

Community Structure of Benthic invertebrate in Greater Zab River/Iraq^{*}

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الخلاصة

تم دراسة مجتمعات اللافقريات العيانية في ثلاثة محطات مختارة على نهر الزاب الكبير وهي محطة قنديل ومحطة افراز ومحطة خبات. خلال فترة الدراسة تم تسجيل 32 نوع من اللافقريات تضمنت ديدان خيطية Nematoda وديدان قليلة الاهلاب Oligochaeta واوستراكودا Ostracoda وعشارية الاقدام Decapoda والحشرات Insect والرخويات Mollusca. لوحظ خلال الدراسة بان الحشرات هي المجموعة السائدة في كل المحطات و من ثم ديدان قليلة الأهداب حيث سجلت في كل المحطات وخلال كل فترة الدراسة. كذلك تم استخدام دليل شانون- وينر لمعرفة تأثير التغيرات البيئية على مجتمع اللافقريات العيانية و قد أظهرت النتائج بان تنوع الأنواع في المحطات المدروسة قد تراوحت بين 0.41 و 2.49 بت/فرد، وهذه النتيجة قد سجلت في محطتي قنديل و افراز على التوالي.

Abstract

A study of macroinvertebrate community has been carried out at three sites selected on greater zab river included Qandel, Efraz and Khabat region. A total of 32 species of benthic invertebrates were recorded including Nematoda, Oligochaeta, Ostracoda, Decapoda, Insecta and Mollusca. During studied period the insecta were regarded the most dominated group, as they observed during all studied periods followed by Oligochaeta which observed in all studied sites. Shanon-Weiner index was used to reflect the effect of environmental fluctuation on benthic invertebrate communities, and the results showed that the species diversity of studied sites was ranged between 0.41 to 2.49 bits/ind. in Qandel and Efraz regions respectively.

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Introduction

Invertebrate community characterization has been used effectively for evaluating water quality (1). Macroinvertebrates are good biological indicators because they are long lived in the ecosystem and have species of varying degrees of tolerance for different sources of pollution (2). They are also easily and economically caught, identified and evaluated (3). The different tolerances of individual macroinvertebrate species are what drive the community changes from one system to the next and therefore allow fast and effective evaluation of a stream Marques and (4).

Using most of the Oligochaeta species and especially that belonging to the families of Naididae and Tubificidae as bioindicators organisms is quite common due to their long life cycles (5). However, Moore ⁽⁶⁾ recorded *Lumbriculus variegatus* (Oligochaetes) as an indicator of heavy metal pollution in a sub-arctic lake in Canada. Also Milbrink ⁽⁷⁾ and Wiederholm ⁽⁸⁾ have used Oligochaetes as indicators of water quality.

On the other hands, Moore ⁽⁶⁾ used Chironomids as indicators of heavy metal pollution a sub-arctic lake in Canada, and the most common species in the studied lake were *Procladius denticulatus*, *Heterotrissocladius change*, and *Chironomus decorus*. Also Glastris, *et al* ⁽⁹⁾ used aquatic insects and especially Chironomids as indicators of water quality. However Sloane, *et al* ⁽¹⁰⁾ found that the Chironomidae, Tanypodinae, and Hydracarina were tolerant taxa for tracing metal pollution in Molonglo River in Australia. While the mayflies Caenidae, Leptophlebiidae, and Baetidae were less tolerant to such pollution.

Mollusca were also used as an indicator of water pollution in different parts of the world; among them Moore ⁽⁶⁾ identified *Pisidium casertanum* molluscs as an indicator of contamination by a high level of arsenic, mercury, lead, copper, and zinc in Canada. Also Bubinas, and Vaitonis ⁽¹¹⁾ used *Dreissena polymorpha* as an indicator of water pollution in the northern and western parts of the Curonian Lagoon in Lithuania.

