Al-Qadisiyah Journal of Pure Science

Volume 25 | Number 1 Article 12

1-7-2020

Sexual Size Dimorphism in Hyla Savignyi Audouin, 1827 (Anura: Hylidae) from Nasiriyah Province, Southern of Iraq

Muhanad Al-Jaberi
Alshuhada secondary school , Directoration general for Education , Dhi-Qar, Iraq, maaljaberi5@gmail.com

Zain Al Abideen Al-Mossawi
Alshuhada secondary school , Directoration general for Education , Dhi-Qar, Iraq

Recommended Citation

Al-Jaberi, Muhanad and Al-Mossawi, Zain Al Abideen (2020) "Sexual Size Dimorphism in Hyla Savignyi Audouin, 1827 (Anura: Hylidae) from Nasiriyah Province, Southern of Iraq," *Al-Qadisiyah Journal of Pure Science*: Vol. 25: No. 1, Article 12.
DOI: 10.29350/2411-3514.1217
Available at: https://qjps.researchcommons.org/home/vol25/iss1/12

Available online at http://qu.edu.iq/journalsc/index.php/JOPS

ISSN 2411-3514 ONLINE
ISSN 1997-2490PRINTED

Al-Qadisiyah Journal Of Pure Science (QJPS)

Vol. .25, No. 1, Bio pp. 7 –13, Year 2020

Sexual Size Dimorphism in *Hyla Savignyi* Audouin, 1827 (Anura: Hylidae) from Nasiriyah Province, Southern of Iraq.

Muhanad Al-Jaberi and Zain Al Abideen al Moussawi

Alshuhada secondary school , Directoration general for Education , Dhi- Qar ,Iraq

mail addresses: maaljaberi5@gmail.com

Received : 31/1/2020 Accepted : 9/3/2020

ABSTRACT:

This study aims at investigating the sexual size dimorphism phenomenon (SSD) in the frog of a tree population Hyla savignyi Audouin, 1827 (Anura: Hylidae) from the province of Nasiriyah, southern Iraq. Thirty-nine specimens (19 females , 20 males) were captured, Digital calipers measured sixteen metric characters to the closest 0.01 mm and released in their natural habitat. SPSS Statistics V22.0 has been used to conduct the measurement of the study. Statistical data analysis clarified that there is a significant difference between genders of the study sample, females larger than males.

KEYWORDS: Sexual Size Dimorphism, ***Hyla Savignyi***, **Nasiriyah Province**

1. INTRODUCTION

Natural selection and sexual can produce dramatic The difference between sexes in traits include size and body shape morphology, colour, body size, mating calls and display behaviour [1] [2]. The traditional interpretation of the morphological differences between the genders was based on the theory of sexual reproduction by Darwin (1871) [3]. Sexual choice (acting through male-male match chance competition or female choice), choice of fertility (resulting in an increase in body volume or female body volume) as well as other elements, every possible cause of sexual dimorphism, like natural selections, decrease of the imbalance between differential gender mortality and intersexual resources attributable to longevity variations [4] [5] [1] [6]. Dimorphism describes the sex size (SSD) of the item that is the two genders vary in metric value of certain morphological traits [1]. A widespread phenomena in the animal kingdom is sexual dimorphic of behavior, colour, shape and size[7][8].Dimorphic rather than monomorphic

in Most species[9]. Because of the great Morphological diversities, life history and habitats, amphibians are an absolutely fantastic group to investigate Sexual size dimorphism (SSD) [3].

Shine (1979) has indicated that males are smaller than females in 90% of anuran species. Arak (2007) created a system based on countering natural selection selective pressures from optimal body size and sexual selection in female and male anurans for big size of the body. He successfully experienced these models for nine anuran groups, a significant association was observed between body size sexual dimorphisms and the variation between gradients of female and male distribution [10]

This study investigates the dimorphism in sexual proportions in a frog tree, Hyla savignyi, Audouin, (1827) indicates that the metric characters between the sexes display a relatively clear trend of dimorphism. Depending on our view, the selection of fertility is a force behind Hyla savignyi's female-based SSD.

