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Preliminary study of dietary interaction between larvae of *Tilapia zilii* and larvae of *Liza abu* in East Hammar marsh.

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Abstract

Food composition of *Tilapia zilii* and *Liza abu* larvae in East Hammar marsh has been studied during January 2014 to December 2014. The diet of these larvae were consist mainly of Cladocera(*Daphnia spp*), Copepod (including adult and larval stages), Rotifer , Diatom and detritus. Feeding activities was high for *T. zilii* and *L.* abu (100%), also Feeding Intensity which was high for *L. abu* (21.84 point/larvae) comparing with *T. zilii* (19.76 point/larvae). According to the Index of Relative Importance (IRI), the diet of *T. zilii* and *L. abu* larvae dominated by Cladocera(*Daphnia spp*) (IRI= 25%, 30%). The highest diet overlap was recorded for detritus 91% being the most consumed item in larvae studied. Total diet overlap among larvae of *T. zilii* and *L. abu* was high (88%). Competition for food is possible, direct competition seemed to be avoided to some extent as a result of great food availability in East Hammar marsh which makes it as a suitable spawning, shelter, nursery and feeding site for many fish.

Introduction

The study of food and feeding habits of fishes is a continuous exercise because if provides information for successful fisheries Management, However, knowledge of diet and feeding ecology of fish larvae is necessary to understand the role of diet and food availability in regulating growth , survival, and ultimate recruitment (Voss, 2009), also feeding is one of the most important biological factors and its abundance and variety influence the structure and composition of fish populations (Aranha *et al.*, 2000).

T. zillii and *Liza abu* are among the most abundant species in Shatt Al-Arab River. *T. zillii* is highly euryhaline can tolerate a wide range of salinity (El-Sayed,2006). It has been introduced in many countries including Ethiopia, Eritrea, Madagascar, Tanzania, Hawaii , Japan, Philippines, Singapore and United States of America (Negassa and Getahun, 2004). Ellewi (2007) recorded *T. zillii* at Al-Musayyib on the Euphrates river in Iraq, and Mutlak and Al-Faisal (2009) founded two species (*T. zillii* and *O. aureus*) from south of the main outfall drain in Basrah city, while *Liza abu* is a mugilid species and in habits Asia: Iraq, Syria, Pakistan and Turkey (Beckman ,1962; Mahdi, 1967; Coad,1980; Turan *et al.*,2004). *L. abu* is one of the most important commercial fish in Southern Iraq. The species remains in freshwaters (Beckman, 1962; Naama *et al.*, 1986) but it has also been recorded in Iraqi brackish water and from the Khawr-Alzubeir (North-west of the Arabian Gulf) in a marine environment (Nasir and Naama, 1988).

The study of dietary interaction between fish larvae are limited to that of the Al-Okailee (2010) studied the spatial and seasonal composition of some ichthyoplankton and trophic relationships in north part of Shatt Al-Arab River. Nothing is known about the diet of larval stage of *T. zillii* was done.

The aim of this study is to analyze diet composition and dietary overlap, between larvae of *Tilapia zillii* and larvae of *Liza abu* in East Hammar marsh.

Material and methods

Monthly samples of fish larvae were collected from East Hammar marsh (Fig. 1), during the period from January 2014 to December 2014.

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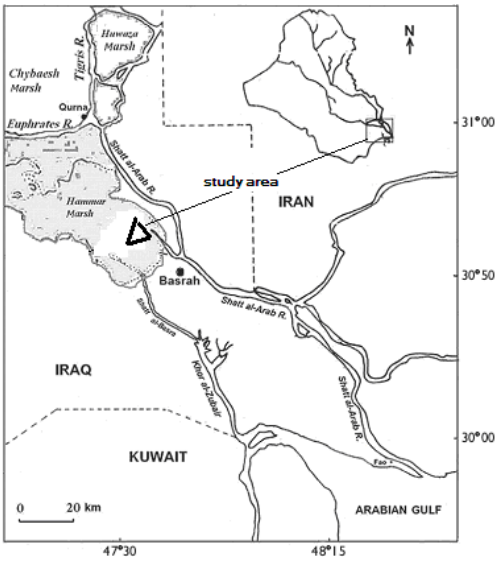

Figure 1. Map of southern of Iraq, showing the location of Al-Hammar Marsh.

Sampling was conducted by using conical net, length 1.25m and equipped with a flow-meter, the conical nets has opening diameter 50cm with mesh sizes 500µ. Oblique was conducted at a speed of 0.5 m/s for approximately 10 minutes from near the bottom to the surface (Robinson *et al*., 1996). Samples were preserved in 10% formalin. Surface water temperature was measured by simple thermometer, and salinity by instrument of YASI 556MPS.

In the laboratory, identification of *T. zilii* and *L. abu* larvae from other species was done using dissecting microscope (Omatosh,1988 ; Daniel, 1983).