Materials and methods

Greater Zab is one of the main tributary of the Tigris river in Iraq it located in the east of Tigris river in the north of Iraq it is located between longitude 43°W and 44°E and latitude 36°S and 37°N, (12). In this study three sites were selected:- Qandel site, It is located in the mountain area at Qandel village about (42) Km apart from point of Zab formed in Rezan village. The mean of depth and width of the river in this site are about (2m) and (50m) respectively. The second site was Efrac located near Efrac village about (64) Km from site one. The mean depth of the river in this site is (2 m), width is (45 m). The last site was Khabat It is located at

Khabat sub-district about (23) Km from site two. The mean depth and width of river in this site are about (3 m) and (60 m) (fig 1).

Benthic invertebrates samples were collected during periods extended from March 2005 until February 2006 in each site by using Surber sampler. In this study Shanon-Weiner diversity index as described by Krebs⁽¹³⁾ was monthly calculated in all sites

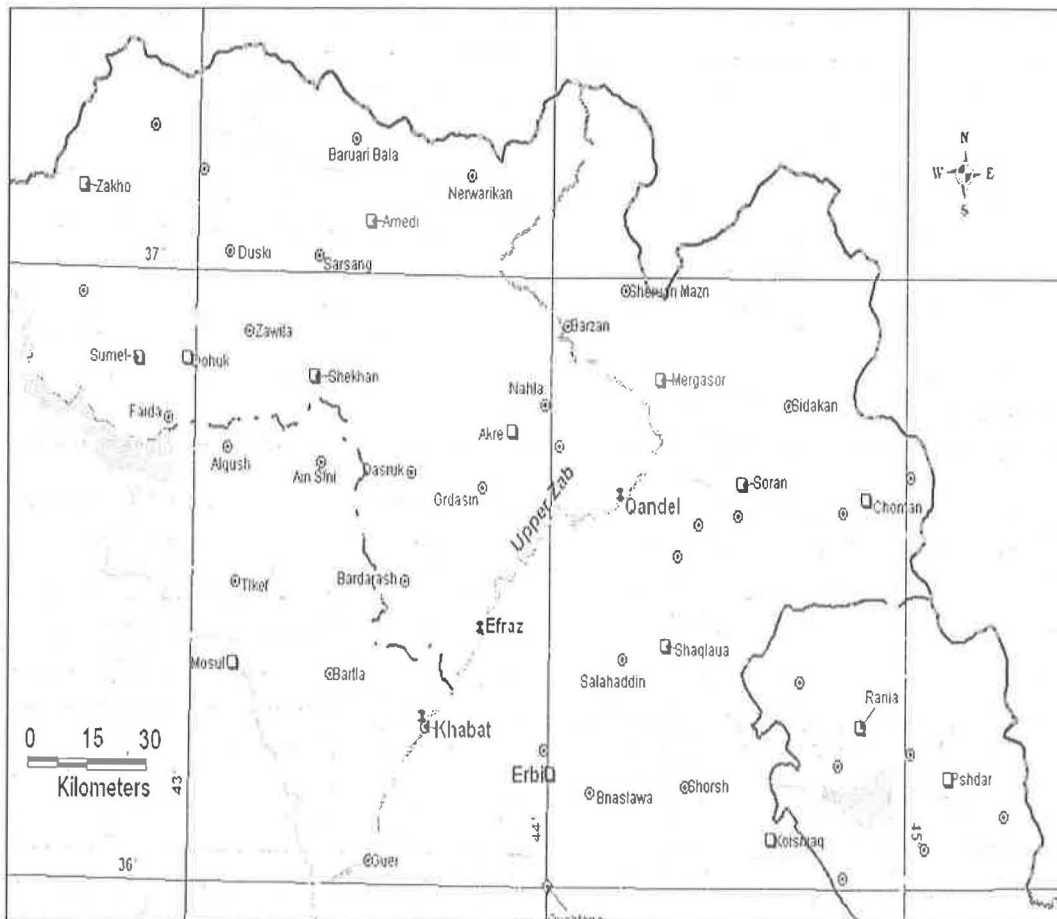


Fig (1) Map of Iraq, inset location of sampling sites on Zab river.

Results

Nematodes

They were observed only in Efratz site during period from May to July 2005. The minimum number was 16 ind./m² in July, and the maximum number was 40 ind./m² in May table (1).

Oligochaeta

The result of the Oligochaeta study indicated a wide range of variations among the studied sites, and the sampling date. It ranged from 40 to 535 ind./m² table (2). The minimum value was recorded in Qandel

site at January 2006, while the maximum value was recorded in Khabat site at November 2005.