2.MATERIALS AND METHODS

During March and April 2016-2017, a total of 39 (21♂ and 18♀) adult specimens of Hyla savignyi were collected in Nasiriyah city southern of Iraq (56.62،31N 56.05،46 E) . Sixteen morphometric characters were selected to measure by digital caliper (±0.01 mm). determined Sex by the presence of a vocal sac in males. After examination, several of the samples were released in similar habitats within the same area. Only fully adult specimens were used in this study. Following the collection, another samples were preserved in ethanol 75% and kept in the laboratory of biology in the Al-Shohada Secondary School .

2.1The Morphological measurements:

• **FmL**, "length of the femur: from the middle of the cloacal space to the outer knee joint when the thighs and shins are perpendicular to the direction of the body".

• **SUL**, "snout-urostyle length: from the top of the snout to the back of the urostyle edge".

• **TbL**, "tibia length: from the inner knee joint to the outer heel articulation margin".

• **HW**, "head width: the width of the head".

• **TrL**, "length of tarsus: from the inner side of the heel to the proximal edge of the inner metatarsal tuber".

• **ES**, "length from the eye from the top of the head to the front of the neck".

• **HLt**, "head length: from head tip to tympanum back margin".

• TD, "diameter of the horizontal tympanum".

• IND, "internarial distance: the distance between the midpoints of nostrils".

• IOD, "interorbital distance: the shortest distance between upper eye lids".

•T1L, "length of the first toe: from the distal edge of the metatarsal tuber to the tip of the first toe".

• IMTL, "the length of the inner metatarsal tuber: the length of the tuber base".

• WL, "webbing length: from the distal margin of the internal metatarsal tuber to the mid-toe margin of the webbing".

• WUE, "Width of Upper Eye-lid".

• HDE, Horizontal Diameter of the Eye and

• MDNE, Minimum Distance from Nostril opening to anterior corner of Eye, fig(1).

ANOVA was applied and Principal Components Analysis (PCA: association matrixes) in order to predict the importance of

sexual gender dimorphic in the Savigny's treefrog (Hyla savignyi). The statistical analysis software SPSS (version 22) are used. Results at $P \leq 0.05$ was considered statistically significant.

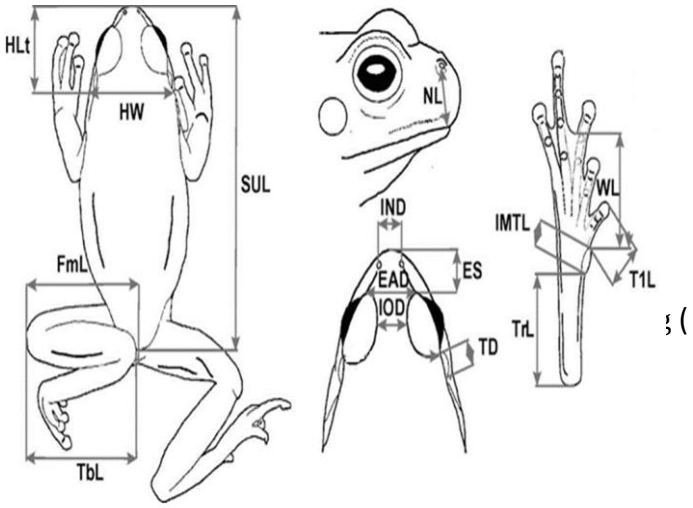

Figure 1. Morphological measurements ccording [11]

RESULTS

A one-way ANOVA revealed major sex disparities in seven of the 16 morphological characteristics.These seven metric characteristics have higher female values than Pvalue ≤ 0.05 in males. That was the **SUL**, snout–urostyle length *(P*=0.000) **. FmL**, femur length(p=0.002)**. HW**, head width(p=0.000) . **HLt**, head length (*P*=0 .000). **IOD**, interorbital distance(*P*= .000) . **WUE**, Width of Upper Eye-lid (p=0.001) and **WL**, webbing length (p= 0.004).