The specimen was then cut open and the entire digestive tract was removed, and allotted points for fullness according to Hyslop(1980) stomach fullness was estimated on a 0-20 points scale Thus 0, 5, 10, 15 and 20 points were allotted to: empty, ¼ full, ½ full, ¾ full and fully stomach respectively. The presence of each food item was presented by a percentage by weighted points (P %), calculated from the sum of points given for each food item divided by the total number of points. Estimation of the occurrence of the different food organisms in each specimen was presented by the percentage occurrence (O %) calculated from the number of guts which contain the organism in question out of the total number of larvae examined(Hyslop,1980) this index represents population's wide food habits.

The gut contents were identified under dissecting microscope consulting Edmondson (1959) and Hadi *et al*., (1984). Feeding activity and feeding intensity for each monthly sample were calculated after Dipper *et al*., (1977) and Gordon (1977) respectively.

Diet for each class was analyzed as an index of relative importance

(IRI). The index was calculated according to the formula of Stergion (1988) as follow:

$$IRI\ \% = P\ \% \times O\ \%$$

where, P % is percentage of total points for each food item and O % is percentage of occurrence for each food item.

To calculate food niche breadth in each species, the Shannon-weaver Index (H) was used (Shannon and Weaver, 1949).

$$H' = -\sum Pi \ln Pi$$

Diet overlaps between fish larvae were calculated according to

Schoener's index (Schoener, 1968):

$$\text{Diet overlap } \% = \left(1 - \sum |Xi - Yi| / Xi + Yi\right) \times 100$$

Xi and Yi = the proportion of each food category in the gut of species X and Y.

Results

Tilapia zillii and *Liza abu* larvae were found in the study region during three months of the year, from April to June. The total number of *Tilapia zillii* and *Liza abu* larvae (43,76 larvae respectively) that were identified**.** The length of *Tilapia zillii* larvae ranged from 11-17mm, while *Liza abu* larvae 6.5-19 mm.

Food composition

A total of 119 larval fishes of two species (*T. zilii* and *L. abu*) was used for diet analyses (Table 1). six prey items were found in the gut of *T. zilii* and *L. abu*. The diet of larvae studied consists of Cladocera(*Daphnia spp*)was the main prey item found, Copepod (including adult and larval stages), Rotifer followed by Diatom, also detritus was found in the gut of larvae of *T. zilii* and *L. abu.*

Table (1) illustrates feeding activities was high for *T. zilii* (100%) and *L.* abu (100%), also Feeding Intensity which was high for *L. abu* (21.84 point/larvae) comparing with *T. zilii* (19.76 point/larvae).

Table1: Percentage of the food items calculated according to occurrence and point methods in gut of *Tilapia zilii* and *Liza abu* larvae.

	Tilapia zilii **TL.= 11-17mm**		***Liza abu*** **TL=6.5-19 mm**	
Food items	**O%**	**P%**	**O%**	**P%**
Cladocera(*Daphnia spp*)	**25**	**100**	**30**	**100**
copepods nauplii	**15**	**100**	**10**	**95**
Copepoda	**20**	**100**	**22**	**95**
Rotifer	**15**	**90**	**10**	**80**
Diatoms	**15**	**100**	**20**	**100**
Detritus	**10**	**100**	**8**	**100**
Number of stomach analysis	**43**		**76**	
Feeding activity%	**100**		**100**	
Feeding Intensity	**19.76**		**21.84**	

According to the Index of Relative Importance (IRI), the diet of *T. zilii* larvae consisted of Cladocera(*Daphnia spp*) (IRI= 25%), copepods nauplii (IRI= 15%),copepod (IRI= 20%), Rotifer (IRI= 15%), diatoms (IRI= 15%) then Detritus with IRI=10 (Fig. 2). The diet of *L. abu* larvae consisted of Cladocera(*Daphnia spp*) (IRI= 30%), copepods nauplii (IRI = 10%),copepod (IRI= 22%), Rotifer (IRI= 10%), diatoms (IRI= 20%). Detritus was also found with IRI=8 (Fig. 2).

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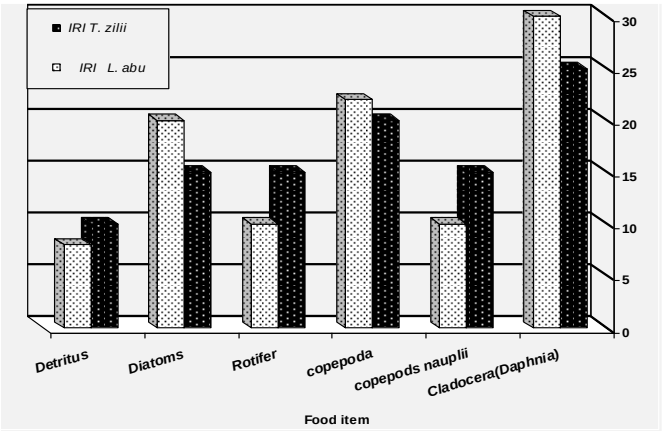

Figure(2) Index of relative Importance (IRI %) of food items in the gut of *Tilapia zillii* and *Liza abu* larvae from East Hammar marsh.

