a blackish bar through the pupil and a broad bar behind the head from the upper end of the gill opening to the pectoral fin base. This species grows to about 20 cm in length and usually seen in caves and crevices during the day, but at night comes out into the open to feed. They are found in tropical waters of the Indo-Pacific. In Australia it is known from the central coast of Western Australia, around the tropical north and south on the east coast to northern New South Wales (McGrouther 2012).

On the other hand, M. kuntee species is rare in terms of fish productions and exportations. According to the Office of the Municipal Agriculturist, Municipality of Kiamba, the fish catch data and fish production from year 2013 up to 2014 is decreased due to the effect of climate change and other factors like decrease of Fish Aggregating Device (FAD).

As far as biodiversity and environmental studies is concern, this research is necessary to asses and determine the specific morphological characteristics of M. kuntee. Through the use of GM, this study aims to differentiate M. kuntee from the other species. This paper is intended to provide baseline data that could be helpful in establishing biological monitoring and conservation programs at the local level to come up with the current status M. kuntee species within the sampling area and will serve as an indicator of biological condition of its aquatic habitat. The study is delimited only on the morphological variation of M. Kuntee which includes the shape and form.

The expected output attests to be useful as an additional literature for the future researches since there are no existing studies conducted about the morphological variation of M. kuntee species found in Tuka Marine Park, kiamba, Sarangani Province.

Materials and method

Study area

The study was conducted last September four (4) to five (5) 2015 in Tuka 3 Marine Park Kiamba, Sarangani Province, which is located at South-Central Mindanao that geographically lies between 5° 59' 22" N and 124° 37' 27" E.

B. Species accumulations

Using net fishing techniques in Tuka 3 Marine Park Kiamba, Sarangani Province, a total of 59 *Myripristis kuntee* (30 and 29 male and female respectively) were collected and became samples for this study and were analysed for body shape differences.

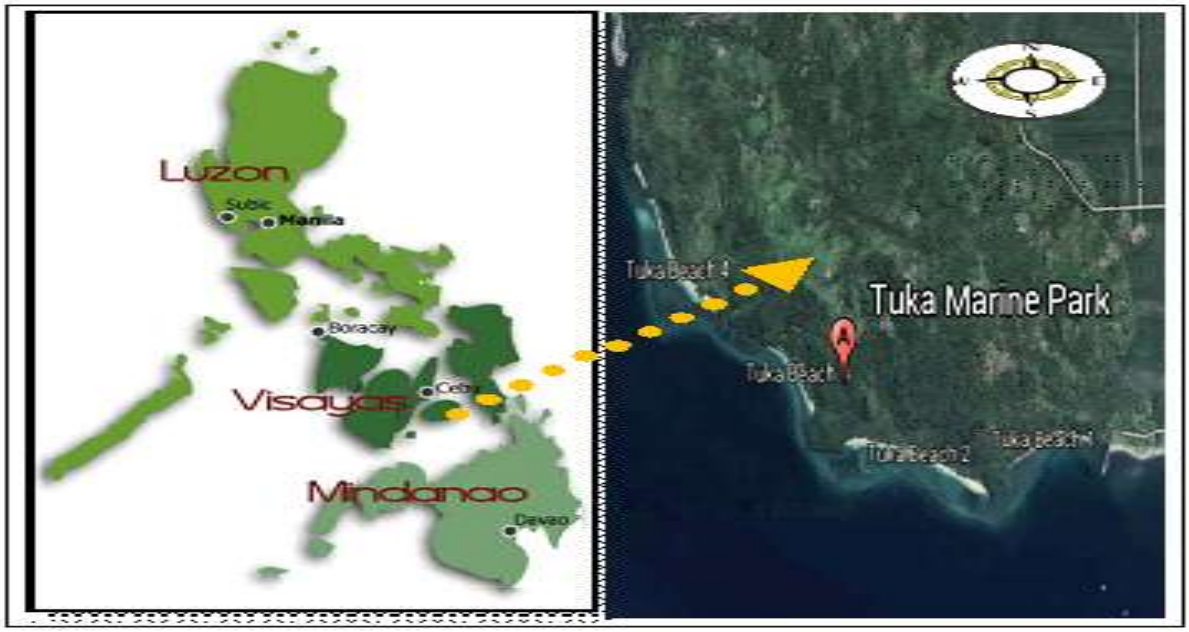

Fig. 1. (A) Map of the Philippines; (B) Sampling site: Tuka 3 Marine Park Kiamba, Sarangani Province.

