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New data on the distribution of aquatic beetles from Morocco (Coleoptera, Adephaga: Gyrinidae, Haliplidae and Dytiscidae)

Abdelkhaleq F. Taybi, Youness Mabrouki, Guy Chavanon, Ali Berrahou, Andrés Millán

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New faunistic and distributional data on aquatic beetles (Adephaga: Gyrinidae, Haliplidae and Dytiscidae) from the Oriental Region of Morocco and the basin of Moulouya River are presented. A check-list of 55 species of three families and 25 genera is provided. Eight species are new records for the basin of Moulouya River and nine species for the Oriental Region of Morocco.

Key words: Aquatic coleoptera, inventory, Northeastern of Morocco.

Abdelkhaleq F. Taybi, Youness Mabrouki, Guy Chavanon, Ali Berrahou. Université Mohamed Premier, Faculté des Sciences, Département de Biologie, Laboratoire Sciences de l'eau, l'environnement et du Développement Durable, B.P. 524, 60000 Oujda, Maroc.

Andrés Millán. Depto. Ecología e Hidrología, Fac. Biología, Universidad de Murcia, 30100, Espinardo, Murcia, Spain.*

**Corresponding author: acmillan@um.es*

INTRODUCTION

Morocco gathers a high biodiversity because of its great landscape and climate heterogeneity (Dakki 1997). Unfortunately, this biodiversity is threatened, particularly that inhabiting aquatic ecosystems. The Moulouya's watershed and Oriental Morocco are suffering a severe deterioration (Dakki & El Hamzaoui 1998). The major causes are resources exploitation and land use changes (Marañón et al. 1999). Indeed, this degradation is becoming more worrying because of the proliferation of many pollution sources from domestic, industrial and agricultural origins (Mabrouki et al. 2016a, 2017a; Taybi et al. 2016a). These anthropic pressures combined with drought episodes, typical of semiarid regions such as the study area, results in an important loss of aquatic habitats (Mabrouki et al. 2016b; Taybi et al. 2016b, 2017).

Within aquatic ecosystems, macroinvertebrates, and particularly water beetles, are one of the main components of total biodiversity (Jäch & Balke 2008), playing a key role in the ecosystem functioning (Wallace & Webster 1996). This group of organisms is also very sensitive to environmental changes, making them very useful for monitoring the ecological integrity of aquatic habitats (Barbour et al. 1999; Millán et al., 2006). In this sense, Berrahou

(1995) was the first researcher proposing a biotypology based on benthic macroinvertebrates of the Moulouya's river to identify aquatic ecosystems alterations. Later, other studies regarding monitoring of aquatic ecosystems have emerged from Oriental Morocco (Belouali, 1999; Chergui et al. 1999; Berrahou et al. 2001a et b; Mabrouki et al. 2016b; Taybi et al. 2016b).

Concerning faunistic works, Bedel (1925) and Alluaud (1926) were the first researchers studying aquatic beetles belonging to the suborder Adephaga from the regions of Oujda, Beni Snassen and Figuig. Posteriorly, Kocher (1958) added the zone of Fritissa in the Middle Moulouya, and several decades later, the Adephaga of the Oriental Región and Moulouya's river were studied again by Chavanon *et al.* (2004). Finally, Bennas & Sainz-Cantero (2006) and, recently, Benamar (2015) in their studies about aquatic coleopteran included also important information for Adephaga beetles in the study area.

In this framework, information of the presence and distribution of water beetles species seems of special concern for any purpose of conservation and/or manage of aquatic ecosystems and their biodiversity in the study area. Thus, the main goal of this work is to contribute to the improvement of the knowledge of the presence and distribution of aquatic beetles (suborder Adephaga) from the Oriental Morocco and Moulouya basin.

MATERIAL AND METHODS

Study area

Morocco is currently divided, according to the new administrative division, into 12 regions including the Oriental Region (Fig. 1), which occupies the entire eastern side of the country and covers an area of 90,127 km^2. This area is bounded to the north by the Mediterranean Sea, to the east and south by the Morocco-Algerian

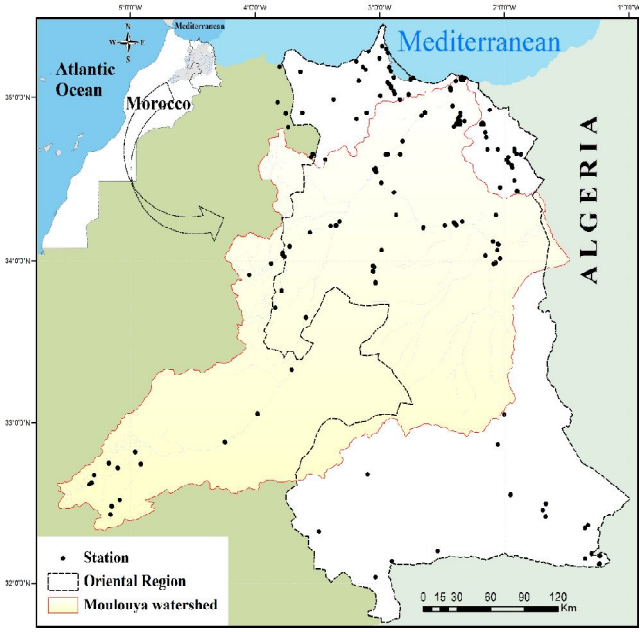

Fig 1. The studied localities of the Oriental Region of Morocco and the basin of Moulouya River

border and to the west by the administrative regions of Tangier-Tetouan, Al Hoceima, Fez-Meknes and Draa-Tafilalt.

The Oriental region includes the wilaya of Oujda (Oujda-Angad prefecture) and the provinces of Berkane, Taourirt, Jerada, Nador, Figuig, Driouch and Guercif. The watershed of the Moulouya (Fig. 1), which includes nearly 55,860 km^2 to the east of Morocco, covers much of the Oriental region. It is located between the parallels 36 and 39 degrees North and the meridians 5.5 and 7 degrees West. With a length of 520 km, the Moulouya is the largest North African river flowing into the Mediterranean. It starts at the junction of the High and Middle Atlas chains, and flows primarily one southwest - northeast axis. Its main tributaries are perennial: Anzegmir Wadi, Melloulou Wadi and Za Wadi, others flow only during the floods (3-5 floods on average per year). The river flows through various Mediterranean bioclimatic zones (Berrahou, 1995).

Sampling

The field surveys were conducted between 2011 and 2016, in which 45 localities have been carried along the watershed of the great Moulouya, with large permanent rivers: Oued Anzegmir (side of the High Atlas) Oued Melloulou (Middle Atlas side) and Oued Za (High Plates) visited at least during three sampling campaigns. This survey was completed sampling 43 more localities distributed all over Oriental Morocco, from the regions of Nador and Saidia North, Figuig southeast, Talessint and Bouanane southwest (See Appendix xx, for the complete list of localities). The samples of benthic fauna, essentially qualitative, were carried out by a kick net, landing nets and clamps.

The recorded species were preserved in alcohol at 70 or 96 % in duly labeled tubes and deposited in the collection of aquatic macroinvertebrates at the Laboratory of Water Sciences, Environment and Sustainable Development of the University Mohammed Premier from Oujda.

