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Food and Feeding Habits of Common Carp (*Cyprinus carpio*) Larvae and Juveniles in Earthen Ponds

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Abstract: Food and feeding habits of common carp (*Cyprinus carpio*) larvae and juveniles were studied in earthen ponds of Marine Science Centre Fish Farm. Total length and mouth width of fish were measured aid of dissecting microscope, while digestive canal contents and fullness degree were inspected aid of compound microscope. Water temperature was between 22-24 °C, whereas salinity was 4 PSU. Results are showed high correlation (0.98) between fish length and mouth width, where mouth width was increased with increasing of fish length. Feeding intensity and activity were 13.98 and 88% respectively, whereas important relative indexes were 3731, 2559, 2263 and 1 for artificial feed, algae, diatoms and copepods respectively. Results appeared that digestive canal of fish less than 25 ml length was undifferentiated straight pipe while in fish more than 25 mm length was curved pipe. Five genere of algae (*Chlorella, Oscillatoria Rhizosolina, Spirogyra* and *Ulothrix*) were detected in the alimentary canal of fish.

Key words: Fish, Common carp, food, feeding, earthen ponds.

Introduction

Larvae life is a transition period from newly hatched larvae that feeding only on yolk globule for 2-3 days to swimming larvae which can feed on and digest live preys. In nature the survival and success of larvae depend on food availability and escaping from predators, so only few larvae can survive. Under cultural conditions, the success rate of fish larvae is high due to regulated food supply and absence of predators, but even under such conditions the mortality rate is high and can varied between batches [20]. Alikunhi, [2] stated that fish larvae are characterized by digestive systems and diets that differ from adults and larvae which undergo a pattern of trophic ontogeny, changed the diet with increasing the size, and these changes caused differences in digestive requirements.

Fish compositions of inland waters depend on environmental and biological factors. Biological factors include interaction between different species, such as, predation and competition for food and place. Environmental factors include water temperature, salinity, pH, transparency, turbidity…etc. Morais and Morais [15] noticed that fish composition in different ecosystems affected directly and indirectly by environmental parametres, for example, composition of fish larvae and young fish changed from year to year according to water salinity. Lee *et al*. [12] stated that

temperature is the most important environmental factor that affects presence and abundance of fish larvae.

Feeding relationships of fish population differ greatly, depending on species adaptations, different stages of life cycle and biological relationships between species such as predation [17]. Environmental factors affect food and feeding habits of fish, for example, seasonal changes in temperature lead to blooming of phytoplankton and algae, then increasing zooplankton which consider an important food for many fishes especially at early life, in addition to that, food quality and quantity play an important role in feeding relationships among species [19; 9; 4].

There are rare studies on feeding relationships between different larvae species, except that of Ahmed [1] on larvae feeding relationships of three cyprinid fish species in Al-Huwaiza Marsh, Southern Iraq, and Al-Okailee [3] on ecological indices and trophic relationships of fish eggs and larvae in north part of Shatt Al-Arab River. Some researchers studied feeding habits of fish juveniles, such as Younis [24] who investigated the occurrence and food habits of *Liza carinata* (=*Planiliza carinata*) in Shatt Al-Arab River at Basrah, and the study of Younis *et al*. [25] on food and diet overlap of small fish assemblage in the upper reaches of Shatt Al-Arab River.

Materials and Methods

Common carp (*Cyprinus carpio*) larvae and juveniles were collected by small seine net (Mesh size less than 1 mm) from earthen ponds of Marine Science Centre Fish Farm. These fish were hatched artificially in Marine Science Centre Fish Hatchery and released in earthen pond that fertilized by organic fertilizers. Water temperature and salinity measured by digital tool. Collected fishes were transferred to the laboratory in Fisheries and Marine Resources Department, College of Agriculture, and preserved in 7% formalin. Laboratory work involved measurements of total length and mouth width of fish using dissecting microscope (plates, 1 and 2). Fish intestines were examined by a compound microscope, and fullness degree determined according to [21], where there were six points from 0 that refer to empty intestine to 25 that refer to completely filled intestine. Food habits were studied by frequency and points methods according to [11]. Food contents were classified according to [10]. Feeding intensity was calculated following the equation of [6]:

Feeding Intensity = $\sum$ of fullness degree/ Number of fed fish

Feeding activity was calculated according to the following equation of [7]:

Feeding Activity = (Number of fed fish /Number of examined fish) × 100

Index of relative importance (IRI) was calculated according to the following equation of [22]:

$IRI = C_w \times F$

where C_w is the portion of each type of food and F is frequency of this type in the intestines.

