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The Fluctuation of Coralline Fish Larvae of Khark and Kharko (Persian Gulf)

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Abstract: This study was undertaken due to identification, abundance and diversity, temporal and spatial fluctuation of coralline fish larvae in Khark and Kharko Islands water. Khark and Kharko Islands are the last Northern point for fringing coral reefs in Iranian side of the Persian Gulf. These Coralline habitats are the Protected Area and Wildlife Refugees with the total area of 2400 ha which located in the territory of Bushehr Province. This research carried out during 2006-2007 with monthly sampling from 9 stations, which selected around Islands inshore waters with maximum depth of 20 m. Sampling was conducted using by Bongo-Net plankton sampler with 500 μ of mesh size. Totally 494 specimens from: 22 coralline fish larva families were identified in studied area, such as pelagic and demersal fishes. The results was shown that coral reef diversity in coral reefs (Khark and Kharko Islands) is more than other habitats such as estuary and river mouth, creeks, mangrove forest sites and off shore water of the Persian Gulf and Oman Sea Iranian side. The pick of fish larvae abundance family were estimated in spring.

Key words: Persian Gulf, Khark and Kharko Islands, ichthyoplankton, diversity indexes

INTRODUCTION

Regarding to mentioned subject, study and research on life cycle of commercial fish species and spatial temporal distribution of their larvae stages have relation with nursery ground, which an important in marine biology subject and fishery management subjects.

There have been a few studies on Ichthyoplankton in the Persian Gulf. Nellen (1973) did sample larval fishes on the Northern and Eastern side of the Persian Gulf as part of a larger Indian Ocean survey. His study provided a useful base for comparison with the present study, but his sample was taken during a single cruise only and was surveyed in a few of stations in Iranian waters (31 stations). Houde *et al*. (1986) were made this survey in Kuwait waters and 214 ichthyoplankton sampling were collected by mesh size 333 μ and diameter 61 cm of bongo net from stations in Kuwait waters and also on two cruises from stations off Saudi Arabia and in southern the Persian Gulf. KISR (2003) studied the Ichthyoplankton along the Kuwait coast and identified 15 fish larvae family in area. Ichthyoplankton survey was made in Iranian waters of the Persian Gulf from 10 years ago that will be continuing in studied area by Iranian Fisheries Research Organization (IFRO) in coastal waters of three Southern provinces, Khozestan Province (Dehgan, 2001), Bushehr (Owfi and Bakhtiary, 1999; Owfi and Mohamadnejad, 2000), Hormozgan (Jokar ad Saraji, 2002; Mortezavi and Saraji, 2008; Ebrahimi and Saraji, 2008). This research was focus on coralline sites of Bushehr Province territorial waters and its aims included:

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- Fish larvae stages identification, base on fish family
- Abundance and diversity indexes of fish larvae family
- Abundance and diversity indexes of fish larvae family
- Temporal and spatial fluctuation of abundance and diversity

MATERIALS AND METHODS

Studied Area

Khark and Kharko coralline Islands which located in Iranian side of the Persian Gulf, Northern part of the Bushehr Province waters. Nine stations around islands were selected for sampling during June 2006-July 2007 (Fig. 1).