Chorological study

The different chorological categories proposed for the 55 Adephaga species of eastern Morocco and the Moulouya's watershed were ranked according to Greca (1964, 1975) and Taglianti et al. (1992) for the classification of western Palearctic fauna.

Abbreviations

SIBE: Site of Biological and Ecological Interest. The species new for Moulouya basin are marked by #, for the entire area by *.

RESULTS

Family Dytiscidae Leach, 1815
Subfamily Hydroporinae Aubé, 1836
***Hyphydrus* Illiger, 1802**
***Hyphydrus aubei* Ganglbauer, 1891#**
Material examined. Ait Oha Ohaki: 14.07.2014, 1 larva; Arbalou: 03.05.2014, 1 male, A.F. Taybi & Y. Mabrouki leg.
Distribution. Mediterranean species, known from North Africa to Central Europe; widely distributed in the Iberian Peninsula (Millán et al. 2014). It was recorded from the north-eastern Morocco (Benamar 2015). A new species for the basin of Moulouya River: one larva of *H. aubei* was found among the macrophytes in the High Moulouya at Ait Boulmane and one adult was sampled during the summer at Irhdis (Fig. 10).

***Hydrovatus* Motschulsky, 1853**
***Hydrovatus clypealis* Sharp, 1876**
Distribution. Atlantic-Mediterranean species, widely distributed in the Iberian Peninsula (Millán et al. 2014). It was recorded from the north-eastern Morocco (Benamar 2015). It was cited (Chavanon et al. 2004; Bennas & Sàinz-Cantero 2006) for the Oriental Region at the mouth of Moulouya River (Fig. 9).

***Yola* Gozis, 1886**
***Yola bicarinata* (Latreille, 1804)**

Material examined. Irhdis: 13.06.2014, 1 male, 1 female; Arbalou: 14.07.2014, 2 females; Pont Hassan II: 18.05.2014, 130 males & females; Pré-Estuaire: 18.05.2014, 88 males & females; Carrière Oujda: 17.07.2016, 4 males, 3 females, A.F. Taybi & Y. Mabrouki leg.
Distribution. This West Mediterranean species is widely distributed in North Africa, Iberian Peninsula and Central Europe (Millán et al. 2014). It was recorded from the northern Morocco by Benamar (2015). It was recorded for the studied area by Bedel (1925), Alluaud (1926), Chavanon et al. (2004) and Bennas & Sàinz-Cantero (2006). *Y. bicarinata* was found between macrophytes at the High Moulouya in stagnant water ponds adjacent to the lower reach of the river, and in stagnant waters of the abandoned quarry near Oujda (Fig. 7).

***Bidessus* Sharp, 1882**
***Bidessus coxalis* Sharp, 1882**
Distribution. West Mediterranean species, known from France, western regions of Iberian Peninsula (Millán et al. 2014). It was recorded from north-eastern Morocco by Benamar (2015) and from the southeast of the Oriental Region at Figuig (Fig. 9) by Chavanon et al. (2004).

***Bidessus goudotii* (Laporte de Castelnau, 1835)**
Distribution. West Mediterranean species. It is distributed in the northwestern part of Morocco and was recorded for the region of Berkane in eastern Morocco (Fig. 9) by Benamar (2015).

***Bidessus minutissimus* (Germar, 1824)**
Material examined. Irhdis: 13.06.2014, 1 male; Amont Taourirt: 19.07.14, 1 female; Confluence Zobzit O. El Bared: 15.08.2014, 2 females; Abbou Lekhal: 22.05.2016, 1male, 1 female, A.F. Taybi & Y. Mabrouki leg.
Distribution. West Mediterranean species, known from the Iberian Peninsula (Millán et al. 2014) and northern Morocco (Benamar 2015). It is a common species in the Oriental Region and the Moulouya basin (Berrahou et al. 2000, 2001b; Chavanon et al. 2004; Bennas & Sàinz-Cantero 2006). At the Middle Melloulou it is recorded for the first time (Fig. 2).

***Hydroglyphus* Motschulsky, 1853**
***Hydroglyphus major* (Sharp, 1882)**
Distribution. Afrotropical-South Mediterranean species (Nilsson & Hájek 2013). It was recorded from the Figuig region of (Fig. 9) by Benamar (2015).

***Hydroglyphus geminus* (Fabricius, 1792)**
Material examined. Ait Boulmane: 14.07.2014, 1 male; Ait Oha Ohaki: 14.07.2014, 1 male, 2 females; Pont Hassan II: 18.05.2014, 3 males, 1 female. Pré-Estuaire: 23.06.2014, 1 male, 2 females; O. Charef: 17.05.2014, 1 female; Marchica (2): 2.05.2016, 4 males, 7 females, A.F. Taybi & Y. Mabrouki leg.

Distribution. It is a palaearctic species, widely distributed in the Iberian Peninsula (Millán et al. 2014) and the northern part of Morocco (Benamar 2015). It has already been recorded in the eastern region and the Moulouya basin (Berrahou et al. 2001a; Chavanon et al. 2004; Bennas & Sàinz-Cantero 2006; Millán et al. in press). The distribution of the species in the studied region as in Fig. 4.

***Hydroglyphus signatellus* (Klug, 1834) #**
Material examined. Mare À Debdou: 27.04.2016, 1 male, A.F. Taybi & Y. Mabrouki leg.
Distribution. Afrotropical-South Palearctic species. It is widely distributed in the entire Mediterranean region, including Iberian Peninsula (Millán et al. 2014). It was recorded in North Africa from Senegal and Morocco to Egypt, Sudan, Ethiopia and Kenya (Biström 1986). It has been previously recorded in the Oriental Region of Morocco between Bouarfa and Figuig (Chavanon et al. 2004). The distribution of the species in the studied region as in Fig. 4.

***Hygrotus* Stephens, 1828**

***Hygrotus (Coelambus) confluens* (Fabricius, 1787)**

Material examined. O. Charef: 19.03.2014, 1male; O. Charef: 07.08.2014, & 1 larva; Pond O. Charef: 19.03.2014, 2males, 3 females; Oued Lakhrouf: 07.08.2014, 1 female; Mare À Debdou: 27.04.2016, 1 female; Bassin Oujda: 20.02.2016, 2males, 3 females, A.F. Taybi & Y. Mabrouki leg.

- Aït Aïssa: 12.09.2014, 1 female, L. Daoudi leg.

Distribution. Palaearctic species extending to the Afrotropic Region; it is known from the Iberian Peninsula (Millán et al. 2014). It is a common species in the northern Morocco (Benamar 2015) and known from the basin of Moulouya River and Oriental Region of Morocco (Alluaud 1926; Berrahou et al. 2001a; Chavanon et al. 2004; Benamar, 2015). The distribution of the species in the studied region as in Fig. 4.

***Hydroporus* Clairville, 1806**

***Hydroporus marginatus* (Duftschmid, 1805)**

Distribution. West Palearctic species. It is usually associated with the main mountain ranges in the Iberian Peninsula (Millán et al. 2014) and Morocco (Benamar 2015). It was recorded from the basin of the Oued Za (Fig. 9), at Ain Benimathar and Guefaït in the eastern part of the basin of Moulouya River (Alluaud 1926; Chavanon et al. 2004).