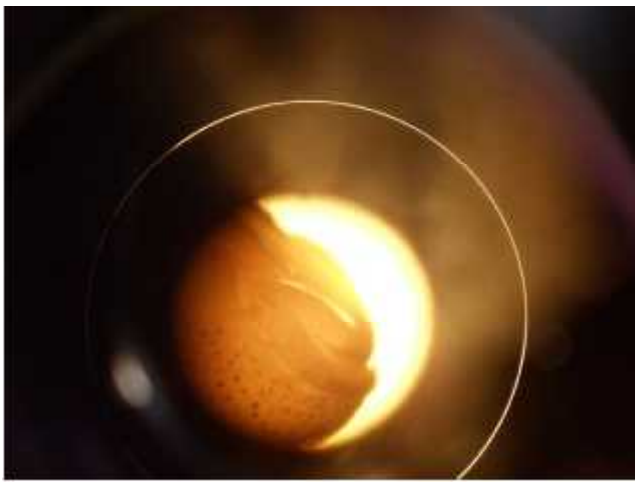

Plate (1): Measuring of total length under dissecting microscope.

Plate (2): Measuring of mouth width under dissecting microscope.

Results

Water temperature was between 22-24 °C during the sampling period, whereas salinity was 4 PSU. Table (1) show the data of 99 common carp larvae and juveniles collected from earthen ponds. Data involved total length, mouth width, fullness degree, ratio and frequency of food contents. It is clear to notice a high significant correlation (0.98) between total length and mouth width, where mouth width increased with increasing total length. Results showed that feeding intensity and activity were 13.98 and 88% respectively, and indices of relative importance were 3731, 2559, 2263 and 1 for artificial food, algae, diatom and copepods respectively.

Plate (3): Circulating intestine of common carp juveniles.

Table (1): Measuring and inspecting data of common carp larvae and juveniles.

Length Group (mm)	Fish No.	Total Length (mm)	Mouth Width	Fullness degree	Ratio of food contents				Frequency of food contents			
					Artif. food	Algae	Diatom	Copepods	Artif. food	Algae	Diatom	Copepods
10-19	10	14.6	1.4	12	45	25	28.75	1.25	75	75	75	25
20-29	32	23.4	1.8	12.5	46.4	24.6	27.1	1.9	100	79	79	7
30-39	42	33.2	2.9	11	34.4	35.7	29.9	0	83	94	72	0
40-49	14	42.1	3.4	15	41.5	31.5	27	0	100	71	86	0
60-70	1	60	6	20	15	25	60	0	100	100	100	0

The alimentary canal of fish less than 25 mm total length was appeared undifferentiated straight pipe to some extent while in fish more than 25 mm was circulated pipe (Plate, 3). Five genera of algae were identified in the alimentary canals of common carp included *Chlorella Rhizosolina*, *Spirogera*, *Oscillatoria* and *Ulothrix*.

Discussion

It is well known that fish larvae feed on yolk sac after hatching, then shift to free feeding mostly on phytoplankton and diatoms. After 2-3 weeks from hatching mouth width increased and larvae can fed on zooplankton. This study revealed high correlation between larvae length and mouth width, which was increased with increasing fish length. Larvae of common carp started free feeding after short time (less than 48 hours) [8; 23], whereas larvae of Beni

Barbus sharpeyi (=*Mesopotamichthys sharpeyi*) started free feeding after 70 hours and larvae of 4.7 mm length began free

movement with the help of water movement and feed on diatoms, whereas larvae of 9.35 mm fed on rotifers then changed their food to zooplankton [16]. [14] stated that grass carp (*Ctenopharyngodon idella*) started to feed on phytoplankton and zooplankton at early life stage then after few days shifted to feed on large zooplankton. [5] stated that Prussian carp (*Carassius auratus*) had a wide feeding range, where at early stages feed on phytoplankton and later feeding on aquatic insects, crustacean, snails, worms, detritus, filament algae, and small fishes. [13] stated that active feeding of sharpsnout sea bream (*Diplodus puntazzo*) began in 50% of larvae at four days of hatching (DAH), although permanence of yolk reserves until seven DAH suggests a period of both endogenous and exogenous feeding. [18] stated that larvae of ide (*Leuciscus idus*) started free feeding after two days from hatching.

