

# Sex ratio, length weight relationships and condition of eight fish species collected from Narreri Lagoon, Badin, Sindh, Pakistan

## Abstract

Length weight relationship of eight species was calculated from Narreri lagoons. Samples were collected from August 2014 to June 2015 from trawling within the depth of 50m to 100m by gill net and trawl net. Four hundred and eighty-six specimens of eight species were selected to estimate the length weight relationship. *Acanthopagrus latus* (151), *Mystus gulio* (59), *Daysciaena albida* (83), *Brachirus orientalis* (28), *Lates calcarifer* (9), *Ellochelon vaigiensis* (106), *Mugil cephalus* (34) and *Sparidentax hasta* (16). The b value varied from 2.204 to 3.375. The growth of *Mystus gulio* (2.20) and *Lates calcarifer* (2.47) *Acanthopagrus latus* (2.92), *Brachirus orientalis* (2.92) and *Mugil cephalus* (2.93) showed negative allometry and *Daysciaena albida* (3.06), *Sparidentax hasta* (3.0) showed ideal isometric fish shape. *Ellochelon vaigiensis* (3.37) exhibited positive allometric growth. Minimum length of *Mugil cephalus* was stated first time in the present study (13.5cm TL). Regression coefficient (R<sup>2</sup>) estimated for eight species were between 0.84-0.994 showed strong LWRs. Condition factor (K) calculated between (0.46-2.66) for all species with lower (K=0.46) in *Acanthopagrus latus* and highest in *Mugil cephalus* (K=2.66) followed by *Bachirus orientalis* (K=2.44). The sex ratio for each species was also calculated. Present data contributes LWRs, sex ratios to the science and may be useful for management of species moving to the lagoons through tidal link in Badin.

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## Introduction

Badin is famous for swampy deltaic land and inconsistent flooding caused by two type of flood, one from melting of ice during summer and other from south west monsoon rain. Due to reducing flow of fresh water and erratic flooding, a person has no dependence on its own water source. The Narrerilagoon is a natural wetland, interconnected with Jabho, Pateji and Cholri wetlands and drain into a tidal link. This intrusion of sea water causes salinity and sedimentation in this lagoon. Being a dwindling natural resource, dramatic increase of fishing and threats of overcrowded area has been observed and there is a need to protect the natural resources as well as ecology of this site. The length weight relationship (LWR) are significantly applied to assess the fish stocks, condition and growth pattern of fish.<sup>1</sup> It also provides the condition of individual fish.<sup>2</sup> Fish condition show the food availability, maturity stages, environmental condition and age and gender.

## Materials and methods

Samples of eight fish species from Narreri lagoon of Badin (24° 39' 0" North, 68° 50' 0" East) collected at monthly basis from August 2014 to July 2015. The data of four hundred and eighty-six individuals of eight species caught by trawl and gill net. All species were identified by using valid relevant book (Fischer and Bianchi, 1983). Further latest species information was validated from the fish base. Body weight was measured in digital scale to the nearest 0.01gm and total length was measured in fish measuring board to the nearest 0.01cm. Sex ratios and chi square test calculated and presented in table 1. Length weight relationship was calculated by transforming TL and BW to natural log [3]  $\log(W) = \log(a) + b \log(L)$ . W) Obtained b value were confirmed for significant difference by using t-test as  $t = (b-3) / (S.E(b))$  where t is t statistics, S.E (b) Standard error of b obtained from linear regression. Fulton's condition factor was calculated for eight

species by using [3] formula  $K = (100 * W) / L^3$  where W is the body weight of fish in g and L is the total length of fish in cm.

## Results

A total of four hundred and eighty-six individuals were taken for length weight estimation. Seven species belongs to Sparidae, Bagridae, Sciaenidae, Latidae and Mugilidae. Parameters of b was estimated within the range of 2.5-3.5 (Froese, 2006) exhibited availability of favorable environmental condition and all species following of cube law.<sup>3</sup> LWRs of all species were first time presented from Narreri lagoon of Badin which will be useful for the fishery managers of Narrerilagoons.