.

The values for these traits as well as direction of differences are summarized in Table 1

Characters		SUL*	HLt *	HW *	IND	IOD *	WUE *	ES	HDE
sex ♂	Mean	37.5985	11.1785	11.4555	2.6255	3.6110	2.6270	4.9375	4.3835
(N=20)	Sem	.49694	.09059	.18846	.08587	.09669	.11805	.12149	.08098
sex ♀	Mean	41.0432	12.4968	12.9058	2.9747	4.5132	3.4189	5.3295	4.5953
(N=19)	sem	.24217	.17204	.35134	.11539	.12656	.12733	.12281	.10744
p-value (≤ 0.05)		**.000**	**.000**	**.001**	**.019**	**.000**	**.000**	**.029**	**.122**

Characters		TD	MDNE	FmL *	TbL	TrL	IMTL	T1L	WL *
sex ♂ (N=20)	Mean	2.4660	3.2015	16.1525	17.5170	10.3875	1.7490	4.6260	9.8580
	sem	.07420	.22499	.32280	.29356	.22301	.06572	.13128	27699
sex♀ (N=19)	Mean	2.6658	2.6700	17.5532	18.4216	11.0195	1.8226	4.7858	11.0847
	Sem	.08715	24836	27065	.35931	.18643	.06887	.21100	.28212
p-value (≤ 0.05)		**.088**	**.121**	**.002**	**.058**	**.037**	**.444**	**.520**	**.004**

Table 1 .Comparison of morphometric characters (mm) of *Hyla savignyi* in males and females. N: number; SEM: standard error of mean; * = significant at level P ≤ 0.05.

In addition multivariate computational approaches including Principle Components Analysis (PCA) have been conducted to classify variables that scientifically describe manifestations in gender discrimination, determining the character that is primarily responsible for the reported variability.

Total information is explained jointly by the first two PCA factors (Table 2). For this, the PC1 describes 56.045 and the PC2 explains 12.833 (Fig. 2 and Table 2). The seven important variables in the study, including SUL, FmL, HW, HLt, IOD, WUE and WL, demonstrated peak (P = 0.897) then minimal (P = 0.670) involvement in the PC1 for the estimation of the own values. In addition the total (P = 0. 596) and minimal (P = 0. 272) representation in the PC2 is dedicated respectively to WUE as well as FmL (Table. 2)

Component Matrix[a]		
	Component	
	PC1	PC2
SUL	.681	-.395-
HLt	.897	-.026-
HW	.785	-.361-
IOD	.768	-.299-
WUE	.671	.596
FmL	.742	.272
WL	.670	.304
Eigenvalues	5.213	.091
% of Variance	56.045	12.833
Cumulative %	56.045	68.878

Table (2)Loadings from a Principal Component Analysis of metric characters of

Hyla savignyi. Abbreviations: SUL (snout-vent length), HLt , (head length), HW (head width), IOD (interorbital distance), WUE (Width of Upper Eye-lid) , FmL (femur length) WL (webbing length).

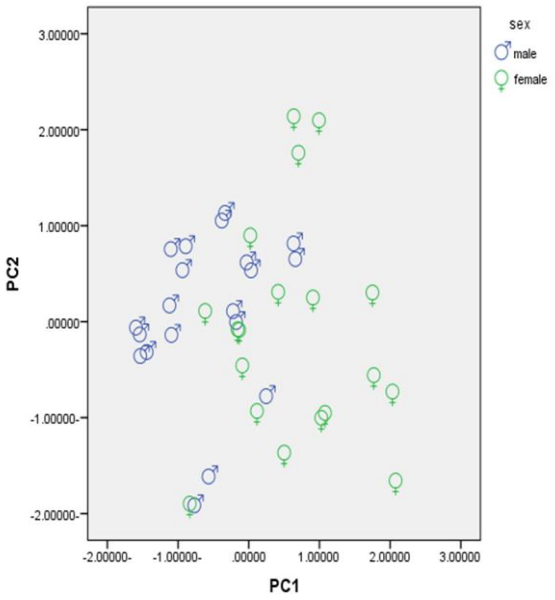

Figure 2. Ordination of the individual males and females of *Hyla savignyi* on the first two principal components. Note the relative degree of isolation between the sexes.