C. Landmarking

In order to locate the morphology of specimens, there are 16 total landmarks digitized with the use of software called tpsDig version 2.12. The location of the landmarks and the anatomical descriptions of each are presented in Figure 3.

Results and discussion

There were six relative warps on male samples which resulted to a total variation of 80.71%. From the data, RW1 is 32.04 % referring to the constriction and broadening in the mouth region particularly on jaw area. RW2 is 16.72 % where it shows the significant changes in position points in the Head area particularly in the mouth part. RW3 is 11.56 % wherein the significant variation lies on the tail part of the species. RW4 is 7.76 % wherein, the variation is located on the head area. RW5 is 6.77 % which shows that the location of variation is within the mouth region specifically the jaw part and in anal fin. RW6 is 5.86% showing a slightly constricted shape in the head region.

There were also six relative warps on the female specimen which resulted to a total variation of 80.76 %. From the data, RW1 is 27.25% where there is a single variation located on the head region. RW2 is 16.66 % stating that there is a single variation located in the head region. RW3 is 13.09 % shows that the variation is located on the head region of the species. RW4 is 11.09 % wherein it describes that the variations were located at the head and caudal region. RW5 is 7.96 % where it explains that the significant variation is located at the head region particularly in the mouth area of the species. RW6 4.98 % describing the single significant variation on the mouth region specifically in the jaw part.

Male A. *Myripristis kuntee*

TPS or commonly known as “Thin Plate Spline” is a technique that produces models of shapes described by landmark configurations as alteration of form. As such, it is not a shape ordination method. It is a graphical tool used to compare any two landmarks-defined shapes (MacLeod,2009). These programs provide various types of statistical analyses using partial warp scores as shape variables and/or expressing the results of morphometric analysis as a shape deformation (http://life.bio.sunysb.edu/morph/).

The analyses of relative warps were performed using Tpsrelw program (Rohlf 1998b).

Table 1. Report summary of relative warps in particular based on the overall shape and percentage variance of male and female *Myripristis kuntee* species.

	Variation	Male		Variation	Female
RW1	32.04%	The significant variation is located on the mouth region. For the negative extreme, there was a constriction expressed in the posterior end of maxilla and it is slightly bended as well whereas on the positive extreme, the posterior end of maxilla becomes broader	RW1	27.25%	There is a single variation located on the head region wherein the anterior margin through midline of orbit in the negative extreme is slightly extended, whereas on the positive extreme, it can be observed that there is a little compression in the anterior margin through midline of orbit.
RW2	16.72%	The significant variations are located in the head and mouth wherein in the negative extreme; there is partly an enlargement in the shape particularly in the posterior margin through midline of orbit, anterior margin through midline of orbit and on the posterior end of maxilla. In positive extreme, it can be observed that the variation is located on the posterior margin through midline of orbit as well for it was partly compressed.	RW2	16.66%	The single significant variation is located on the head region particularly in the anterior margin through midline of orbit. In negative extreme, it was slightly constricted while on the positive extreme, it was slightly widened.
RW3	11.56%	The significant variation is located on the tail area of the species in negative extreme particularly on the posterior insertion of dorsal fin where there is a constriction whereas on the positive extreme, notice that the posterior insertion of dorsal fin widens.	RW3	13.09%	The significant variation is located on the head region. The anterior margin and posterior margin through midline of orbit in the negative extreme were seemed to be pulled inwards, causing it to be partially condensed. On the positive extreme, it can be observed that the anterior margin through midline of orbit is partly elongated.
RW4	7.76%	The significant variation is located on the head region or area. For the negative extreme, the over-all shape is most likely the same with the normal shape except in the part of posterior margin through midline of orbit where there is a little curve to the left causing it to look wider. In contrast, for positive extreme, the posterior margin through midline of orbit was been slightly pulled inwards causing it to narrow a little.	RW4	11.09%	The significant variation is located on the head region wherein focusing on the negative extreme, the posterior margin through midline of orbit appears to be pulled towards the dorsal end of opercle whereas on the positive extreme, the significant variation is located on the midpoint of caudal border of hypural plate where in it was slightly bended.
RW5	6.77%	The significant variation is located on the head region, specifically in the jaw and anal areas. In the negative extreme, it shows that there is a curve between the posterior end of maxilla and ventral end lower jaw articulation which causes the reducing of size in species. The posterior insertion of anal fin shows extending direction towards the right side. In the positive extreme, the curve or change in position is located on the posterior end of maxilla where it is slightly contracted as well as the posterior insertion of anal fin.	RW5	7.96%	The significant variations are located on the head region in the negative extreme particularly on the posterior end of nuchal spine where it is slightly bended and posterior end of maxilla where it appears to be broader than the normal shape. On the other hand, if we try to observe the rostral tip of premaxilla in the positive extreme, it can be noticed that it was bending a little.
RW6	5.86%	The significant variation lies on the head region/area. In the negative extreme, notice that the posterior end of maxilla became slightly constricted. On the other side, for the positive extreme, it appears that the position of anterior margin through midline of orbit expanded compared to the normal shape of the species. It means that its eyes are bigger.	RW6	4.98%	There is a single significant variation on the mouth region as observed in the negative extreme; the ventral end of lower jaw articulation was slightly lengthened. In the positive extreme, it is nearly the same to the normal shape except on the part between the ventral end of lower jaw articulation and dorsal base of pelvic fin where there is an observable manifestation of a slight curve causing it to appear slightly constricted.
	80.71%	The total variation on male *Myripristis kuntee*		80.76%	The total variation on female *Myripristis kuntee*