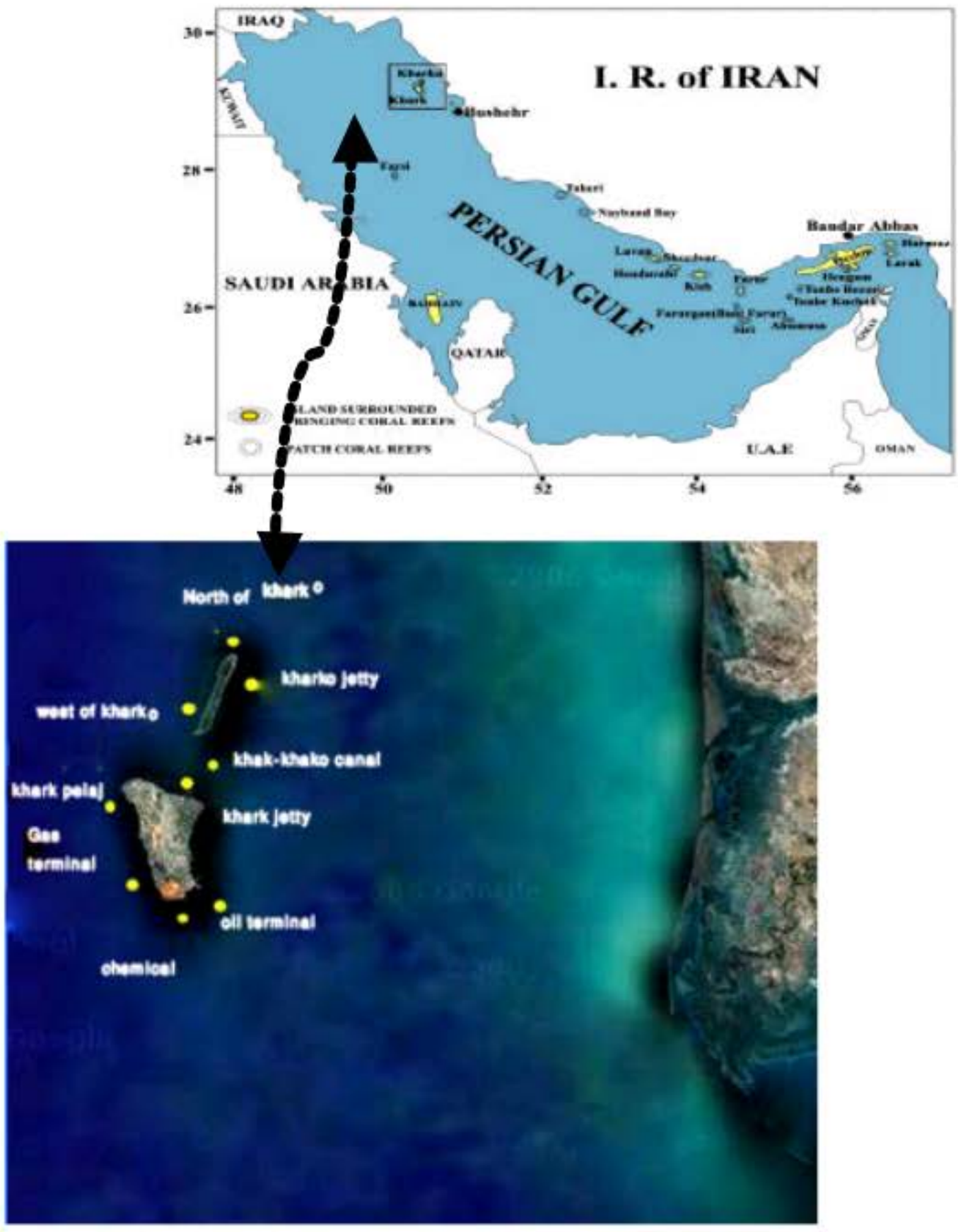

Fig. 1: Ichthyoplankton sampling stations, Khark and Kharko Islands (Northern of the Persian Gulf)

Cruise and Ichthyoplankton Sampling

Totally, 11 cruises for fish larvae sampling were made during June 2006-July 2007. Ichthyoplankton was sampled during daylight hours using a net plankton sampler, with 61 cm of frame (Smith and Richardson, 1977) which equipped with 500 μ-mesh size of nets. Oblique tows of the plankton sampler were made from near bottom to sea surface. Length of wire for towing was calculated on the base of station depth (Smith and Richardson, 1977). The time of towing for each of station was 10 min while the boat was underway at approximately 1 knot. Samples fixed in 5% formalin in seawater immediately after each tow that samples bottles labeled with sampling information.

Sorting and Identification

Samples were brought to the Laboratory after sampling and the solution fixture was changed with 10% ethanol. Similar samples were separated and morph metric and meristic parameters were measured with use of stereomicroscope that equipped to micrometer and standard length of fish larvae were measured to the nearest 0.5 mm. To aid identification, selected specimens were cleared and stained with alcian blue and alizarin (Balon, 1985).

Data Interpretation and Analysis

The raw catch data for larvae at each station were converted to numbers per cubic meter of water filtered based on flow meter readings. The data also were standardized to numbers in 10 m^2 of sea surface by the method given by Houde *et al*. (1986) and Smith and Richardson (1977). Measures of diversity indexes were used to examine relationships among kinds and abundance of larvae. Diversity was determined for each cruise base on the Shannon-Weaver index (Houde *et al*., 1986; Smith and Richardson, 1977).

In some case, Identification of fish larvae was separated in different type groups when their identification in species taxon was difficult (Leis and Rennis, 1983; Houde *et al*., 1986; Leis and Transky, 1989). The compare mean and average of abundance indexes were tested with ANOVA between stations and seasons.