***Hydroporus lucasi* Reiche, 1866**

Material examined. Anzar Oufounas: 15.07.2014, 1 male; Aval Anzar Oufounas: 14.06.2014, 1 male, 1 female; Bassin Oujda: 23.04.2016, 2 males; Ait Oha Ohaki: 03.05.2014, 2 males, 2 females; Sources O. El Bared: 11.07.2014, 1 males, 2 females, A.F. Taybi & Y. Mabrouki leg.

Distribution. West Mediterranean species. It is distributed in southern Europe and North Africa; the Iberian and central systems represent the northern limit of its range (Millán et al. 2014). It is known from the northwestern Morocco (Benamar 2015). Indeed, all bibliographic records of *H. planus* must be corresponds with *H. lucasi*, since its distribution is limited to Europe (Millán et al. 2014). This species was recorded for the studied area (Chavanon et al. 2004; Bennas & Sàinz-Cantero 2006). The distribution of the species in the studied region as in Fig. 5.

***Hydroporus pubescens* Gyllenhal, 1808**

Material examined. Anzar Oufounas: 15.07.2014, 1 male, A.F. Taybi & Y. Mabrouki leg.

Distribution. West Palearctic species, with diffusive distribution throughout the mountain systems of the Iberian Peninsula (Millán et al. 2014) and mountain regions of the northern Morocco (Benamar 2015). It was recorded from the mouth of the Moulouya River (Chavanon et al. 2004). During the sampling period, only one adult of *H. pubescens* was found in source of Anzar Oufounas (Fig. 5), belonging to Oued Anzegmir (High Atlas).

***Hydroporus discretus* Fairmaire & Brisout de Barneville 1859 #**

Material examined. Sources O. El Bared: 11.07.2014, 1 male, A.F. Taybi & Y. Mabrouki leg.

Distribution. West Palaearctic species, widely distributed in the western Asia and North Africa. It is one of the most common species in the Iberian Peninsula (Millán et al. 2014). It was recorded from the Rifian Area of Morocco (Benamar 2015) and from Nador in the eastern region (Bennas & Sàinz-Cantero 2006). It is a new species for the basin of the Moulouya River, being collected upstream of Wadi Melloulou (Fig. 5), corresponding to the Middle Atlasic part (see study area section).

***Graptodytes* Seidlitz, 1887**

***Graptodytes ignotus* Mulsant & Rey, 1861 #**

Material examined. Irhdis: 14.07.2014, 2 females; Tamdafelt: 15.07.2014, 1 male, A.F. Taybi & Y. Mabrouki leg.

Distribution. West Mediterranean species, known from the southern Europe and North Africa; it is widely distributed in the Iberian Peninsula (Millán et al. 2014). It was recorded

for the Rifian area of Morocco by Benamar (2015) and for Nador, Oriental Region (Bennas & Sàinz-Cantero 2006; Benamar 2015). It is recorded for the Moulouya for the first time (Fig. 7).

***Graptodytes varius* Aubé, 1838**

Material examined. Ait Oha Ohaki: 14.07.2014, 2 female; Arbalou: 13.06.2014, 1 female; Irhdis: 13.06.2014, 1 male; Tamdafelt: 15.07.2014, 2 males, 7 females; Missour: 15.07.2014, 5 males, 5 females; Pont Hassan II: 23.06.2014, 1 male, 9 females; Aval Anzar Oufounas: 15.07.2014, 5 males 3 females; O. Charef: 07.08.2014, 9 female; Pond O. Charef: 07.08.2014, 6 males, 4 females; Amont Gafait: 07.08.2014, 4 females; Douar Ifrane: 07.08.2014, 3 males, 2 females; Douar Imzaghrou: 08.06.2014, 2 males ; Pont Taddarte: 08.06.2014, 1 male, 2 females, A.F. Taybi & Y. Mabrouki leg.

Distribution. This species is widely distributed in southern Europe and North Africa; it was recorded for the Iberian Peninsula (Millán et al. 2014), for the northwestern part of the Rifian area of Morocco (Benamar 2015). It was cited for the studied area by Kocher (1958) and Chavanon et al. (2004). The distribution of the species in the studied region as in Fig. 7.

Graptodytes flavipes* Olivier, 1795

Material examined. Ait Oha Ohaki: 14.07.2014, 3 males, 7 females; Irhdis: 14.07.2014, 4 males 7 females; Tamdafelt: 15.07.2014, 5 females; Missour: 15.07.2014, 2 males; Pont Hassan II: 23.06.2014, 2 females; Pré-Estuaire: 23.06.2014, 1 male; O. Charef: 07.08.2014, 3 females; Petite Cascade: 07.08.2014, 2 males; Amont Gafait: 07.08.2014, 1 male, A.F. Taybi & Y. Mabrouki leg.

Distribution. Turanic-Euro-Maghrebian species; common in the Iberian Peninsula, absent from the Mediterranean side (Millán et al. 2014). It is known from the northern Morocco (Benamar 2015). It is a new record for the studied area (Fig. 10).

***Graptodytes aequalis* Zimmermann, 1918**

Material examined. Ait Boulmane: 14.07.2014, 4 males, 3 females; Ait Oha Ohaki: 14.07.2014, 13 males 10 females; Irhdis: 14.07.2014, 22 males, 24 females; Tamdafelt: 15.07.2014, 10 males, 9 females; Missour: 15.07.2014, 2 males, 4 females; Pont Hassan II: 23.06.2014, 5 males, 3 females; Pré-Estuaire: 23.06.2014, 5 males, 13 females; O. Charef: 07.08.2014, 1 male, 2 females; Pond O. Charef: 17.05.2014, 3 males, 3 females; Petite Cascade: 07.08.2014, 2 males, 2 females; Oued Lakhrouf: 07.08.2014, 4 females; Grandes Cascades: 07.08.2014, 1male, 6 females; Amont Gafait: 07.08.2014, 1 male, 1 female; Douar Ifrane : 07.08.2014, 1 male; Pont Taddarte: 08.06.2014, 2 females, A.F. Taybi & Y. Mabrouki leg.

Distribution. Ibero-Moroccan species; it is known from the southern part of the Iberian Peninsula (Millán et al. 2014) and northern Morocco (Benamar 2015). In the eastern region it was recently reported at Debdou (Benamar, 2015). Like its congener *G. flavipes*, *G. ignotus* was found on the Moulouya River and in the upper regions of the Oued Za, in addition to Oued Melloulou (Fig. 11).

***Scarodytes* Gozis, 1914**

***Scarodytes halensis halensis* (Fabricius, 1787)**

Distribution. West Palearctic species, widely distributed in the Iberian Peninsula and absent in the arid areas (Millán et al. 2014). It is a quite rare species in Morocco, known from the northern part (Benamar 2015). It was recorded in the area of Oujda, Oriental Region (Bedel 1925; Kocher 1958).

***Herophydrus* Sharp, 1882**

***Herophydrus musicus* Klug, 1833**

Material examined. O. Charef: 17.05.2014, 1 female; Barrage Sfissef: 21.05.2016, 1 male 3 females, A.F. Taybi & Y. Mabrouki leg.

Distribution. South Palearctic species. It is known from the southern part of the Mediterranean region of the Iberian Peninsula (Millán et al. 2014) and northeastern Morocco

(Benamar 2015). It is a very common species in the studied area (Kocher 1958; Berrahou et al. 2001b; Chavanon et al. 2004). The distribution of the species in the studied area is show in Fig. 4.