Highest individuals of *Acanthopagrus latus* (151) and *Ellochelon vaigiensis* (106) were recorded followed by *Daysciaena albida* (83) (Table 1). Chi square test was tested against male and female of each species and found significantly different for *Sparidentax hasta* (X<sup>2</sup> = 0.85). *Lates calcarifer* and *Mugil cephalus* were female dominated, male was dominated in others. Condition factor (K) were in the range of 0.46-2.66. *Acanthopagrus latus* found in poor condition (K=0.46) whereas, *Mugil cephalus* (K=2.66) followed by *Bachirus orientalis* (K=2.44) observed with good condition in Narrerilagoon.

The (LWRs) was analyzed to check the growth as shown in Table 2. The b value varied from 2.204 to 3.375. The growth of *Mystus gulio* (2.20) and *Lates calcarifer* (2.47) experiencing negative allometry. *Acanthopagrus latus* (2.92), *Brachirus orientalis* (2.92) and *Mugil cephalus* (2.93) showed slightly negative allometry and *Daysciaena albida* (3.06), *Sparidentax hasta* (3.0) showed ideal fish shape. *Ellochelon vaigiensis* (3.37) exhibited positive allometric growth in the present study from Narreri lagoon of Badin. Regression coefficient (R<sup>2</sup>) were in the range of 0.84-0.994 showed strong correlation between length and weight.

Minimum and maximum lengths were within range of 10.2-58cm TL. Body weight within the range of 13.7-2630g. Mean length (36.79) and weight (764) of *Sparidentax hasta* was higher than other seven species. Lowest mean length of *Acanthopagrus latus* (14.7) and mean weight *Mystus gulio* (37.63) were recorded in the present study (Table

3). Our results compare with previously reported estimations and lie within the total length range of all species except *Mugil cephalus*. Minimum length of *Mugil cephalus* was first time reported in the present study (13.5cm TL) when compared with other work done by Zubia<sup>4</sup> (Table 3 & 4).

**Table 1** Sex ratio estimated for eight species collected from Narreri lagoon of Badin

Family name	Species name	F	M	Total	F/M	X <sup>2</sup>	K
Sparidae	<i>Acanthopagrus latus</i> (Houttuyn, 1782)	62	89	151	0.7	0.01	0.46
	<i>Sparidentax hasta</i> (Valenciennes, 1830)	2	14	16	0.14	0.85	1.53
Bagridae	<i>Mystus gulio</i> (Hamilton, 1822)	25	34	59	0.74	0.03	1.04
Sciaenidae	<i>Daysciaena albida</i> (Cuvier, 1830)	33	50	83	0.66	0.04	1.31
Soleidae	<i>Brachirus orientalis</i> (Bloch & Schneider, 1801)	13	15	28	0.87	0.04	2.44
Latidae	<i>Lates calcarifer</i> (Bloch, 1790)	8	1	9	8	0.04	1.69
	<i>Ellochelon vaigiensis</i> (Quoy & Gaimard, 1825)	60	106	0.77	0.24	1.46	
Mugilidae	<i>Mugil cephalus</i> (Linnaeus, 1758)	22	12	34	1.83	0.31	2.66

F: Female; M: Male; X<sup>2</sup> = Chi square test; K: Condition Factor

**Table 2** Length weight parameters estimated for eight species collected from Narrerilagoon of Badin

Species name	a	CI95% A	b	CI95% b	R <sup>2</sup>	T-Test (B=3)
<i>Acanthopagrus latus</i>	0.023	-4.400--3.079	2.926	2.682-3.171	0.91	-0.339
<i>Mystus gulio</i>	0.11	-2.910--1.915	2.204	2.021-2.386	0.911	-8.728
<i>Daysciaena albida</i>	0.008	-5.351--4.261	3.069	2.908-3.230	0.947	0.853
<i>Brachirus orientalis</i>	0.019	-4.385--3.489	2.927	2.769-3.086	0.982	-0.949
<i>Lates calcarifer</i>	0.091	-2.977--1.797	2.478	2.306-2.649	0.994	-7.21
<i>Ellochelon vaigiensis</i>	0.005	-6.147--4.442	3.375	3.063-3.687	0.84	2.451
<i>Mugil cephalus</i>	0.014	-4.569--3.870	2.931	2.814-3.047	0.987	-0.07
<i>Sparidentax hasta</i>	0.013	-5.253--3.403	3.001	2.744-3.259	0.98	0.008

a: intercept; b, Slope; a and b are constant. R<sub>2</sub>: Coefficient of determination; K: condition factor.