RESULTS

Totally, 494 coralline fish larvae were collected at 12 stations in 22 families (Table 1). Abundance data was showed that Blenniidae, Atherinidae and Tripterygiidae were dominant coralline families, consequently in studied area. The percent of pre flexion fish larvae was 96%. Mean abundance of fish larvae was 9.5374 larvae under 10 m^2 of sea surface, the maximum abundance was 21.2757 larvae under 10 m^2 of sea surface in Khark Jetty and the minimum was 2.3955 larvae under 10 m^2 of sea surface in North of Kharko (Table 2). Maximum and minimum of abundance was in May 29.4596 and March 0.4736 larvae under 10 m^2 of sea surface, consequently (Fig. 2). The pick of fish larvae abundance family were estimated in two main pick of fish larvae abundance; in fall and higher than in spring to early summer.

The mean diversity was 0.2383, maximum and minimum of diversity in stations was in West of Kharko Islands, Chemical Terminal (0.4631) and (0.0775), consequently (Table 3).

The maximum and minimum of diversity in months was in August (0.5733) and February and March (0), consequently (Fig. 3).

The mean of evenness was 0.2239 and maximum and minimum of evenness was in Khark Pelaj (0.4226) and North of Kharko (0.1013), consequently.

The mean of richness was 0.503 and maximum and minimum of richness was in Khark Pelaj (1.0159) and North of Kharko (0.2966) (Table 4, 5).

Table 1: The number and abundance of coralline fish larvae family, Khark and Kharko Islands (Northern of the Persian Gulf)

Family	Number	Mean abundance (N/10 m^2)
Apogonidae	2	0.1113
Atherinidae	131	1.3329
Blenniidae	152	2.1532
Bregmacerotidae	3	0.1234
Chatodontidae	3	0.1545
Creediidae	1	0.1718
Gerreidae	22	0.4059
Gobiidae	109	0.7923
Haemulidae	1	0.1128
labridae	2	0.1718
Lethrinidae	6	0.2545
Lutjanidae	5	0.3457
Mugiloididea	2	0.3325
Mullidae	57	0.6183
Nemipteridae	9	0.3067
Platycephalidae	5	0.1389
Pomacenteridae	26	0.4985
Scorpaenidae	2	0.1572
Siganidae	1	0.1271
Sphyraenidae	30	0.2168
Tetraodontidae	2	0.1294
Tripterygiidae	91	0.8673

Table 2: Variation of coralline fish larvae abundance in stations (N/10m²), Khark and Kharko Islands (Northern of the Persian Gulf)

Station	Mean abundance (N/10 m^2)
Oil Terminal	17.0876
Chemical Terminal	2.6697
Gas Terminal	6.4068
Khark Pelaj	14.1018
Khark Jetty	21.2757
Khark-Kharko Canal	5.5218
Kharko Jetty	13.6493
West of Kharko	2.7288
North of Kharko	2.3955

Table 3: Variation of coralline fish larvae diversity in station, Khark and Kharko Islands (Northern of the Persian Gulf)

Station	Diversity index
Oil Terminal	0.1898
Chemical Terminal	0.2299
Gas Terminal	0.2071
Khark Pelaj	0.4631
Khark Jetty	0.2570
Khark-Kharko Canal	0.2880
Kharko Jetty	0.2604
West of Kharko	0.1717
North of Kharko	0.0775

Table 4: The amount of abundance, diversify, richness and evenness in stations, Khark and Kharko Islands (Northern of the Persian Gulf)

Station	Abundance	Diversity	Richness	Evenness
Oil Terminal	17.0876	0.1898	0.5246	0.2739
Gogerdi	2.6697	0.2299	0.4278	0.2243
Silandr	6.4068	0.2071	0.4590	0.2232
Khark Pelaj	14.1018	0.4631	1.0160	0.4226
Khark Jetty	21.2757	0.2570	0.4934	0.1995
Khark-Kharko Canal	5.5218	0.2880	0.3571	0.1591
Kharko Jetty	13.6493	0.2604	0.4934	0.2129
West of Kharko	2.7288	0.1717	0.4590	0.1986
North of Kharko	2.3955	0.0775	0.2967	0.1013

Table 5: The amount of abundance, diversify, richness and evenness in stations, Khark and Kharko Islands (Northern of the Persian Gulf)