***Stictonectes* Brinck, 1943**

***Stictonectes optatus* (Seidlitz, 1887)**

Material examined. Ait Oha Ohaki: 14.07.2014, 1 female; Arbalou: 14.07.2014, 1 male, 1 female; O. Charef: 17.05.2014, 1 female; Grandes Cascades: 17.05.2014, 1 male; Source Himer: 18.11.2015, 1 female; Amont Himer: 18.11.2015, 1 male, A.F. Taybi & Y. Mabrouki leg.

Distribution. West Mediterranean species, known from the southern and eastern parts of the Iberian Peninsula (Millán et al. 2014) and northern Morocco (Benamar 2015). It was recorded for the studied area by Berrahou et al. (2000) and Chavanon et al. (2004). The distribution of the species in the studied region as in (Fig. 7).

Stictonectes escheri* (Aubé, 1838)

Material examined. Arbalou: 14.07.2014, 1 male; O. Charef: 07.08.2014, 1 male, 2 females; Pond O. Charef: 07.08.2014, 2 females, A.F. Taybi & Y. Mabrouki leg.

Distribution. West Mediterranean species, known from the southwestern part of the Iberian Peninsula (Millán et al. 2014) and from the Atlantic coast and the Rifian domain in Morocco (Benamar 2015). It is recorded here from the Upper Moulouya and the Upper Oued Za for the first time (Fig. 11).

***Stictotarsus* Zimmermann, 1919**

***Stictotarsus procerus* (Aubé, 1838)**

Distribution. Maghrebian species, known from Corsica, Sardinia and Sicily (Mazzoldi & Toledo 1998). It is known from the northern Morocco (Benamar 2015) and from Oujda near Oued Isly (Kocher 1958), Oriental Region (Fig. 9).

Stictotarsus maghrebinus* (Mazzoldi & Toledo, 1998)

Material examined. Boumia: 15.07.2014, 1 male, A.F. Taybi & Y. Mabrouki leg.

Distribution. It was described from Maghreb. This species is known from the Tassili Region of Algeria (Mazzoldi & Toledo 1998) and the Rif and Atlas regions of Morocco (Benamar 2015). It is a new species for the studied area: a single male of *S. maghrebinus* was collected at Boumia (Fig. 10), corresponding to the High Moulouya and the Middle Atlasic slope.

***Deronectes* Sharp, 1882**

***Deronectes moestus* (Fairmaire, 1858)**

Material examined. Ain Almou: 6.06.2016, 1 male, 2 females, A.F. Taybi & Y. Mabrouki leg.

Distribution. West Mediterranean species; it is distributed in the Iberian Massif with some Mediterranean influence (Millán et al. 2014) and widely distributed in the northern Morocco (Benamar 2015). It was recorded for Nador, Oriental Region (Bennas & Sàinz-Cantero 2006) and in the basin of the Moulouya in the Zeghzel complex (Chavanon et al. 2004). The distribution of the species in the studied region as in Fig. 3.

***Deronectes fairmairei* Lepieur, 1876**

Material examined. Irhdis: 13.06.2014, 2 females; Boumia: 15.07.2014, 1 female; Sources O. El Bared: 27.03.2014, 2 females; Amont O. El Bared: 07.08.2014, 1 male, 1 female; Sources Berkine: 15.06.2014, 1 female; Douar Imzaghrou: 15.08.2014, 1 male; Aval Zeghzel: 28.04.2016, 2 females; Amont Himer: 18.11.2015, 1 male, 3 females; Source Zeghzel: 01.02.2015, 4 males, 2 females; O. Anwal: 21.01.2016, 1 male, A.F. Taybi & Y. Mabrouki leg.

Distribution. West Mediterranean species. It is known from the Mediterranean mountain regions of the Iberian Peninsula (Millán et al. 2014) and widely distributed in the northern Morocco (Benamar 2015) and in the studied area (Berrahou 1995; Chavanon et al. 2004; Bennas & Sàinz-Cantero 2006). The distribution of the species in the studied region as in Fig. 3.

***Nebrioporus* Régimbart, 1906**

***Nebrioporus (Nebrioporus) clarkii* Wollaston, 1862**

Material examined. Ait Oha Ohaki: 14.07.2014, 1 male, 1 female; Anzegmir Avant Barrage: 14.06.2014, 1 male; Tindint: 14.06.2014, 2 females; O. Charef: 17.05.2014, 23 males, 38 females 15 larvae; Pond O. Charef: 19.03.2014, 14 males, 16 females. 22 larvae; Petite Cascade: 19.03.2014, 2 males; Oued Lakhrouf: 07.08.2014, 5 males, 2 females; Pont Gafait: 19.03.2014, 3 males, 14 larvae; Pont Gafait: 07.08.2014, 20 males, 22 females, 6 larvae; Gafait: 17.05.2014, 6 males, 7 females, 6 larvae; Amont Taourirt: 19.07.14, 2 females; Amont O. El Bared: 07.08.2014, 3 males, 1 larva; Amont Berkine: 15.08.2014, 2 females; Pont O. Zobzit: 15.08.2014, 2 males, 2 females.& 1 larva; Confluence Zobzit O. El Bared: 08.06.2014, 3 larvae; Douar Imzaghrou: 15.08.2014, 3 females, 1 larva; Pont Taddarte: 15.08.2014, 1 female; Aval Melloulou: 15.08.2014, 4 males, 5 females; Mare à Debdou: 27.04.2016, 2 females; Amont Himer: 18.11.2015, 1 male; Source Zeghzel: 01.02.2015, 1 female; Raknat Naam: 21.05.2016, 1 female; Barrage Zriga: 21.05.2016, 1 male; Barrage Sfissef: 21.05.2016, 4 males, 2 females, 3 larvae; Abbou Lekhal: 22.05.2016, 1 male, 3 females, A.F. Taybi & Y. Mabrouki leg - Aït Aïssa: 9.05.2014, 3 males, 4 females, L. Daoudi leg.

Distribution. West Mediterranean species, extending to the Canary Islands and Turkey. It is distributed in the southeastern Iberia (Millán et al. 2014) and northern Morocco(Benamar 2015) and was recorded for the Oriental Region and basin of Moulouya River (Berrahou et al. 2000, 2001a,b; Chavanon et al. 2004; Bennas & Sàinz-Cantero 2006). The distribution of the species in the studied region as in Fig. 6.

***Nebrioporus (Zimmermannius) ceresyi* (Aubé, 1838)**

Material examined. Dardoura: 2.05.2016, 1 male; Oumassine: 12.05.2016, 7 males, 2 females; Kert: 12.05.2016, 5 males, 11 female; Barrage Zriga: 21.05.2016, 1 male; Abbou Lekhal: 22.05.2016, 1 male, 1 female, A.F. Taybi & Y. Mabrouki leg.

Distribution. Holomediterranean species. It is known from the southern coastal part of Iberian Peninsula, (Millán et al. 2014) and widely distributed in Morocco (Benamar 2015). It was recorded for the studied area (Alluaud 1926; Kocher 1958; Chavanon et al. 2004), where the species inhabit river systems near the coast and the saline waters of the Oriental Desert. It was collected from Nador and saline habitats of the Figuig Region (Fig. 6).