DISCUSSION

Sexual size dimorphic was considered as a common phenomenon whereas the females and males sizes are differed in the same types. There is an established theory that describes the role and nature of SSD in anurans, where men like results of sexual choice are usually smaller than females [10].

That SSD as identified here was the adaptive product of selections which works differently on other female and male features and body size [3].

As shown in Table 2, on average, seven characters for hyla ($p \leq 0.05$) are significantly different for males and females and 100 percent of the characters tested were representative of the prevalence of sexual dimorphism in size.

There have been proposals of different theories to clarify SSD interspecific variations [12] [1] [4]. Firstly, the preference of fecundity may benefit from improved woman body size comparative to man size (woman-based SSD) [13] [1]. Secondly, there may be body size adjustments and morphology of animals where resources are limited and sexuality-specific violence occurs [14] [13] [4]. Thirdly, SSD may be chosen for sexual selection on either gender [15]. For example, in men of the genus as males competed for females intensely, male-male competition may favor large body sizes[15][14] [16].Therefore, large size may be desirable for males in polygamous animals [17][18]. As a final point, the specific benefit of body sizes might indeed depending on whether the competitions are taking place in the air or on the ground ([19][20].When men contest or show in the sky, the benefit may be small male[21][22][23],however for certain species where males present or compete on the surface, large size may be advantageous [24] [25] This process of selection can be strengthened through female selection (reviewed in Choe and Crespi, 1997; Thornhill and Alcock, 1983).

In our ideas Hyla savignyi's best appropriate for SSD interpretation is the first hypothesis (fecundity selection) in which higher female reproductive performance is linked in their larger body size compared to males.

Acknowledgments

We are grateful to the Iraqi Ministry of Education and the Directorate of Education in Dhi Qar province For their good cooperation . Thanks and appreciation to all workers in the Laboratory of Zoology at the University of Al-Razi / Kermanshah / Iran

Refrences

[1] M. Andersson, *Sexual selection*, vol. 72. Princeton University Press, 1994.

[2] C. D. Kelly, "Sexual size and shape dimorphism and allometric scaling patterns in head traits in the New Zealand common gecko Woodworthia maculatus," *Zoology*, 2015.

[3] N. Rastegar Pouyani, A. Fattahi, R. Karamiani, and M. Takesh, "Sexual Size Dimorphism in Hyla savignyi Audouin, 1827 (Anura: Hylidae) from Kermanshah Province, Western Iran," *Iran. J. Anim. Biosyst.*, vol. 11, no. 1, pp. 17–22, 2015.

[4] R. Shine, "Ecological causes for the evolution of sexual dimorphism: a review of the evidence," *Q. Rev. Biol.*, vol. 64, no. 4, pp. 419–461, 1989.

[5] D. K. Hews, "Examining hypotheses generated by field measures of sexual selection on male lizards, Uta palmeri," *Evolution (N. Y).*, vol. 44, no. 8, pp. 1956–1966, 1990.

[6] M. Olsson, R. Shine, E. Wapstra, B. Ujvari, and T. Madsen, "Sexual dimorphism in lizard body shape: the roles of sexual selection and fecundity selection," *Evolution (N. Y).*, vol. 56, no. 7, pp. 1538–1542, 2002.

[7] L. L. Woolbright, "Sexual selection and size dimorphism in anuran amphibia," *Am. Nat.*, vol. 121, no. 1, pp. 110–119, 1983.

[8] W. E. Cooper Jr and L. J. Vitt, "Sexual dimorphism of head and body size in an iguanid lizard: paradoxical results," *Am. Nat.*, vol. 133, no. 5, pp. 729–735, 1989.