Table (1) Total number of Nematodes recorded in studied sites during studied period.

| Stations Months | Nematodes | | |
|--------------------|-----------|-------|--------|
| | Qandel | Efraz | Khabat |
| March | - | - | - |
| April | - | - | - |
| May | - | 40 | - |
| June | - | 28 | - |
| July | - | 16 | - |
| August | - | - | - |
| September | - | - | - |
| October | - | - | - |
| November | - | - | - |
| December | - | - | - |
| January | - | - | - |
| February | - | - | - |

- = Not found

Table (2) Total number of Oligochaeta recorded in studied sites during studied period.

| Stations Months | Qandel | Efraz | Khabat |
|--------------------|--------|-------|--------|
| March | 240 | 214 | 226 |
| April | 256 | 214 | 230 |
| May | 200 | 234 | 244 |
| June | 211 | 4.8 | 280 |
| July | 211 | 486 | 444 |
| August | 208 | 487 | 242 |
| September | 215 | 460 | 514 |
| October | 261 | 360 | 504 |
| November | 266 | 512 | 535 |
| December | 60 | 316 | 399 |
| January | 40 | 314 | 287 |
| February | 140 | 220 | 206 |

- = Not found

Ostracoda

It was observed only in Khabat site during the period from March to May 2005. The lower number was 8 ind./m² in two other months, and the higher number was 12 ind./m² in March table (3).

Decapoda

It is recorded in all sites for 8 months from March to October during the studied period, while in four other months it disappeared. It ranged from 0 to 8 ind./m² table (4). The maximum value was recorded in Khabat site during September, and October 2005.

Insecta

During the studied period, the density of insects ranged from 0 to 1440 ind./m² table (5). The minimum number of insects was recorded in Qandel during two months; January and February 2006, whereas the maximum number was recorded in Khabat during October 2005.

Mollusca

According to the studied results, gastropod ranged from 0 to 90 ind./m² table (6). The lower value was recorded in Khabat site during several months, while the higher value was recorded in Efraz during January 2006. While bivalve was ranged from 0 to 10 ind./m². The minimum number was recorded in all the studied sites during several months, while the maximum number was recorded in Efraz during August 2005.

Table (3) Total number of Ostracoda recorded in studied sites during studied period.

| Stations Months | Ostracoda | | |
|--------------------|-----------|-------|--------|
| | Qandel | Efraz | Khabat |
| March | - | - | 12 |
| April | - | - | 8 |
| May | - | - | 8 |
| June | - | - | - |
| July | - | - | - |
| August | - | - | - |
| September | - | - | - |
| October | - | - | - |
| November | - | - | - |
| December | - | - | - |
| January | - | - | - |
| February | - | - | - |

- = Not found

Table (4) Total number of Decapoda recorded in studied sites during studied period.

| Stations Months | Decapoda | | |
|--------------------|----------|-------|--------|
| | Qandel | Efraz | Khabat |
| March | 2 | 2 | 2 |
| April | 3 | 2 | 2 |
| May | 2 | 4 | 3 |
| June | 4 | 5 | 3 |
| July | 4 | 4 | 4 |
| August | 6 | 4 | 3 |
| September | 6 | 3 | 8 |
| October | 3 | 2 | 8 |
| November | - | - | - |
| December | - | - | - |
| January | - | - | - |
| February | - | - | - |

- = Not found

Table (5) Total number of Insects recorded in studied sites during studied period.

| Months \ Stations | Qandel | Efraz | Khabat |
|-------------------|--------|-------|--------|
| March | 420 | 401 | 360 |
| April | 412 | 540 | 420 |
| May | 505 | 706 | 407 |
| June | 540 | 711 | 480 |
| July | 441 | 420 | 620 |
| August | 1000 | 411 | 801 |
| September | 410 | 420 | 720 |
| October | 450 | 210 | 1440 |
| November | 302 | 612 | 360 |
| December | 310 | 390 | 252 |
| January | - | 511 | 209 |
| February | - | 304 | 240 |

- = Not found

Table (6) Total number of Mollusca recorded in studied sites during studied period.