Nebrioporus nemethi* Guignot, 1950

Material examined. Oued Lakhrouf: 07.08.2014, 1 male, 1 female; Marchica (1): 22.05.2015, 1 male, A.F. Taybi & Y. Mabrouki leg.

Distribution. It is an endemic of the northern Morocco (Benamar 2015) and new species for the basin of Moulouya River and the Oriental Region. We collected specimens at Oued Lakhrouf, a tributary of the Oued Za, and near Nador Lagoon (Fig. 11) in a small saltwater pond resulting from the rising of the level of groundwater.

Subfamille Laccophilinae Gistel, 1856

***Laccophilus* Leach, 1817**

***Laccophilus hyalinus testaceus* Aubé, 1837**

Material examined. Irhdis: 14.07.2014, 1 male; Boumia: 14.06.2014, 3 males, 1 female, 1 larva; Pont Hassan II: 23.06.2014, 2 females; Pré-Estuaire: 18.05.2014, 1 male, 1 female; Petite Cascade: 17.05.2014, 1 female; Grandes Cascades: 17.05.2014, 1 female; Amont Gafait: 19.03.2014, 2 females; Pont Gafait: 17.05.2014, 3 males, 2 females; Gafait: 17.05.2014, 1 female; Amont Taourirt: 19.07.14, 3males; Amont Berkine: 15.06.2014, 2 males, 3 larvae; Douar Ifrane: 07.08.2014, 1 female; Pont O. Zobzit: 15.08.2014, 1 male, 2 females; Confluence Zobzit O. El Bared: 15.08.2014, 3 males; Douar Imzaghrou: 15.08.2014, 2 males, 1 female; Entrée Guercif: 15.08.2014, 1 female; Aval Melloulou: 15.08.2014, 3males; Mare à Debdou: 27.04.2016, 5 males, 2 females; Source Himer:

18.11.2015, 19 males, 20 females; Amont Himer: 18.11.2015, 15 males, 9 females; Dardoura: 2.05.2016, 1 female; Oued Ouzej: 30.04.2016, 5 males, 8 females; O Messoussate: 2.05.2016, 1 male; Mont Gourougou: 5-6-7.02.2015, 1 female; Oued Tifassour: 12.05.2016, 1 female; Oumassine: 12.05.2016, 1 male, 1 female; Mariouari:12.05.2016, 2 males; Barrage Sfissef: 21.05.2016, 1 male; Abbou Lekhal: 22.05.2016, 6 males, 5 females, A.F. Taybi & Y. Mabrouki leg.

Distribution. West Mediterranean species, widely distributed in the Iberian Peninsula (Millán et al. 2014) and northern Morocco (Benamar 2015). It is one of the most widely distributed species in the studied area (Berrahou 1995; Chavanon et al. 2004; Bennas & Sàinz-Cantero 2006). The distribution of the species in the studied region as in Fig. 6.

***Laccophilus minutus* Linnaeus, 1758**

Material examined. Ait Oha Ohaki: 14.07.2014, 1 male, A.F. Taybi & Y. Mabrouki leg.

Distribution. Palaearctic species; widely distributed in the Iberian Peninsula (Millán et al. 2014) and Morocco (Benamar 2015). It was cited for several localities of the studied region (Chavanon et al. 2004; Benamar 2015). The distribution of the species in the studied region as in Fig. 6.

Subfamily Colymbetinae Erichson, 1837

***Agabus* Leach, 1817**

***Agabus (Gaurodytes) bipustulatus* (Linnaeus, 1767)**

Material examined. Ain Chabbak: 28.04.2016, 3 males, 3 females, A.F. Taybi & Y. Mabrouki leg.

Distribution. Palaearctic species, with an extension into the Afrotropical Region and widely distributed in the Iberian Peninsula (Millán et al. 2014) and northern Morocco (Benamar, 2015). It was recorded for Tendrara, Oriental Region by Alluaud (1926). It is a new record for the basin of the Moulouya River (Fig. 2), where it was collected in the marshy system of Cherraba (Saidia).

***Agabus (Gourodytes) biguttatus* Olivier, 1795 #**

Material examined. Anzar Oufounas: 14.06.2014, 1 male, 1 female; Aval Anzar Oufounas: 14.06.2014, 1 male; Anzegmir Avant Barrage: 14.06.2014, 1 male; Aval Anzegmir: 14.06.2014, 2 males, 4 females; Sources O. El Bared: 11.07.2014, 4 males, 4 females; Amont O. El Bared: 07.08.2014, 1 male, 3 females; Douar Ifrane: 07.08.2014, 3males; Sources Berkine: 15.06.2014, 4 males, 7 females; Sources Berkine: 15.06.2014, 6 males, 4 females; Amont Berkine: 15.06.2014, 2 males, 3 females; Amont Berkine: 15.06.2014, 1 male, 4 females; Pont O. Zobzit: 08.06.2014, 4 females; Confluence Zobzit O. El Bared: 15.08.2014, 2 females, A.F. Taybi & Y. Mabrouki leg.

Distribution. West-palaearctic species, widely distributed in the Iberian Peninsula, especially in mountainous areas (Millán et al. 2014), common species for the mountains of Morocco (Benamar 2015). It was recorded from Nador (Bennas & Sàinz-Cantero 2006). It is recorded here for the basin of Moulouya River for the first time (Fig. 2).

***Agabus (Gourodytes) didymus* Olivier, 1795**

Material examined. Ait Boulmane: 13.06.2014, 1 male, 1 female; Arbalou: 13.06.2014, 1 female; Boumia: 14.06.2014, 7 males, 18 females; Anzar Oufounas: 15.07.2014, 5 males, 7 females ;Aval Anzar Oufounas: 14.06.2014, 3males; Anzegmir Avant Barrage: 02.05.2014, 1 female; Aval Anzegmir: 02.05.2014, 1 male; Sources O. El Bared: 11.07.2014, 1 male; Douar Ifrane: 07.08.2014, 1 female; Sources Berkine: 15.06.2014, 4 males, 1 female; Bassin Oujda: 1-4.12.2015, 1 female, A.F. Taybi & Y. Mabrouki leg.

Distribution. European-Mediterranean species, widely distributed in the Iberian Peninsula (Millán et al. 2014) and northern Morocco (Benamar 2015). This species was recorded for the studied area (Berrahou 1995; Chavanon et al. 2004; Bennas & Sàinz-Cantero 2006). The distribution of the species in the studied region as in Fig. 2.

***Agabus (Gaurodytes) brunneus* gr. Fabricius, 1798**

Material examined. Amont Himer: 18.11.2015, 1 male; Mont Gourougou: 5-6-7.02.2015, 2 males, 1 female, 1 larva, A.F. Taybi & Y. Mabrouki leg.

Distribution. *A. brunneus* complex is a West Mediterranean group that extends to Atlantic Europe (Hidalgo-Galiana et al. 2014). It is widely distributed in the Iberian Peninsula and North Africa, where it is represented by two species: *A. brunneus* (Fabricius, 1798) and *A. ramblae* Millán & Ribera 2001. In Morocco, *A. brunneus* as a wide distribution in the north (Benamar 2015). However, we highlighted the presence, particularly in the most eastern zone (Amont Himer) from the study area, of some mixed forms between *A. brunneus* and *A. ramblae* resembling *A. rufulus* Fairmaire, 1859. Unfortunately, we could not preserve any material in pure ethanol from such population that seems crucial to be more precise to disentangle if the studied material really corresponds to *A. brunneus, A. ramblae* or *A. rufulus*. It was collected in intermittent streams at the Gourougou and Jbel El Himer (Fig. 10).

