



CHECK-LIST OF THE NON-MARINE MOLLUSCAN SPECIES-GROUP OF OUERGHA WATERSHED (MOROCCO)

Abdelaziz Maqboul*¹, Rabia Aoujdad¹, Mohamed Fadli¹ and Mohamed Fekhaoui²

¹Laboratory of Biodiversity and Animal Resources, Ibn Tofail University, B.P 133, 14000, Kenitra, Morocco.

²Laboratory of Zoology and Animal Ecology, Scientific Institute of Rabat, BP 703 Agdal, Rabat, Morocco.

Corresponding Author

Abdelaziz Maqboul
Email:- maqboul2012@gmail.com

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ABSTRACT

The primary goal of this work was to establish the specific biodiversity of freshwater molluscs in aquatic environments of Ouergha watershed. This faunal inventory fills the gaps in inventories malacological of Morocco especially the malacofauna of high altitudes. The missions surveys conducted between 2002 and 2005 show that the species found in the catchment area belong mostly to the class of gastropods. Indeed, among the 40 surface freshwater molluscs known in Morocco, 20 species have been recorded including two potential taxa : Planorbis Planorbis and Gyraulus laevis. The species inventoried are divided into 10 families: two families of Prosobranchia, six families of Pulmonata and two family of Bivalvia. The subclass Pulmonata has the most species (10 species) followed by Prosobranchia (5 species) and Bivalvia (4 species).

Keywords : Check-list, Systematic, Freshwater Molluscs, Ouergha Watershed, Morocco

INTRODUCTION

The systematic of freshwater molluscs of Morocco was revised in 1998 by Ghamizi. He identify 82 groundwater and superficial species. However, faunal research dedicated to this group in medium and high altitudes conducted right now are reduced and confined to the work of [1] on the Middle Atlas Mountains. The choice of this watershed to study biodiversity and ecology of freshwater molluscs was prompted by several reasons. Indeed, the catchment area of Ouergha provides a great

variety of continental aquatic environments. Those water body have the characteristic to be less affected by pollution who suffered most of the hydrological basins of the country. So it is easy to carry out studies in natural populations who are not submitted to the aggressions of pollution.

The description of aquatic environments in Ouergha watershed has focused on 39 selected stations during surveys carried out between september 2002 and december 2005. The choice of these stations was based on the molluscan data available, species diversity in each station, proximity of human settlements and the maximum coverage area of the watershed. Stations selected belong to various hydrological facies fresh and brackish water, standing and running-water ecosystems, temporary and permanent-water ecosystems. They include different types of continental aquatic environments such as rivers, creeks, streams, ponds, dams and sources.

Therefore, we contribute by the present labor to establish a comprehensive inventory of the superficial freshwater molluscs in the catchment area of the Ouergha river. That study will also fill the gaps in the field of malacological inventories of water body in Rif mountains.

MATERIALS AND METHODS

The study area

The basin area of Ouergha river (Fig. 1) is located in north of Morocco between 34° 20' ~ 35° 10' north latitude and 3° 50' ~ 5° 30' west longitude. Elevations of mountains are between 100 and 2450 m.



The total area of the catchment is 7325 km². This watershed is set on the southern slopes of the Rif arch mountain chain of Alpine orogeny. In the northern region of the basin, are located the largest number of high ridges of the Rif chain whose high altitude exceed 2000 m.

The morphology of the basin is characterized by a relief that contains very strong slopes, a fundamental factor in erosion susceptibility. The climate of the basin is mediterranean type ranging from subhumid to semi-arid. In these bioclimatic zones are linked different stages of vegetation that are largely related to the altitude. Al-Wahda Dam is situated in the basin of the Ouergha with the retention capacity over than 3,700 million m³. It is the largest dam in Morocco that can protect Gharb plain against floods and can irrigates 100,000 hectares in the same plain. Pond of Annasser is the only existing important natural stagnant water bodies in the Ouergha basin. They are located 5 km west of Bab Berred city. The substrate is muddy, gravelly, rocky, sandy and muddy. Aquatic vegetation is composed by *Ceratophyllum demersum*, *Scirpus* sp, *Typha angustifolia*, *Juncus* sp, *Polygonum amphibium*, *Potamogeton pectinatus* and grasses.

