



Commented inventory of macroinvertebrates collected at oued R'dom (Morocco)

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Abstract

Wetlands are the cradle of biological diversity and provide the water and primary productivity on which countless plant and animal species depend for their survival. The identification of the stand structure constituting this biodiversity makes it possible to assess the status of this biodiversity and the quality of these ecological and economic functions produces wetlands. In this sense, we have carried out surveys of the macroinvertebrate fauna of Oued R'dom, a tributary of Oued Sebou which is one of the main rivers in Morocco. The results show that at the wadi R'dom level the population groups 43 species divided into 43 genera, 33 families, 6 classes and many Orders. All the inventoried fauna belongs to 3 systematic branches: Arthropods, Molluscs and Annelids. However, 75% of the inventoried species belong to the class of Insects. In addition, the overall distribution of species varies from one systematic taxon to another and with in each taxon.

It should be noted that the identification of the macroinvertebrate population is of great importance in the constitution of certain biotic indices, such as the Globalised General Biological Index (GGBI), which is used as a tool for assessing the biological quality of the environment.

Keywords: environment, Globalised, Annelids, Wetlands, biotic

Introduction

Wetlands are places of biodiversity, a natural filter of water against pollution and a support for various human activities, including a source of drinking water and water [1]. Thus, during the 21st century, drinking water consumption has doubled, exceeding the growth rate of the world population. However, in the face of this great need for water, this vital substance is constantly deteriorating [2]. Human action is the main factor in this degradation. Indeed, pollution and climate change, caused by human activity, are considered to be the main causes of water scarcity in the world [3].

Biodiversity is also the earth's natural wealth and provides the essential elements for the life and prosperity of all humanity. Thus, for the reservation of the ecological quality of any hydrosystem, it is useful to assess the degree of biodiversity and to continue this assessment [4]. In this sense, the United Nations has proclaimed 2010 as the International Year of Biodiversity to alert public opinion to the state and consequences of the decline in biodiversity worldwide. Thus, since the publication of the recommendations of the Rio Convention (1992) [5], biodiversity loss has become one of the greatest environmental concerns of the last century. The assessment of water quality in a hydrosystem is no longer purely physico-chemical. The biological quality of this water has received considerable attention from researchers. This biological estimate is based on the presence or absence of certain polluting sensitive species in the environment and/or on the analysis of the stand structure of certain plant groups (e. g. Diatoms) or animals such as the structure of the Macroinvertebrate stand in the environment. Thus, for any environment to be studied, the development of systematic taxa of zoological or plant groups is necessary.

The objective of our study is to determine an inventory of the macro-invertebrates of the river "oued R'dom", a main course

of a watershed located in northern Morocco, that of oued Sebou.

Material and Method

Site studied

The topographic basin of Oued R'dom is a sub-basin of the large watershed of Oued Sebou which is located in the northwestern part of Morocco (fig. 1). It covers part of the Gharb plain, including the province of Sidi Kacem, which extends over 2318 km. The relief of this basin is young and characterized by gentle slopes [6]. The hydrological network of the geographical area studied consists of the main river "Oued R'dom" and natural drainage channels. Oued R'dom, which is 110 km long and has 110 km of tributaries to form a hydrological network of more than 200 km. Among these tributaries wadi Boufekrane, wadi Ouisslane, wadi Serja and wadi Khoumane.

The soils of the basin are dominated by raw mineral soils, advanced soils and vertisols. The climate is Mediterranean with oceanic influences on the western side and continental influences on the eastern side of the basin. The average annual temperature is about 18°C but it is seasonally variable; in summer the maximum temperature can exceed 40°C and in winter the minimum temperature can drop below 4°C. It should also be noted that oued R'dom receives wastewater from the city of Sidi Kacem, the slaughterhouse, the tannery, and some small industrial units and still keeps residues of hydrocarbons previously discharged from the SCP [7] petroleum refining unit. Similarly, the watershed of this river is heavily used for agriculture and livestock breeding.

Choice of stations studied.