[9] T. Puthal and G. Sahoo, "Sexual size and shape dimorphism in an agamid lizard Sitana Ponticeriana (Sauria: Agamidae)," *Adv. Zool. Bot.*, vol. 2, no. 1, pp. 15–20, 2014.

[10] J.-M. Monnet and M. I. Cherry, "Sexual size dimorphism in anurans."

[11] V. GVOŽDÍK, J. MORAVEC, and L. KRATOCHVÍL, "Geographic morphological variation in parapatric Western Palearctic tree frogs, Hyla arborea and Hyla savignyi: are related species similarly affected by climatic conditions?," *Biol. J. Linn. Soc.*, vol. 95, no. 3, pp. 539–556, 2008.

[12] W. U. Blanckenhorn, "Behavioral causes and consequences of sexual size dimorphism," *Ethology*, vol. 111, no. 11, pp. 977–1016, 2005.

[13] B. K. Sandercock, "What is the relative importance of sexual selection and ecological processes in the evolution of sexual size dimorphism in monogamous shorebirds?," *Bull. STUDY Gr.*, vol. 96, pp. 64–70, 2001.

[14] P. Lindenfors, T. Székely, and J. D. Reynolds, "Directional changes in sexual size dimorphism in shorebirds, gulls and alcids," *J. Evol. Biol.*, vol. 16, no. 5, pp. 930–938, 2003.

[15] G. Raihani, T. Székely, M. A. Serrano-Meneses, C. Pitra, and P. Goriup, "The influence of sexual selection and male agility on sexual size dimorphism in bustards (Otididae)," *Anim. Behav.*, vol. 71, no. 4, pp. 833–838, 2006.

[16] J. C. Mitani, J. Gros-Louis, and A. F. Richards, "Sexual dimorphism, the operational sex ratio, and the intensity of male competition in polygynous primates," *Am. Nat.*, vol. 147, no. 6, pp. 966–980, 1996.

[17] I. P. F. Owens and I. R. Hartley, "Sexual dimorphism in birds: why are there so many different forms of dimorphism?," *Proc. R. Soc. London. Ser. B Biol. Sci.*, vol. 265, no. 1394, pp. 397–407, 1998.

[18] T. H. Clutton-Brock, P. H. Harvey, and B. Rudder, "Sexual dimorphism, socionomic sex ratio and body weight in primates," *Nature*, vol. 269, no. 5631, pp. 797–800, 1977.

[19] J. R. Jehl and B. G. Murray, “The evolution of normal and reverse sexual size dimorphism in shorebirds and other birds,” in *Current ornithology*, Springer, 1986, pp. 1–86.

[20] R. B. Payne, “Sexual selection, lek and arena behavior, and sexual size dimorphism in birds,” *Ornithol. Monogr.*, no. 33, pp. iii--52, 1984.

[21] M.-A. Serrano-Meneses and T. Székely, “Sexual size dimorphism in seabirds: sexual selection, fecundity selection and differential niche-utilisation,” *Oikos*, vol. 113, no. 3, pp. 385–394, 2006.

[22] O. Berkat and M. Tazi, “Country pasture / forage resource profiles: Morocco,” *Fao*, pp. 6–28, 2006.

[23] M. ANDERSSON and R. Å. K. E. NORBERG, “Evolution of reversed sexual size dimorphism and role partitioning among predatory birds, with a size scaling of flight performance,” *Biol. J. Linn. Soc.*, vol. 15, no. 2, pp. 105–130, 1981.

[24] P. Lindenfors and B. S. Tullberg, “Phylogenetic analyses of primate size evolution: the consequences of sexual selection,” *Biol. J. Linn. Soc.*, vol. 64, no. 4, pp. 413–447, 1998.

[25] S. S. Anderson and M. A. Fedak, “Grey seal males: energetic and behavioural links between size and sexual success,” *Anim. Behav.*, vol. 33, no. 3, pp. 829–838, 1985.