Sampling methods

Sampling by Surber sampler

This method was used in rivers and springs. The Surber sampler consists of two interlocking frames that

support a capturing net. One frame outlines the area of stream bed to be sampled while the other supports the net. The sampler is intended for use in shallow (30 cm or less) flowing waters. We used a colander square (32 cm square) which is fitted with a mosquito net of 0.8 mm mesh size. The principle consists in scraping the bottom within the area bounded in front of the filter surface. The fauna stopped by strainer is recovered and taken for identification.

Quadrat method

The quadrat method has been widely used in plant and faunal studies. A quadrat is a four-sided figure which delimits the boundaries of a sample plot. Quadrat sampling involves counting all individuals within a known area (or volume). Since density (D) and population size (N) are related, as $N = D \times \text{area}$, we can estimate the density for the sample and from this compute the total population.

Visual search

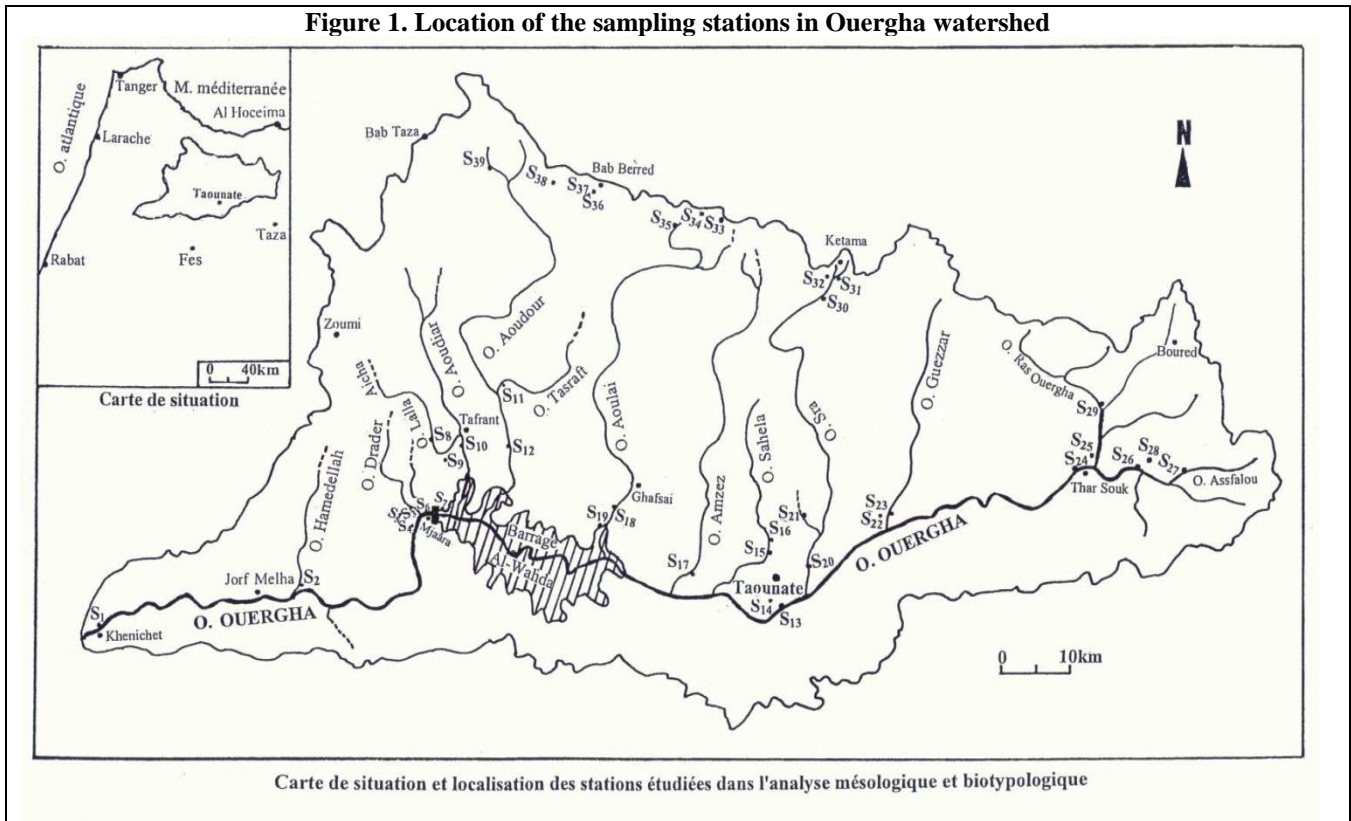
Visible species are taken by hand. Hunting shall be performed during a delimited period between 15 to 30 minutes. The alternative is not to set a time and consider that the sampling is completed when the habitat was enough sampled.