For the most complete overview possible of the structure of the benthic macroinvertebrate stand, we conducted our surveys at four stations. The selection of sampling stations

was made according to a longitudinal transect of the river, taking into account the heterogeneity of the environment and in relation to wastewater discharge points. Thus, 4 stations were chosen for this study:

S1: located 15 km upstream from the city of Sidi Kacem. We estimated that this station is the area of the river affected by the influence of agricultural inputs from the watershed. In addition, the substrate is coarse gravel;

S2: located in the main wastewater discharge area of the city of Sidi Kacem. The substrate is clayey

S3: Located 2 km downstream of the discharge point of the city's main sewer. The substrate is sandy-clayey;

S4: located 8 km downstream of S3. This station was chosen to represent the area of the river after the part that was directly affected by the city's discharges.

Method for sampling the macro-invertebrated benthic fauna of the environment.

Samples for the various micro-habitats present on the site are taken in front of the water flow in a predefined order according to a standardised sampling protocol [8]. Samples will be taken in both lotic and lentic environments. The choice of the selected micro-habitats is made on the basis of their biogenic capacity (i.e. favourable to aquatic life), their representativeness within the station and the different current speed classes on the site.

Depending on the water velocity, wildlife sampling was carried out either with the "Surber" type sampler placed on the bottom of the stream bed facing the current, the sampler frame determines the area of the micro-habitat to be sampled, or with the "Haveneau" type sampler where turbidity is used by pulling for about 50 cm or back and forth at the level of the support to be collected. Generally in lentic environments. The sample collected is stored in diluted formaldehyde. Then, in the laboratory, it is sorted. The systematic determination of taxa is based on systematic documents specific to each zoological group, such as the "Guide d'identification des principaux macro-invertébrés benthiques d'eau douce du Québec 2010" developed by Moison *et al* (2010) [9]. It should be noted that the samples were taken seasonally during 2016 but the population given for each station

Results and Discussion

1. Systematic list of collected species

Branch line : ARTHROPODES

Under branching of Antennates (= Mandibulates) **Classe des Insectes** : Order des Trichoptera

Family : Hydropsychidae

- *Hydropsyche incognita* Pitsch, 1993

Order des Plécoptera

Family : Capniidae

- *Capnia nigra* Pictet, 1833

Family Perlodidae

- *Hemimelaena flaviventris* Pictet, 1841

Order odonates

Sous-ordre des Zygoptera :

Family : Lestidae

- *Lestes barbarus* (Fabricius, 1798)

Family : Coenagrionidae

- *Anax parthenope* Sélys, 1839

Order Coleoptera

Family : Dytiscidae

- *Laccophilus* sp.
- *Agabus bipustulatus* (Linnaeus 1767)
- *Hydrovatus* sp.
- *Graptodytes aequalis* Zimmermann, 1918

Family : Haliplidae

- *Peltodytes* sp.

Family: Gyrinidae

- *Gyrinus caspius* (Ménétries 1832)

Family : Noteridae

- *Noterus* sp.

Family : Hydrophilidae

- *Enochrus* sp.
- *Hydrous piceus* (L.)
- *Berosus* sp.
- *Coelostoma* sp.

Family : Elmidae

- *Elmis maugetii velutina* (Reiche 1879)

Family : Hygrobiidae

- *Hydrobia* sp.

Order : Hemiptera

Family : Corixidae

- *Corixa affinis* Leach, 1817
- *Micronecta vidali* Poisson, 1938

Family : Veliidae

- *Velia noualhieri* Puton (1889)

Family : Notonectidae

- *Notonecta glauca glauca* Linnaeus, 1758.

Family : Gerridae

- *Aquarius cinereus* (Puton, 1869)

Family Naucoridae

- *Naucoris maculatus* Fabricius, 1798

Order : Diptera

Family : Chironomidae

- *Chironomus* sp.

Family : Tabanidae

- *Tabanus* sp.