***Agabus (Gaurodytes) nebulosus* (Forster, 1771)**

Material examined. Debdou: 27.04.2016, 1 female; Bassin Oujda: 1-4.12.2015, 1 male, 1 female, 1 larva; Amont O. El Bared: 07.08.2014, 3 males; Douar Ifrane: 07.08.2014, 1 male, 3 females, A.F. Taybi & Y. Mabrouki leg.

Distribution. European-Mediterranean species, widely distributed in the Iberian Peninsula (Millán et al. 2014) and northern Morocco (Benamar 2015). It was recorded for the studied area (Alluaud 1926; Berrahou 1995; Berrahou et al. 2001a; Chavanon al. 2004). *A. nebulosus* was found around Debdou, Oujda and Upper Wadi Melloulou (Fig. 2), where it inhabit stagnant puddles adjacent to the main streams.

***Ilybius* Erichson, 1832**

***Ilybius chalconatus* Panzer, 1796 #**

Material examined. Ait Boulmane: 03.05.2014, 1 female; Ait Oha Ohaki: 13.06.2014, 1 male, A.F. Taybi & Y. Mabrouki leg.

Distribution. European-Mediterranean species, widely distributed in the Iberian Peninsula (Millán et al. 2014) and Morocco (Benamar 2015). It was recorded for the basin of Oued Za in the Oriental Region (Chavanon et al. 2004). It is recorded here for the High Moulouya (Fig. 5) for the first time in: specimens were collected in stagnant ponds near the main stream.

***Colymbetes* Clairville, 1806**

***Colymbetes fuscus* (Linnaeus, 1758)**

Material examined. Irhdis: 14.07.2014, 1 male; Mont Gourougou: 5-6-7.02.2015, 3 larvae, A.F. Taybi & Y. Mabrouki leg.

Distribution. West Palaearctic species, widely distributed in the Iberian Peninsula (Millán et al. 2014) and the northern Morocco (Benamar 2015). It was recorded from Nador (Bennas & Sàinz-Cantero 2006) and the High Moulouya (Berrahou et al. 2001b). The distribution of the species in the studied region as in Fig. 3.

Colymbetes schildknechti* Dettner, 1983

Material examined. Amont Himer: 18.11.2015, 1 male, A.F. Taybi & Y. Mabrouki leg.

Distribution. West Mediterranean species, known from Corsica, southern Italy including Sicily, southern part of the Iberian Peninsula (Millán et al. 2014) and northwestern Morocco (Benamar 2015). It is a new species for the studied region (Fig. 3).

***Rhantus* Dejean, 1833**

Rhantus (Rhantus) suturalis* (Macleay, 1825)

Material examined. Ain Chabbak: 28.04.2016, 1 male, A.F. Taybi & Y. Mabrouki leg.

Distribution. A subcosmopolitan species (Nilsson & Holmen 1995; Balke 2001; Balke & Mazzoldi 2003), known from the northwestern Morocco (Benamar 2015). The distribution of the species in the studied region as in Fig.11.

***Meladema* Laporte de Castelnau, 1834**
***Meladema coriacea* Laporte de Castelnau, 1835**
Material examined. Mont Gourougou: 5-6-7.02.2015, 3 males, 3 females, 3 larvae; Source Himer: 18.11.2015, 2 males, 1 female; A.F. Taybi & Y. Mabrouki leg - Aït Aïssa: 15.06.2014, 1 female, L. Daoudi leg.
Distribution. Mediterranean species, widely distributed in the southern part of the Iberian Peninsula (Millán et al. 2014) and northern Morocco (Benamar 2015). It was recorded for several localities of the studied region by Chavanon et al. (2004). The distribution of the species in the studied region as in Fig. 6.

Subfamily Dytiscinae Leach, 1817
***Eretes* Laporte de Castelnau, 1833**
***Eretes sticticus* (Linnaeus, 1767)**
Material examined. Mare à Debdou: 27.04.2016, 2males, A.F. Taybi & Y. Mabrouki leg.
Distribution. It is a cosmopolitan species, widely distributed in the Old World from the Middle East through North Africa to Cyprus, Cape Verde and the Canary Islands, and in the New World from Peru and the Galápagos Islands to the Virgin Islands of the United States (Miller 2002). It is known from northern Morocco (Benamar 2015), and from the studied area (Chavanon et al. 2004; Bennas & Sàinz-Cantero 2006). The distribution of the species in the studied region as in Fig. 4.

Eretes griseus* (Fabricius, 1781)
Material examined. Barrage Za: 27.04.2016, 1 male, A.F. Taybi & Y. Mabrouki leg.
Distribution. The species is widely distributed in the Palearctic Region (Miller 2002), known from the Mediterranean parts of the Iberia (Millán et al. 2014) It was recorded from Morocco without a precise locality by Miller (2002) and from the northwestern region by Benamar (2015). It is here recorded for the Moulouya and the Oriental Region (Fig. 11).

***Dytiscus* Linnaeus, 1758**
***Dytiscus circumflexus* Fabricius, 1801**
Distribution. West Palearctic species, known from the Iberian Peninsula (Millán et al. 2014) and from the northern Morocco (Benamar 2015). It was recorded from three localities (Debdou, Tafoghalt and the mouth of the Moulouya River (Fig. 9) of the studied region by Chavanon et al. (2004).

ý*Cybister* Curtisý, 1827
***Cybister (Scaphinectes) lateralimarginalis lateralimarginalis* (De Geer, 1774) #**
Material examined. Ain Chabbak: 28.04.2016, 1 larva, A.F. Taybi & Y. Mabrouki leg.
Distribution. Ponto-Mediterranean subspecies, widespread in most of the western part of the Palearctic (Kalnioð 1999). The typical form lives in the west Europe and the Mediterranean Region, with the exception of the Middle East and the Crimea, where the typical form mixed with others (Zaitzev 1953). It was recorded by Lindberg (1939) in the vicinity of Oujda (Oriental Region); after 80 years we have rediscovered it in the vicinity of Saidia, in the wetland of Cherraba, which forms part of the SIBE (Sites d'Intérêts Biologique et Ecologique) of Moulouya (Fig. 3).

Cybister (Cybister) tripunctatus africanus* Laporte de Castelnau, 1834
Materiel examined. Barrage Zelmou: 12.06.2011, 1 male, C. Landsmann leg.
Distribution. Afrotropical-Mediterranean subspecies, distributed mainly in the southern and eastern coastal regions of the Iberian Peninsula (Millán et al. 2014) and northwestern Morocco (Benamar 2015). It is recorded here for the Oriental Region for the first time: the single specimen was collected in the extreme south of the eastern desert at Bouanane (Fig. 10).