| Months \ Stations | Snail | | | Bivalve | | |
|-------------------|--------|-------|--------|---------|-------|--------|
| | Qandel | Efraz | Khabat | Qandel | Efraz | Khabat |
| March | 46 | 28 | 12 | - | 2 | - |
| April | 53 | 23 | 18 | 2 | - | - |
| May | 50 | 33 | 20 | 6 | - | - |
| June | 51 | 64 | 24 | 6 | 5 | 2 |
| July | 46 | 43 | 40 | 4 | 9 | 2 |
| August | 21 | 40 | - | - | 10 | - |
| September | 10 | 44 | - | - | 4 | - |
| October | 10 | 40 | - | - | 4 | - |
| November | 22 | 36 | 33 | - | - | - |
| December | 20 | 82 | 12 | - | - | - |
| January | 21 | 90 | - | - | - | - |
| February | 25 | 22 | - | - | 2 | 4 |

- = Not found

Shanon-Weiner index:-

The lower species diversity of benthic macroinvertebrate was 0.41 bits/ind. observed in Qandel site during November 2005, whereas the higher species diversity of it was 2.49 bits/ind. observed in Efraz site during June 2005 (fig. 2, 3, 4).

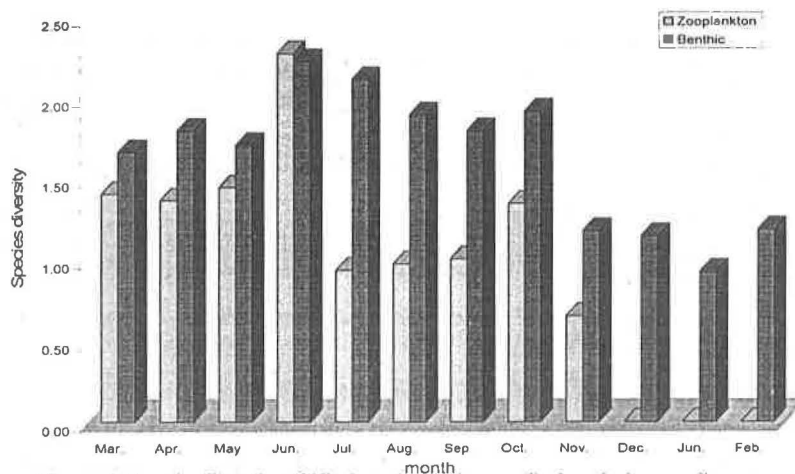


Fig.(2) Species diversity of Khabat site during studied period according to Shaanon-Weiner index.

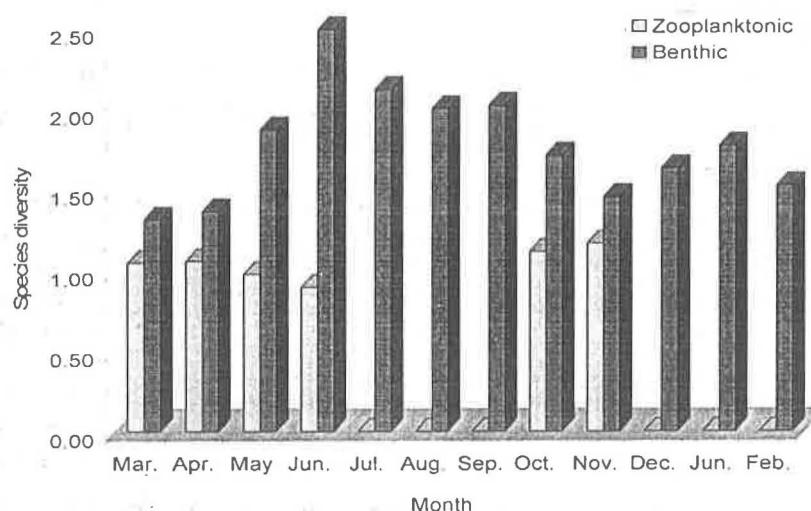


Fig.(3) Species diversity of Efraz site during studied period according to Shaanon-Weiner index.