Although the *Myripristis kuntee* fishes are indistinguishable externally as male and female, the table above represents the summary of the variations in the morphology of the sample species through the use of Relative Warp Scores and its equivalent frequency histograms within the two sexes. Based on the results, male *M. kuntee* acquires more constriction in the jaw region whereas the female *M. kuntee* appears to have a broader shape in the jaw region. In addition, female *M. kuntee* has larger eyes compared to the male *M.kuntee*. Moreover, this study shows that when compared to males, female *M.kuntee* appears to have more curvature in their posterior margin through midline of orbit.

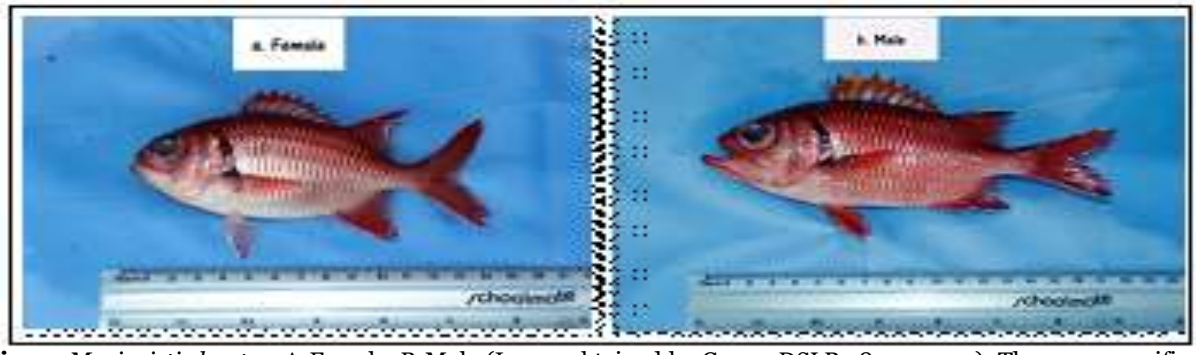

Fig. 2. *Myripristis kuntee* .A-Female, B-Male (Image obtained by Canon DSLR 18-200 mm). There are specific methods in classifying the Female (Figure 2a) and Male (Figure 2b) *M. kuntee*. Love and Chase (2009) cited by Lecera *et al*, (2015), the identification was based on external morphology and later confirmed by direct examination of the gonads. The findings in identifying both male and female *M. kuntee* mainly points out that males have whitish soft textured gonads while females have yellowish coarsely textured gonads with eggs (Riquieron *et al*, 2015). Canon DSLR (18-200mm) was used as a medium to capture the left side of the specimen.

The body shape variations within *Myripristis kuntee* species were proven by the quantitative data gathered in Multivariate Analysis of Variance (MANOVA). It shows "no" significant differences between sexes that was determined by the p value (p= 1) which is greater than 0.05 level of significance (p>0.05).