**Table 3** Length (TL) and body weight (BW) along with mean and standard deviation calculated for eight species

Species name	Common name	TL Min-Max	Mean ± SD	BW Min-Max	Mean ± SD
<i>Acanthopagrus latus</i>	Yellowfin seabream	11.5-17.7	14.71±1.301	27.18-133.1	65.69±17.63
<i>Mystus gulio</i>	Long whisker cat fish	10.7-20.7	15.37±1.951	19-70.7	37.63±11.29
<i>Daysciaena albida</i>	Bengal corvine	13-47	30.27±8.362	32-1100	363.9±276.1
<i>Brachirus orientalis</i>	Oriental sole	10.2-38	17.85±7.72	13.7-600	139.4±173.82
<i>Lates calcarifer</i>	Barramundi	20-42	32.27±9.038	172.16-1020	568.4±325.6
<i>Ellochelon vaigiensis</i>	Squaretail mullet	11.8-19.6	15.45±1.745	20-130	55.07±22.51
<i>Mugil cephalus</i>	Flathead grey mullet	13.5-56.6	21.59±12.67	29.8-2060	268.3±538.9
<i>Sparidentax hasta</i>	Sobaity seabream	26.7-58	36.79±8.31	260-2630	764±607.11

TL: Total Length; BW: Body Weight; Min: Minimum; Max: Maximum; SD: Standard Deviation

**Table 4** Length weight parameters of previously reported species from different location

References	Location	N	Length Type	Sex	Length	B	R <sup>2</sup>		
Panda, Karna, Mukherjee, & Manna et al., <sup>6</sup>	Chilka lagoon, India	66		M	9.4-7.7	3.18	0.2		
		212		F	9.2-1.5	3	0.9		
		341		U	8.5-1.5	3.11	0.92		
<i>Mystus gulio</i>	Rupsha River, Bangladesh	59	TL	Pooled	7.4-7.2	3.11	0.96		
			FL			3.03	0.95		
			SL			3.1	0.95		
Panda, Karna, Mukherjee, & Manna et al., <sup>6</sup>	Chilka lagoon, India	103	TL	M	12.3-58	2.95	0.96		
		236	TL	F	13.3-63	3.01	0.98		
			TL	U	3.7-68.5	3.06	0.99		
<i>Daysciaena albida</i>		62	TL	U	2.4-101.0	2.917			
		Karna, Sahoo, & Panda, <sup>8</sup>	Chilka lagoon, India	66	TL	M	20.1-53.4	2.683	0.98
				128	TL	F	19.7-50.6	2.661	0.96
<i>Lates calcarifer</i>	Zubia, Rehana, Muhammad, Omer, et al., <sup>4</sup>	36		B	19.7-53.4	2.669	0.98		
				Mixed	20-37.8	36.4	0.93		
<i>Mugil cephalus</i>				F	20-36.8	33.2	0.94		
				M	21.7-37.8	39.8	0.92		

## Discussion

In the present study, coefficient of regression showed significant relation ( $R^2 = 0.840-0.987$ ) between length and weight relations. The regression constant (b) values lie between the ranges of (2.204 to 3.375). Fish with b value less than 3 consumed more of its energy in axial growth rather than weight<sup>5</sup> *Mystus gulio*, *Lates calcarifer*, *Acanthopagrus latus*, *Brachirus orientalis* and *Mugil cephalus* showed negative allometry in Narreri lagoon. According to Panda et al.<sup>6</sup> *Mystus gulio* display isometric and slight positive allometric growth in Chilka lagoons. Same findings were reported from Rupusha River, Bangladesh by.<sup>7</sup> The b value of *Daysciaena albida* was within the range given by Panda et al.<sup>6</sup> The b value of *Lates calcarifer* were close to the finding of<sup>8</sup> from Chilka lagoon. From our studies, we can conclude that for *Mystus gulio*, the condition of Narreri lagoon was not favorable and also showing low condition factor when compared with Chilka lagoon of India.<sup>9</sup> Also emphasized on b value and notice higher value in adult than juvenile. Froese (2006) also suggested that adult individuals were thicker than juvenile. The condition factor assessment also showed difference among different area and species. High condition factor may be due to favorable environmental while low value showed unfavorable condition.<sup>10</sup> *Ellochelon vaigensis*, *Daysciaena albida* and *Sparidentax hastata* display b value greater than 3 suggested that these fishes grow more in height and width than in length Froese (2006).<sup>11</sup>

## Acknowledgments

None.

## Conflicts of interest

None.

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