Month (2006-07)	Abundance	Diversity	Richness	Evenness
July	3.1584	0.2892	0.6412	0.4172
August	3.9094	0.5733	0.7251	0.4874
September	11.8719	0.0181	0.1603	0.0261
October	12.2097	0.0885	0.1603	0.0375
November	7.3607	0.3066	1.0877	0.2509
December	12.9886	0.2787	0.6412	0.4021
February	2.8639	0.0000	0.0000	0.0000
March	0.4736	0.0000	0.0000	0.0000
April	16.1621	0.4074	0.7990	0.3351
May	29.4596	0.4705	0.9975	0.3245
June	4.4542	0.1888	0.3206	0.1822

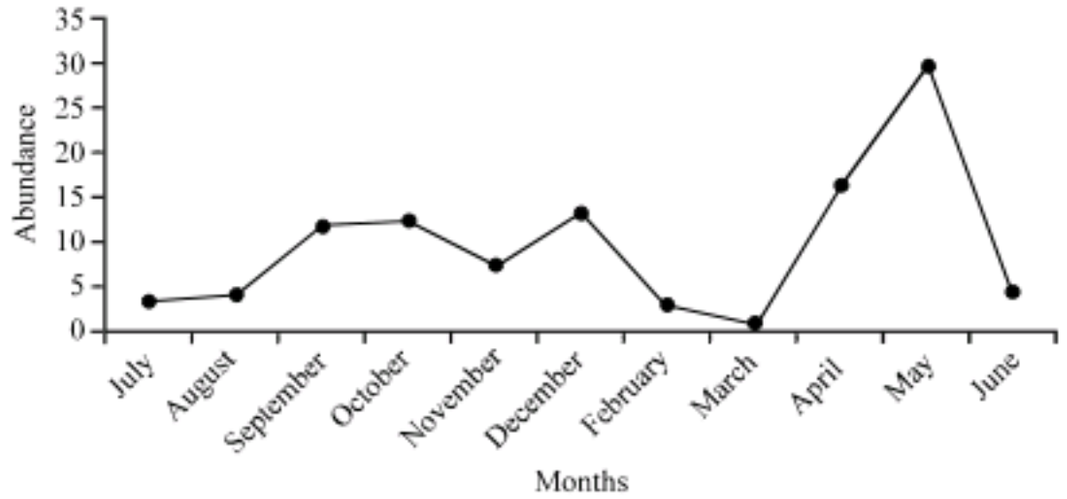

Fig. 2: Variation of coralline fish larvae abundance in months (N/10 m²), Khark and Kharko Islands (Northern of the Persian Gulf)

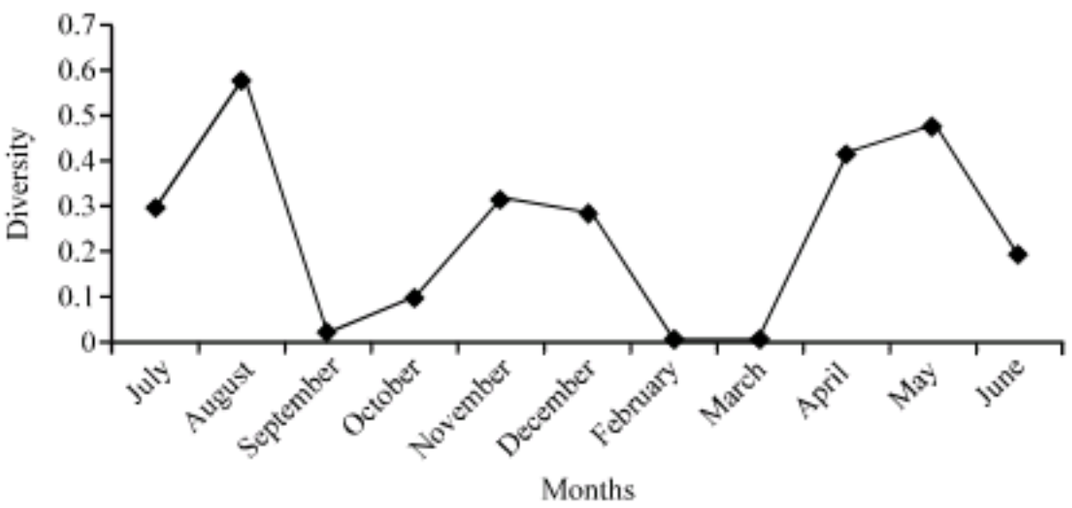

Fig. 3: Variation of coralline fish larvae diversity in month (N/10 m²), Khark and Kharko Islands (Northern of the Persian Gulf)