Fig. 3. A total of 16 landmarks were being used for digitizing the image of *Myripristis kuntee* on this study. The following landmarks are: 1 - Rostral tip of premaxilla; 2 - Posterior end of nuchal spine; 3 - Anterior insertion of dorsal fin; 4 - Posterior insertion of dorsal fin; 5 - Dorsal insertion of caudal fin; 6 - Midpoint of caudal border of hypural plate; 7 - Ventral insertion of caudal fin; 8 - Posterior insertion of anal fin; 9 - Anterior insertion of anal fin; 10 - Dorsal base of pelvic fin; 11 - Ventral end of lower jaw articulation; 12 - Posterior end of maxilla; 13 - Anterior margin through midline of orbit; 14 - Posterior margin through midline of orbit; 15 - Dorsal end of opercle; 16 - Dorsal base of pectoral fin.

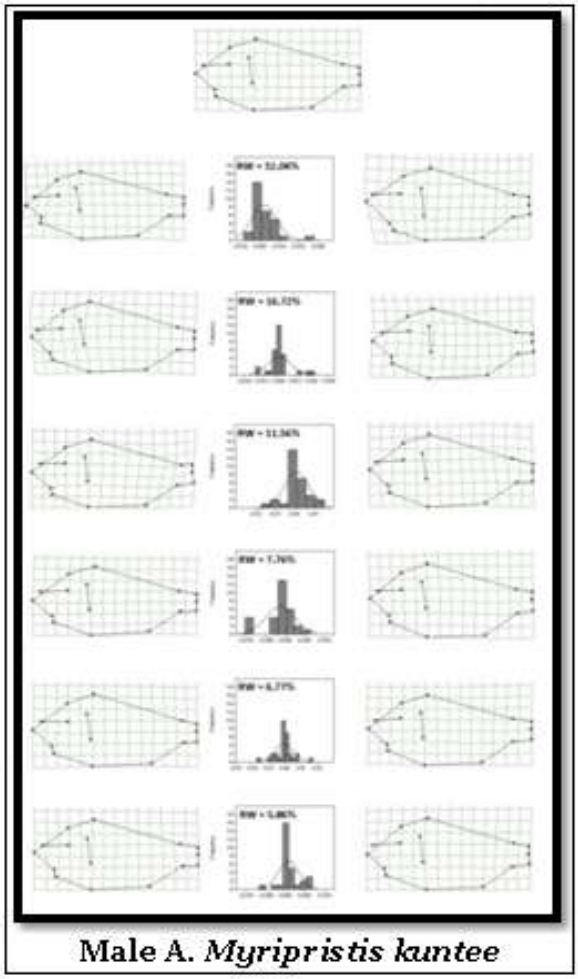

Fig. 4. Summary of the Geometric Morphometrics in male A. *Myripristis kuntee* presenting the relative warps and the variation in body shapes from maximum negative (left) towards maximum positive (right) as compared to the normal shape (top).

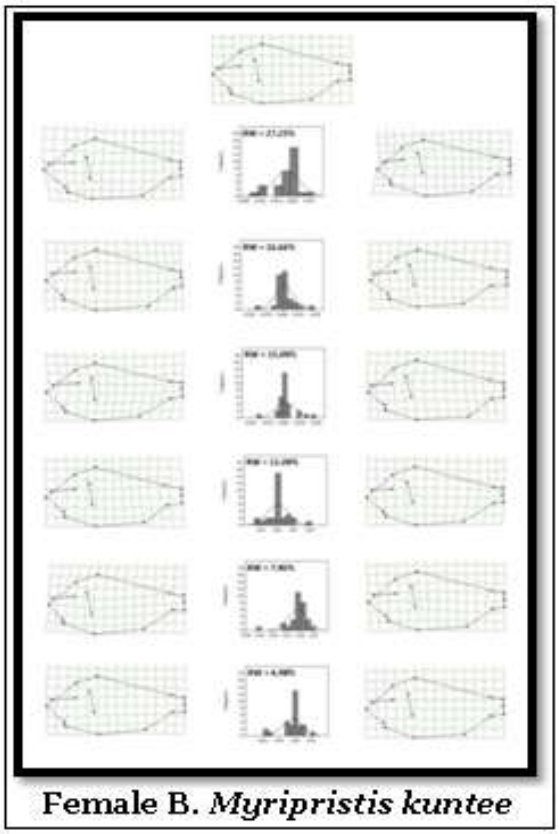

Fig. 5. Summary of the Geometric Morphometrics in female B. *Myripristis kuntee* presenting the relative warps and the variation in body shapes from maximum negative (on left side) towards maximum positive (on right side) as compared to the normal shape (on top).