Family : Simuliidae

- *Prosimulium* sp.
- *Simulium intermedium* Roubaud, 1906

Family : Culicidae

- *Culex impudicus* (Ficalbi 1890)
- *Anopheles labranchiae* (Falleroni 1926)

Classe des Crustacea

Sous classe : Malacostracés

Order : Amphipoda

Family : Gammaridae

- *Gammarus* sp

Under classe : Entomostraca

Family : Diaptomidae

- *Hemidiaptomus maroccanus* Kiefer, 1955

Branch line : Annelides

Class Oligocheta :

Family : Lumbricidae

- *Eiseniella tetraedra* (Savigny, 1826)

Family : Tubificidae

- *Tubifex tubifex* (Mueller, 1774)
- *Tubifex ignotus* (Stolc, 1886)

Class : Hirudinées

Order : Rhynchobdellae

Family : Glossiphoniidae

- *Glossiphonia complanata* (Linnaeus, 1758)
- *Helobdella sp.*

Order : Arhynchobdellae

Family : Hirudidae

- *Hirudo medicinalis* (Linnaeus, 1758)

Branch line : Molluscan

Classe : Gastropoda :

Under class : Pulmonata

Order : Basommatophora

Family : Lymnaeidae

- *Lymnaea truncatula*- Muller, 1774

Family : Physidae

- *Physa acuta* Draparnaud, 1805

Family: Ancylidae

- *Ancylus fluviatilis*- Muller, 1774

Order : Stylommatophora

Family : Succineidae

- *Succinea debilis* Morelet, 1859

Sous classe : Prosobranchia

Family : Melanopsidae

- *Melanopsis praemorsa*, Linnaeus, 1758

Classe : Lamellibranchia

Order : Eulamellibranchia

Under ordre : Schizodonta

Family : Unionidae

- *Unio durieui* Philipsson, 1788

As shown in the list of taxa harvested, 30 species have identified up to the species name and 13 "species" have been determined up to the "Genus". Thus, the specific richness is at least equal to 43 species and by this value, relatively low, it seems that it is low in the watercourse studied. In addition, the 43 inventoried species are grouped into 43 genera, a number equal to that of the species. This shows that there is no specific diversification at the levels of the genres inventoried. Similarly, the number of families inventoried (33), if we consider the number of genera found, is significant.

In addition, the identified fauna belongs to three major zoological groups or branches. Specific wealth varies greatly from one branch to another and within the classes, orders and families of each branch.

With 31 inventoried species belonging to the Arthropods branch, this branch covers 75% of the species we have determined. Within this branch, the species are divided into 2 systematic classes, the class of Insects which groups the majority of Orders, Families and Genres and the reported species. In addition, the Orders of Beetles, Hemipterans and Dipterans are the most species-rich orders. The Crustacean class, relatively undiversified compared to that of Insects, is systematically under-represented.

Molluscs and Annelids are the other branches inventoried. The results show that, from the point of view of specific richness and diversity, it is the Molluscan shellfish branch that comes after the Arthropod branch.

3. Systematic taxa collected and assessment of the biological quality of the water

Water quality can be assessed by a biological method based on the analysis and counting of the various macroinvertebrates that inhabit wetland waters. Thus, many studies, including those of Andrianov (2015) ^[10], have used the so-called "Normalized Global Biological Index" or IBGN, which is based on the systematic determination of the population of benthic macroinvertebrates. Thus, the list of inventoried species can be used as a basis for assessing the biological quality of the watercourse under study. Ephemeroptera found in some sections of the stream can indicate a certain degree of water quality. Indeed, according to Brulin (2007) ^[11], these species are very sensitive to light pollution and chemical pollution by pesticides. They are in strong decline in a large part of their natural range (or disappeared for some species). The same utility is ensured by the qualitative and quantitative identification of the structure of the population structure of Trichoptera ^[12]. By its great richness and specific composition, the order of Beetles ^[13], Diptera ^[14], and Odonates ^[15], participate as a biological tool for evaluating the water biology of wetlands.

Similarly, some species of molluscs or Annelids, by their sensitivity or their ability to resist certain types of pollutants, may indicate the quality of the environment ^[16].

Conclusion

With only 43 species that have been collected it therefore seems that the population of wadi macroinvertebrates R'dom is not very qualitatively very rich. These 43 species are divided into 43 Genera, which means that within the genera there are not enough species. In addition, there are only 33 systematic families, which proves that, on average, there is no great specific diversity at the family level. The identified fauna belongs to 3 branches, but the specific richness varies greatly from one branch to another and within the classes, orders and families of each branch. It is the Arthropod branch that accounts for 75% of the species collected and it is the Insects class that groups the majority of Orders, Families and Genera and reported species. Within the class of Insects itself, the Orders of Beetles, Hemipterans and Diptera are the most species-rich orders. The Molluscan and Annelid branches are relatively less rich in systematic Taxa.

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