Table 1. The list of species harvested in Ouergha watershed throughout the study period

Class	Subclass	Order	Family	Species	
Gastropoda	Prosobranchia	Neritopsina	Neritidae	- <i>Theodoxus fluviatilis</i> Linnaeus, 1758	
		Neotaenioglossa	Melanopsidae	- <i>Melanopsis praemorsa</i> Linnaeus, 1758 - <i>Melanopsis scalaris</i> Gassies, 1856 - <i>Melanopsis costellata</i> Ferussac, 1823	
			Hydrobiidae	- <i>Mercuria similis</i> Draparnaud, 1805 - <i>Hydrobia maroccana</i> Pallary, 1921	
	Pulmonata	Basommatophora	Lymnaeidea	- <i>Lymnaea truncatula</i> O.F. Müller, 1774 - <i>Lymnaea maroccana</i> Pallary, 1889 - <i>Lymnaea peregra</i> O.F. Müller, 1774	
			Physidae	- <i>Physa acuta</i> Draparnaud, 1805	
			Planorbidae	- <i>Planorbarius metidjensis</i> Forbes, 1836 - <i>Anisus spirorbis</i> Linnaeus, 1758 - <i>Planorbis planorbis</i> Linnaeus, 1758 [?] - <i>Gyraulus laevis</i> Alder, 1838 [?]	
			Ancylidae	- <i>Ancylus fluviatilis</i> O.F. Müller, 1773	
			Succineidae	- <i>Succinea debilis</i> Morelet, 1845	
	Bivalvia	Eulamellibranchia	Veneroida	Sphaeriidae	- <i>Pisidium casertanum</i> Poli, 1791 - <i>Pisidium personatum</i> Malm, 1855 - <i>Pisidium nitidum</i> Jenyns, 1832
			Unionoida	Unionidae	- <i>Unio pictorum</i> Linnaeus, 1758.



Figure 1. Location of the sampling stations in Ouergha watershed



RESULTS AND DISCUSSION

The purpose to establish the checklist of freshwater molluscs in the Ouergha watershed (Table 1) is to be a useful tool for the aquatic management in the area especially after the construction of the Al-Wahda Dam. The symbol [?] indicates that the species is potential in the basin where only empty shells were collected. Freshwater molluscs were identified until species by referring the proceedings of [2-8].

Among the 40 freshwater molluscs known in Morocco, 20 species have been identified in the basin with two taxa are potential (*Gyraulus laevis* and *Planorbis Planorbis*). These species collected are divided into 10 families: 02 families Prosobranchia, 06 families of Pulmonate and 02 families of Bivalvia. Regarding species, the subclass of Pulmonata has the higher number of species (10 species) than Prosobranchia (5 species) and Bivalvia (4 species). The presence of *Lymnaea maroccana*, endemic species of Morocco, was confirmed in pools of Annasser which 13 species were collected. In comparison with other structural formations surrounding

the basin, [1] listed 17 species of freshwater molluscs in the Middle Atlas mountains. [9] identified 22 species in the Tangier Peninsula. According to our investigations in 1996, we collected 20 species in the Gharb plain. [10,11] sampled 20 and 16 species respectively in the coastal plateau and eastern Morocco. 11 species have been recorded by [12] in the Souss valley and 9 species only by [13] in the Tassaout plain.

The distribution of freshwater molluscs in the area of study has revealed a close correlation between the distribution of molluscs and various typological facies prospected. Ecological exclusion between prosobranchs and pulmonata confirms that biotic and abiotic factors are the most controlling the distribution of aquatic in the study area. Those factors are speed of water current, nature of the substrate and abundance of aquatic plants. [14] stated that freshwater snails are able to assimilate different ecological situations, which contributes to the expression of their high degree of eurytopy, pointed out by [15-20].

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