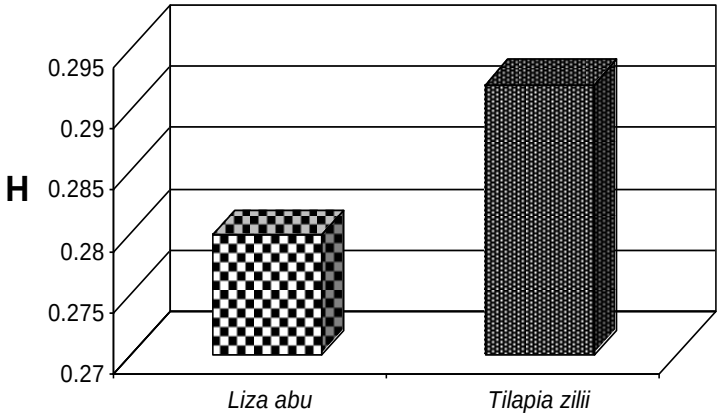

Figure 3. Food diversity (H) for food items in the gut of of *Tilapia zillii* and *Liza abu* larvae from East Hammar marsh.

Figure (3) shows the trophic diversity, as *T. zilii* larvae have the trophic diversity (H=0.292), then *L. abu* larvae (H=0.279).

Diet overlap

The diet overlap between *T. zilii* and *L. abu* larvae are listed in Table 2. It shows percentage diet overlap values ranged from 72.5% to 91% . The highest diet overlap was recorded for detritus 91% being the most consumed item in larvae studied, while lowest was recorded for Cladocera(*Daphnia spp*) (72.5%). Total diet overlap values among larvae of *T. zilii* and *L. abu* was (88%).

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Table 2: Food overlap between *Tilapia zilii* and *Liza abu* larvae in East Hammar marsh.

Food item	Foodoverlap
	Tilapia zilii* - *Liza abu
Cladocera(Daphnia)	**72.5**
copepods nauplii	**87.5**
copepoda	**79**
Rotifer	**87.5**
Diatoms	**82.5**
Detritus	**91**

Discussion

The diet analysis of fishes allows us to understand their feeding strategy, their intra-or interspecific potential interaction (competition and predation) and indirectly indicate community energy flow (Ramirez-Luna *et al*.,2008).

No data on *T. zillii* larvae diet is available. Nevertheless, Various authors have studied the food and feeding habits of *T. zillii* in the middle east and Africa, and reported that food of adult and juvenal species covers a wide spectrum consumed a great variety of items preys from animal and plant origin(Fagade and Olaniyan, 1973; Akinuwmi,2003; Negassa and Padanillay 2008; Dadebo *et al*.2014).

Analysis of stomach contents during this study indicated that *T. zillii* and *L. abu* larvae fed on a variety of food categories including Cladocera(*Daphnia spp*), copepods nauplii,copepod , Rotifer, diatoms and Detritus. This is in agreement with the findings of *L. abu* larvae of Al-Okailee (2010) in north part of Shatt Al-Arab River, but no rotifers were eaten. The dominance of this food item in gut of *T. zillii* and *L. abu* larvae examined, may be due to the dominance of this phytoplankton and zooplankton in East Hammar marsh (Sodani *et al*., 2007), or due to its suitable size and shape. The wide variety of items occurring in the stomachs of *T. zillii* (6 items) and *L. abu* (6 items) is an indication that there are non selective in feeding.

Although some of zooplankton and phytoplankton were found in a high density in the plankton samples collected, this food item was not recorded in any gut examined, which means that larvae *T.zillii* and *L. abu* do not eat it.

The zooplankton (Cladocera *Daphnia*, copepods adult , nauplii and Rotifer)the majority of the diet of *T. zillii* and *L. abu* larvae, however, phytoplankton (Diatoms)was less important, which have a high food value as a protein source of fish larvae and is easily digestible comparing with plant source food (Kajmunke *et al*., 2002; Contente *et al*., 2009).

This study showed that the larvae of *T. zillii* and *L. abu* usually

having higher feeding activity indicated that the highest amounts of food for both species were consumed, fed mostly upon a variety of prey, mostly are generalized feeders, which has been shown from high diversity index of food items.

Diet overlap Average between 25 % and 75 % was considered

moderate while values exceeding 75 % indicating substantial overlap

(Pedersen, 1999). Diet overlap between *T. zillii* and *L. abu* is high (88%). This may be related to apparent similarities in their dietary spectrum. It is well known that species encounter strong competitor may exercise obvious qualitative or quantitative shift in dietary requirements or may expand their local distribution to avoid serious circumstances otherwise they may undergo serious decline in population density (Schoenher,1981).

the diet overlap between the two larval species does not necessarily lead to food competition due to the availability of food in the marsh area, which is seen from high primary productivity (Richardson *et al*., 2005). The same result was recorded by Al-Okailee (2010) for C. *carpio* and *C. auratus*. larvae in north part of Shatt

Al-Arab River, as these larvae share a wide range of prey types, but with no direct competition.

We conclude the present study the greatest availability of zooplankton and phytoplankton in East Hammar marsh reduce the potential for competition and plays a role as a spawning, shelter, feeding and nursery ground for fish larvae .

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