DISCUSSION

In view of Khark and Kharko Island in North part of Persian Gulf include of coralline habitat, we can see many of coralline fish larvae that impossible see in near coastal waters (Coast of Busher Province).They are included of Blenniidae, Atherinidae, Tripterygiidae, Gobiidae and Mullidae fish larvae families were dominated in studied area. All of the abundant fish larvae were in coralline in all earlier studies of fish larvae in Iranian waters (except Nayband Bay-South of Busher Province) were not see this diversity. The increased ichthyoplankton diversity in this area must be largely a consequence of increased habitat diversity with which adult fishes are associated. Fish larvae whose adult live and catch from study area were collected and only in some cases as same as Cilinidae, Creediidae and Tripterygiidae that they are benthic fish of coralline habitat, it is first report.

The mean abundance in Nayband Bay which is multi-ecosystem habitat was 28.47 larvae under 10 m^2 of sea surface of and diversity was 1.76 and the dominated families were: Clupeidae, Sphyraenidae, lutjanidae; this area included in several habitats such as: Creek, Estuary, Mangrove forest that it causes of diversity. But increased the sea current from September and the abundance of fish larvae decreased (Rabbaniha, 1998). The mean abundance and diversity of fish larvae the Ziarat to Asaloe (Southern Creek of Busher City) were 43.67 larvae under 10 m^2 of sea surface and 1.1, consecutively and the dominated families were: Gobiidae, Engraulididae and Clupeidae (Owfi and Mohamadnejad, 2000). The mean abundance and diversity of central Busher creek fish larvae were 30.23 (N/10 m^2) and 1.06, consecutively and the dominated families were: Gobiidae, Sillaginidae and Clupeidae (Owfi and Bakhtiary, 1999), which main ecosystems of this area is creek and estuary. The mean abundance and diversity of fish larvae from the creek-estuary Busher to Genave (Northern part of coastal waters Busher) were 7.87 larvae under 10 m^2 of sea surface and 0.7, consecutively and the dominated families were: Gobiidae, Clupeidae, Sillaginidae, Sparidae (Rabbaniha, 2002). Comparing of the mean abundance between these areas, it is clearly that the most abundance is in central creeks of Busher, because the creeks of this area are sheltered creeks (pond shape and deep canal creeks). Also, the abundance of fish larvae in Khark and Kharko Islands is more than northern creeks of Busher, because the most of stations in Northern creeks of Busher is located in open sea and they have not any shelter area. Due to phenomena, it seems that the fish larvae move with currents.

Finally, the habitat diversity of Khark and Kharko, is one of the main reasons for species diversity of fish larvae, the coralline fish larvae as same as Sphyraenidae, Lutjanidae, Blenniidae, Atherinidae, Tripterygiidae are percents.

The mean abundance and diversity of coastal waters Khozestan Province (Northern part of Persian Gulf) were 59.11 larvae under 10 m^2 of sea surface and 0.78, consecutively and Gobiidae, Clupeidae, Engraulididae dominated fish larvae family and so Leiognathidae and Sciaenidae reported in some stations. Creek is main habitat of Khozestan Province.

Nellen (1973) collected larval fishes in 71 net tows at 65 stations off the Iranian side of the Persian Gulf in 2 week period (31 March-14 April 1965) and used 500 μm mesh. The predominant fish larvae in Persian Gulf were Pomadasyidae, Clupeidae, Gobiidae and Apogonidae.

Houde *et al*. (1986) collected fish larvae in Kuwait water and two cruises, Saudi Arabia (Southern part of the Persian Gulf) from September 1979 to August 1980. The mean abundance was 71 m^2 and dominant families were Engraulididae, Gobiidae and Clupeidae.

According e to the result, The pick of fish larvae abundance family were estimated in two main pick of fish larvae abundance; in fall and higher than in spring to early summer that it has overlapping with results of others study of ichthyoplankton in the Persian Gulf.

CONCLUSION

Khark and Kharko Islands are habituate with the fringing coral that cause increased ichthyoplankton diversity in this area and 22 coralline fish family identified in this research that in some cases they were first record from area.

The main pick of abundance fish larvae was in spring that it was correlation with increase productivity in area and this result as same of another study.

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