Gyrinidae Latreille, 1810
***Aulonogyrus* Motschulsky, 1853**
***Aulonogyrus (Aulonogyrus) striatus* Fabriciens, 1792**
Material examined. Anzar Oufounas: 02.05.2014, 2 larvae; Aval Anzegmir: 02.05.2014, 1 male; Missour: 02.05.2014, 1

female; Moulouya Amont Melloulou: 24.05.2014, 4 males, 2 females; Moulouya Aval Melloulou: 07.07.2014, 2 females; Moulouya Aval Za: 03.04.2014, 2males, 1 female; O. Charef: 17.05.2014, 2 males; Oued Lakhrouf: 17.05.2014, 3 males, 1 females Pont Gafait: 07.08.2014, 3 males, 2 females; Amont Taourirt: 07.06.2014, 6 males, 2 females; Melg El Ouidane: 19.07.14, 2 females; Sources O. El Bared: 01.06.2014, 2 males, 2 females; Amont O. El Bared: 23.03.2014, 2 males, 2 females, 1 larva; Douar Ifrane: 07.08.2014, 2 females; Sources Berkine: 27.03.2014, 2 males; Amont Berkine: 15.08.2014, 3 females; Pont O. Zobzit: 23.03.2014, 6 larvae; Confluence Zobzit O. El Bared: 15.08.2014, 2 males, 3 females, 3 larvae; Douar Imzaghrou: 15.08.2014, 2 males; Pont Taddarte: 15.08.2014, 2males, 1 female; Entrée Guercif: 15.08.2014, 1 male; Oued Ouzej: 30.04.2016, 2 males; Oumassine: 12.05.2016, 1 male, 1 female; Kert: 12.05.2016, 1 male, A.F. Taybi & Y. Mabrouki leg - Aït Aïssa: 11.07.2014, 2 males, 3 females, L. Daoudi leg.

Distribution. Holomediterranean species; in Iberia it is mainly distributed in the Mediterranean Basin (Millán et al. 2014). It is known from the northern part of Morocco (Benamar 2015) and widely distributed in the studied area (Berrahou et al. 2001b; Chavanon et al. 2004). The distribution of the species in the studied region as in Fig. 7.

***Gyrinus* Müller, 1764**

***Gyrinus (Gyrinus) dejeani* Brullé, 1832**

Material examined. Oued Tifassour: 12.05.2016, 1 female; Debdou: 8.06.2013, 2males, 1 female, A.F. Taybi & Y. Mabrouki leg.

Distribution. Holomediterranean species. It is known from the southern part of the Iberian Peninsula (Millán et al. 2014) and the northern Morocco (Benamar 2015), and known from the studied area (Bedel 1925; Berrahou 1995; Chavanon et al. 2004). The distribution of the species in the studied region as in Fig. 8.

***Gyrinus (Gyrinus) substriatus* Stephens, 1829 #**

Material examined. Arbalou: 13.06.2014, 1 male, A.F. Taybi & Y. Mabrouki leg.

Distribution. West Palearctic species, with an extension to the Maghreb. It was recorded from several localities in the northern and southern parts of the Iberian Peninsula (Millán et al. 2014). It was recorded from the northern Morocco by Benamar (2015). The distribution of the species in the studied region as in Fig. 8.

***Gyrinus (Gyrinus) urinator* Illiger, 1807**

Material examined. Dardoura: 2.05.2016, 1 male; Oued Ouzej: 30.04.2016, 1 female; O Messoussate: 2.05.2016, 1 male; Oumassine: 12.05.2016, 1 female; Ain Chabbak: 28.04.2016, 5males, 6 females; Douar Ifrane: 23.03.2014, 1 male, A.F. Taybi & Y. Mabrouki leg.

Distribution. Holomediterranean species with an extension to the Atlantic Region and central part of the Eastern Europe; it is widely distributed in the Iberian Peninsula (Millán et al. 2014). It was recorded for the northern Morocco (Benamar 2015) and the basin of Zeghzel river and Oujda Region (Bedel 1925; Chavanon et al. 2004). We recorded it for the Mediterranean coast of the Oriental Region Morocco and the eastern Middle Atlas (Fig. 8) for the first time.

Family Haliplidae C. G. Thomson, 1860

***Haliplus* Latreille, 1802**

***Haliplus (Lyaphlus) mucronatus* Stephens, 1832**

Distribution. Mediterranean species, known from the eastern part of Iberia (Millán et al. 2014) and northern Morocco (Benamar 2015). It was recorded for Oujda, Oriental Region by Kocher (1958) (Fig. 9).

***Haliplus (Neohaliplus) lineatocollis* Marsham, 1802**

Material examined : Ait Boulmane: 14.07.2014, 1 larva; Ait Oha Ohaki: 14.07.2014, 2 males, 2 females, 3 larvae ; Arbalou: 03.05.2014, 2 males; Irhdis: 13.06.2014, 4 males, 5 females, 7 larvae; Boumia: 02.05.2014, 2 larvae; Anzar Oufounas: 02.05.2014, 1 larva; Aval Anzar Oufounas:

14.06.2014, 1 female. 7 larvae; Anzegmir Avant Barrage: 15.07.2014, 1 female; Aval Anzegmir: 14.06.2014, 18 males, 25 females. 17 larvae; Pont Hassan II: 18.05.2014, 5 females; Pond O. Charef: 17.05.2014, 1 female; Oued Lakhrouf: 07.08.2014, 1 male; Amont Gafait: 07.08.2014, 2males, 3 larvae; Pont Gafait: 07.08.2014, 1male, 2 females, 1 larva; Gafait: 07.08.2014, 3 females; Barrage Za: 17.05.2014, 1male, 2 females; Confluence Zbzit O. El Bared: 08.06.2014, 2 larvae; Douar Imzaghrou: 15.08.2014, 5 females; Entrée Guercif: 15.08.2014, 3 males, 3 females; Source Zeghzel: 01.02.2015, 2 males, 2 larvae; Oued Ouzej: 30.04.2016, 1 larva; Mariouari:12.05.2016, 2 males, A.F. Taybi & Y. Mabrouki leg.

Distribution. Palaearctic-Afrotropical species. It is a one of the most common aquatic beetles in the Iberian Peninsula (Millán et al. 2014) and the northern Morocco (Benamar 2015). The species is widely distributed in the studied area (Chavanon et al. 2004). The distribution of the species in studied area as in Fig. 8.

***Peltodytes* Régimbart, 1878**

***Peltodytes caesus* (Duftschmidt, 1805)**

Distribution. Palaearctic species, with a very fragmented distribution in the Iberia (Millán et al. 2014) and the northern part of Morocco (Benamar 2015). The species was recorded for Oujda in the Oriental Region (Bedel 1925; Chavanon et al. 2004).

***Peltodytes rotundatus* (Aubé, 1836)**

Material examined. Arbalou: 14.07.2014, 1 male 1 female 10 larvae; Boumia: 15.07.2014, 4 larvae; Aval Anzegmir: 15.07.2014, 4 larvae; Confluence Zobzit O. El Bared: 15.08.2014, 1 male; Douar Imzaghrou: 15.08.2014, 1 male, 1 female, A.F. Taybi & Y. Mabrouki leg.

Distribution. Holomediterranean species, widely distributed in Iberia (Millán et al. 2014) and northern Morocco (Benamar 2015). It was recorded for the studied area by Bedel (1925) and Chavanon et al. (2004). The distribution of the species in the studied area as in Fig. 8.