This study pointed out that feeding intensity of common carp larvae and juveniles was 13.98 and feeding activity 88%, and this may be attributed to water temperature (24 °C) that close to optimum water temperature of common carp. Feeding activity recorded at present study was less than the value (100%) recorded by [3] for common carp and Prussian carp in Al-Huwaiza Marsh, but it was higher than feeding activity (64%) recorded for long seminan (*Alburnus mossulensis*). The same was found about feeding intensity which was higher in Al-Huwaiza Marsh (20, 20.5 and 17.7 for common carp, Prussian carp and long seminan respectively) than feeding intensity of present study. Al-Okailee [3] recorded higher feeding intensity (20) in north part of Shatt Al-Arab River for common carp larvae during February, March and May 2008 and 2009, with lower value (16.3) during April, while feeding activity was 100% for all months of sampling. Feeding intensity for Prussian carp larvae cached from north part of Shatt Al-Arab River ranged between 15.01 at April 2009 and 20 at May 2008, while feeding activity was 100% for all months of sampling [3].

During current study four foods (artificial food, algae, diatoms and copepods) were recorded in the digestive canal of common carp larvae and juveniles. Index of relative importance were 3731, 2559 and 2263 for artificial food, algae and diatoms respectively, while less important was copepods that recorded in the intestines of two larvae only. Artificial food more important (about 40% of total food) because it was available in ponds that fed daily by labours, while algae consist 30.4% of total food, diatoms about 29.3% of total food and copepods only 0.3% of total food. During this study phytoplankton is very important in the food of carp larvae in comparison with zooplankton even in juveniles, this result may be attributed to low population of zooplankton in earthen ponds of Marine Science Centre because of bad water quality resulted from absent of recirculation of water in ponds. Al-Okailee [3] recorded four food items for common carp larvae, six food items for Prussian carp larvae and five food items for long seminan larvae in north part of Shatt Al-Arab River, where copepods was the main food for larvae of all above

species, followed by *Daphnia*, rotifers and aquatic insects. It is cleared that current results differ mostly from the results of Al-Huwaiza Marsh, and this results may be attributed to differences in these two ecosystems and followed with differences in water quality. Ahmed [1] recorded four food items in diet of common carp larvae (3-20 mm) and Prussian carp larvae (4-23 mm), where diatoms and detritus are the main foods, followed by algae and copepods.

References

[1] Ahmed, S. M. (2011). Note on feeding relationships of three species of cyprinid fish larvae in Al-Huwaiza marsh, Southern Iraq. Mesopot. J. Mar. Sci., 26 (1): 35-46.

[2] Alikunhi, K. F. (1958). Observation on feeding habits of young carp fry. Indian J. Fish., 5: 65-106.

[3] Al-Okailee, M. T. K. (2010). Ecological indices and trophic relationships of fish eggs and larvae in north part of Shatt Al-Arab River. Ph. D. Thesis, Univ. Basrah, Coll. Agriculture. 212 pp. (In Arabic).

[4] Bhyiyan, A. S.; Afroz, S. and Zaman, T.(2006). Food and feeding habit of the juvenile and adult snakehead, *Channa punctatus* (Bloch). J. Life Earth Sci., 1(2): 53-54.

[5] Coad, B. W. (2010). Freshwater fishes of Iraq. 1st ed. Pensoft Pub., 247 pp.

[6] Dipper, F.; Bridges, C. and Menz, A. (1977). Age, growth and feeding in the ballan wrasse (*Labrus bergyta* Ascanius, 1767). J. Fish Biol.,11: 105-120.

[7] Gordan, J. D. (1977). The fish population in shore water of the west costal Scotland. The food and feeding of the whiting (*Merlanguis merlanguis* L.). J. Fish Biol., 11(6): 513-529.

[8] Govoni, J. J.; Boehlert, G.W. and Watanabe, Y. (1968). The physiology of digestion in fish larvae. Environ. Biol. Fish., 16: 59-77.

[9] Hurst, T. P. and Conover, D. O. (2001). Diet and consumption rates of over wintering YOY striped bass, *Morone saxatilis*, in the Hudson River. Fish. Bull., 99: 545-553.

[10] Hadi, R.; Al-Saboonchi, A. A. and Yousuf Haroon, A. K. (1984). Diatoms of the Shatt Al-Arab River, Iraq. Nova Hedwigia Band Braunschweig J., 39: 513- 557.

[11] Hynes, H. B. N. (1950). The food of freshwater sticklebacks (*Gasterosteus aculeatus*) and (*Pygosteus pungitius*) with a review of methods used in studies of food of fishes. J. Anim.Ecol., 19: 36-58.

[12] Lee, M. A; Lee, K. T. and Shiah, G.Y. (1995). Environmental factors associated with the formation of larvae anchovy fishing grounds in the coastal water of south west Taiwan. Mar. Biol. (Berlin), 121: 621-625.