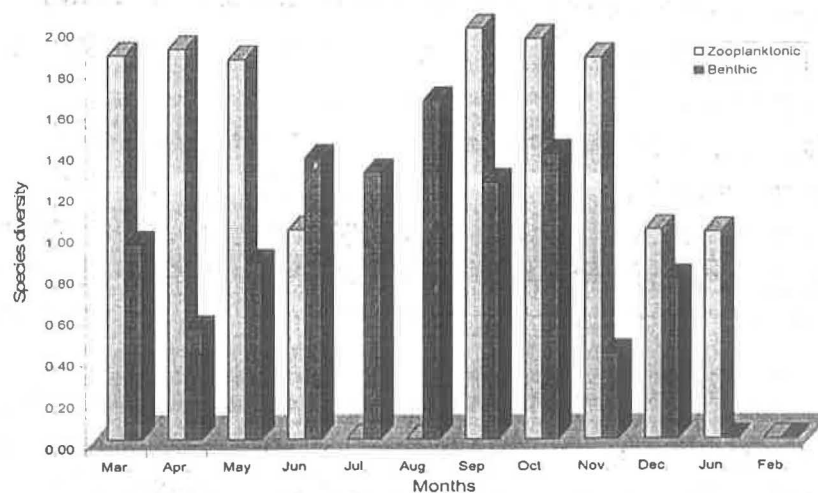


Fig.(4) Species diversity of Efraz site during studied period according to Shaanon-Weiner index.

Discussion

Macroinvertebrate community, abundance, and distribution of the results showed a high monthly variation during the studied period in the studied sites, they ranged from 69 ind./m² belonging to three classes, in Qandel site during January 2006 to 1983 ind./m² belonging to four classes in Khabat site during October 2005. Generally, the total number of recorded macroinvertebrate in this study was lower than that recorded by other investigators in different parts of Iraq such as Al-Lami, *et al* ⁽¹⁴⁾ and Saadalla ⁽¹⁵⁾. These differences may be due to differences in the studied area, climate, geological formation of the basin, and physio-chemical property of the river.

However, the dominance of insects in this study during most of the studied period came in accordance with that reported by Saadalla ⁽¹⁵⁾ in Iraq, and Rader and Ward ⁽¹⁶⁾ in other parts of the world. Oligochaeta was the second dominant class and then followed by Mollusca, and then Crustacea.

The wide occurrence of Insects, Oligochaeta, Mollusca, and Crustacea during all the studied period is relatively close to that observed by Al-Mukhtar, *et al* ⁽¹⁷⁾.

During the studied period, the lower number of insects was zero ind./m² observed in Qandel site during January and February 2006, this may be due to decrease in water temperature in this site because it was located in mountainous area comparing to other sites. Whereas the higher number was 1440 ind./m² recorded in Khabat site during October 2005.

Regarding the class Oligochaeta, it was observed in all sites during all the studied period. The lower recorded number was (40 ind./m²) in Qandel site during January 2006. This may be due to the decreases in water temperature in this site comparing with other studied sites. In general, Oligochaeta community in these investigations was very poor in this site as a result of rapid water current and rocky basin of Greater Zab in Qandel site. A similar result was reported Dumnicka and Galas ⁽¹⁸⁾, they reported that the mountainous area and in a rapid flow stream with rock basin seem to be unfavorable to aquatic Oligochaetes, while the higher number of Oligochaetes (535 ind./m²) was recorded in Khabat site during November 2005 with dominance of *Limnodrillus claparedeianus*, and *L. hoffmeisteri*. This might be due to the increase of organic matter in this site as a result of sewage water disposal from Aski-Kalk city into Zab River.

Concerning the Mollusca, lower density of Gastropoda was zero ind./m² observed in Khabat site in many months. While the higher density was 90 ind./m² recorded in Efray site during January 2006. Gastropoda in the present study was represented by four taxa, and the result was similar to that of Al-Nemrawy ⁽¹⁹⁾ in Euphrates River.

Bivalvia was represented by two species. The lower density of bivalvia was zero ind./m² recorded for many months, and in all studied sites, whereas the higher density was 10 ind./m² recorded in Efraz site during August 2005. The recorded results were relatively close to that of Saadalla ⁽¹⁵⁾.

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