Classification of *Myripristis kuntee*.are as follows;
Kingdom: Animalia
Phylum: Chordata
Subphylum: Vertebrata
Class: Actinopterygii
Order: Beryciformes
Family:Holocentridae
Genus: Myripristis
Species: kuntee

Habitat, biology, and fisheries

According to Valenciennes (1831), "A coral- reef species generally found in relatively shallow water. Often seen in aggregations in and at the entrance to caves. Although one of the most common of soldierfishes, its small size reduces its valueas a food fish".

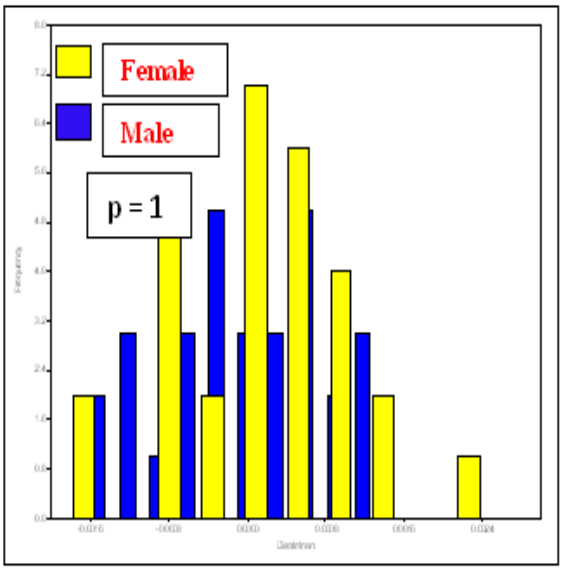

Fig. 6. Discriminant Function Analysis (DFA) Graph

Discriminant Function Analysis (DFA) graph in Figure 6 summarized the extent of variation between the two (male and female) *M. kuntee* species. This manifests the sexual dimorphism between the two sexes. Differences in the body shape of the sexes vary in functions.

Moreover, as cited by www.whatthatfish.com, *Myripristis kuntee* or commonly termed as Epaulette Soldierfish is also known as Epaullete Squirrelfish, Shoulderbar Soldierfish, Shoulderbar Squirrelfish, Pearly Squirelfish and Pearly Soldierfish. Usually, it can be found in small groups of reef flats, lagoons and seaward reef walls. They normally feed on zooplankton more likely shrimp and crab larvae. In terms of color, there is a red to orange-red above and shades to silver ventrally. These species are also nocturnal with large eyes and a broad bar behind the head(*http://australianmuseum.net.au/*).
Squirrelfishes are thinner with a pointed snout and horizontal stripes.

Conclusion

Based on the discussion and data that were presented above, *Myripristis kuntee* acquires specific morphology in which it could be identified. In line with this, the researchers therefore conclude that although there are a lot of species under the family of Holocentridae, there are still specific determinants

that will distinguish *the M. kuntee* from the other species.

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References

David PP. 2012. Geometric Morphometrics; an introduction. Department of Geology, Indiana (Biology and Anthropology) University, 1001 E.

De Silva MPSK, Liyanage NPP. 2009. Morphological variation of *Puntius bimaculatus (Cyprinidae)* with respect to altitudinal differences and five major river basins of Sri Lanka. RUHUNA JOURNAL OF SCIENCE **4,** 51-64

Dornburg A, Moore JA, Webster R, Warren DL, Brandley MC, Iglesias TL, Wainwright PC, Near TJ. 2012. Molecular phylogenetics of squirrelfishes and soldierfishes (Teleoste, Beryciformes, Holocentridae): Reconciling more than 100 years of taxonomic confusion **65,** 727-738.

Kulbicki M, Guillemot N, Amand M. 2005. A general approach to length-weight relationships for New Caledonian lagoon fishes. Cybium, **29(3),** 235-252.

MacLeod N. 2009. Principal warps, Relative warps and *Procrustes* PCA. Palaeontology Department The Natural History Museum.

McGrouther M. 2012. Epaulette Soldierfish, *Myripristis kuntee* Valenciennes, 1831. Australian Museum.

Randall JE, Greenfield DW. 1996. HOLOCENTRIDAE Squirrelfishes (soldierfishes), 2225-2226.

Rohlf FJ. 1998b. TPSRELW, version 1.18. A program to performs a relative warp analysis. Department of Ecology and Evolution, State University of New York, Stony Brook, New York.