[13] Micale, V.; Di Giancamillo, A.; Domeneghini, C. ; Mylonas, C. C.; Nomikos, N.; Papadakis, I. E. and Muglia, U. (2008). Ontogeny of the digestive tract in sharpsnout sea bream *Diplodus puntazzo* (Cetti, 1777). Histol. Histopathol., 23: 1077-1091.

[14] Mojer, A. M. (2010). Assessment of descriptive and productive characters of hybrid from females *Carassius auratus* L., 1758 with males *Ctenopharyngodon idella* Val.,1844. M. Sc. Thesis, Univ. Basrah. 127pp. (In Arabic).

[15] Morais, A.T. and Morais, L. T. (1994). The abundance and diversity of larval and juvenile fish in a tropical estuary. Estuaries, 17: 216-225.

[16] Mukhaysin, A. A. and Jawad, L. A. (2012). Larval development of the cyprinid fish *Barbus*

sharpeyi (Gunther, 1874). J. Fish. Aqu. Sci., 7(5): 307-319.

[17] Oscoz, J.; Leuda, P. M.; Miranda, R. and Escala, M. C. (2006). Summer feeding relationship of the co- occurring *Phoxinus phoxinus* and *Gobio lozanoi* (Cyprinidae) in an Iberion river. Folia. Zool., 55(4): 418- 432.

[18] Ostaszewska,T.; Wegner, A. and Wêgiel, M. (2003). Development of the digestive tract of Ide *Leuciscus idus* (L.) during the larval stage. Archives of Polish Fisheries, 11(2): 181- 195.

[19] Parra, G. and Yufera, M. (2001). Comparative energetics during early development of two marine fish species, *Solea senegalensis* (Kaup) and *Sparus aurata* L. J. Exp. Biol., 204: 2175-2218.

[20] Research Council of Norway (RCN)(2009).The fish larvae: a transition life form, the foundation for aquaculture and fisheries. Report from a working group on research on early life stages of fishes. www. forsk ningsradet.no / publikasjoner. 73 pp.

[21] Sinha,V. R. and Jones, J. W. (1967). On the feed of the freshwater eels and their feeding relationship with salmonids. J. Zool., 153: 119-137.

[22] Stergion, K. I. (1988). Feeding of lessepian migrant *Sigannus luridus* in Eastern Mediterra-nean, its new environment. J. Fish Biol., 33: 534-543.

[23] Swee, U. B. and McCrimmon, H. R. (1984). Reproductive biology of the carp, *Cyprinus carpio* L. in Lake St. Lawerence, Ontario. Trans. Am. Fish. Soc., 95: 372-380.

[24] Younis, K. H. (1995). Occurrence and food habit of the juveniles of *Liza carinata* (Valenci- ennes, 1836) in Shatt Al-Arab River at Basrah, Iraq. Mar. Mesopot., 10(2): 331-339.

[25] Younis, K. H.; Hussain, N. A. and Yousif, U. H. (2001). Food and diet overlap of small fish assemblage in the upper reaches of Shatt Al-Arab river. Iraq. Mar. Mesopot., 16(1): 129 - 39.

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طبيعة غذاء وتغذية يرقات ويافعات أسماك الكارب الشائع *Cyprinus carpio* في الاحواض الطينية

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المستخلص

درست طبيعة غذاء يرقات ويافعات اسماك الكارب الشائع *Cyprinus carpio* في الاحواض الطينية لمزارع اسماك مركز علوم البحار. قيس الطول الكلي وعرض فتحة الفم باستخدام مجهر تشريحي، بينما فحص امتلاء المعدة ومكونات القناة الهضمية باستخدام مجهر مركب. تراوحت درجات حرارة الماء بين 22-24 م^0، بينما كانت الملوحة حوالي 4 جزء بالالف. اظهرت النتائج ارتباط عالي (0.98) بين طول اليرقة وعرض فتحة الفم، اذ ان عرض فتحة الفم يزداد بازدياد طول السمكة. بلغت شدة التغذية للاسماك 13.98 ونشاط التغذية 88% بينما كان دليل الاهمية النسبي 3731 و2559 و2263 و1 لكل من الغذاء المركز والطحالب والدايتومات ومجدافية الاقدام على التوالي. أظهرت النتائج ايضا ان القناة الهضمية عبارة عن انبوب قليل الالتواء ومستقيمة وغير متميزة في الاسماك التي طولها اقل من 25 ملم، بينما كانت عبارة عن انبوب ملتوي في الاطوال الاكبر من 25 ملم. وجدت خمسة اجناس من الطحالب في القناة الهضمية للأسماك وهي (*Rhizosolina, Spirogyra, Chlorella, Oscillatoria* and *Ulothrix*).