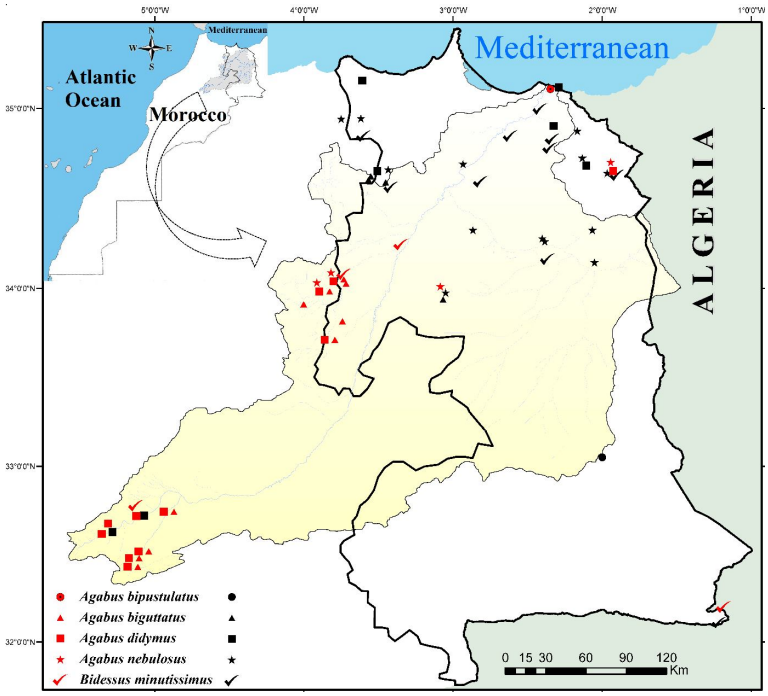

Fig. 2. Distribution of *A. bipustulatus*, *A. biguttatus*, *A. didymus*, *A. nebulosus* and *B. minutissimus* (new records in red, old records in black).

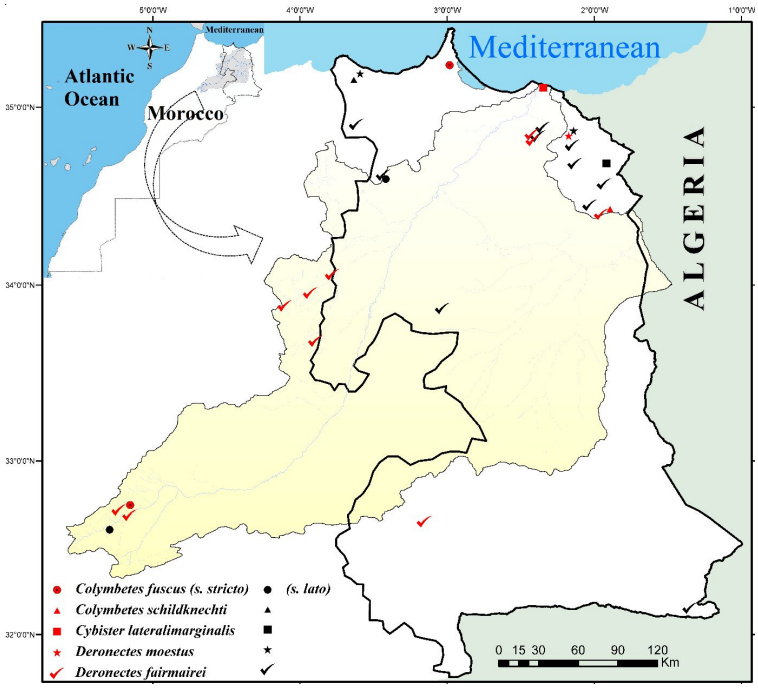

Fig. 3. Distribution of *C. fuscus*, *C. schildknechti*, *C. lateralimarginalis*, *D. fairmairei* and *D. moestus* (new records in red, old records in black)

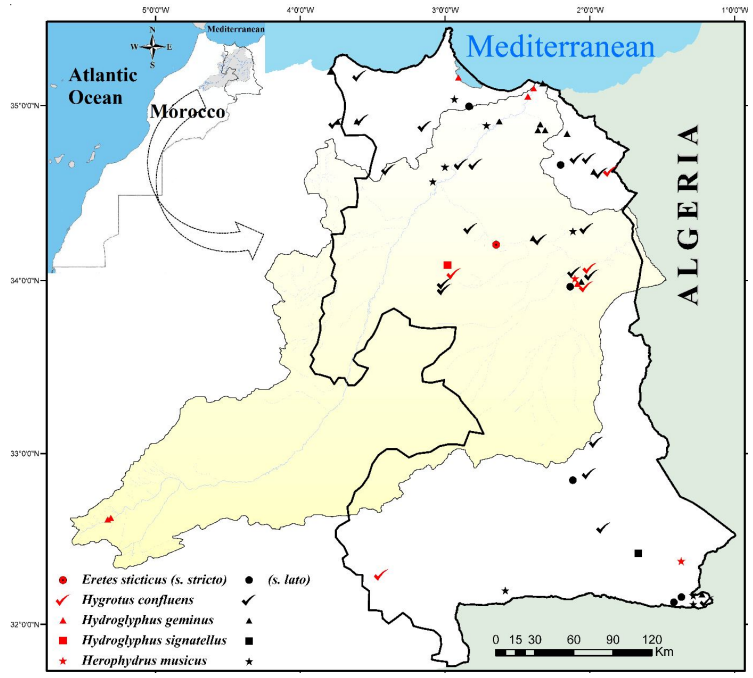

Fig. 4. Distribution of *E. sticticus*, *H. confluens*, *H. geminus*, *H. signatellus* and *H. musicus* (new records in red, old records in black)

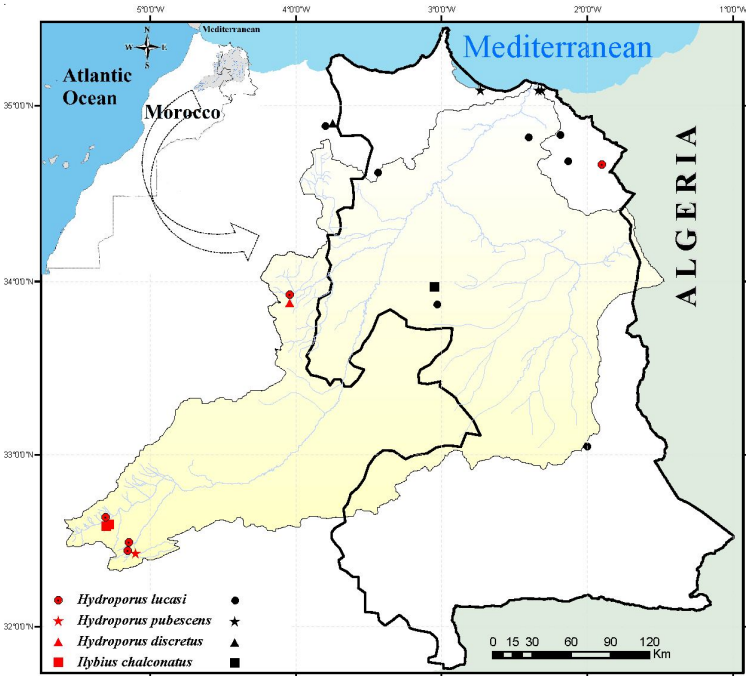

Fig. 5. Distribution of *H. lucasi*, *H. pubescens*, *H. discretus* and *I. chalconatus* (new records in red, old records in black).

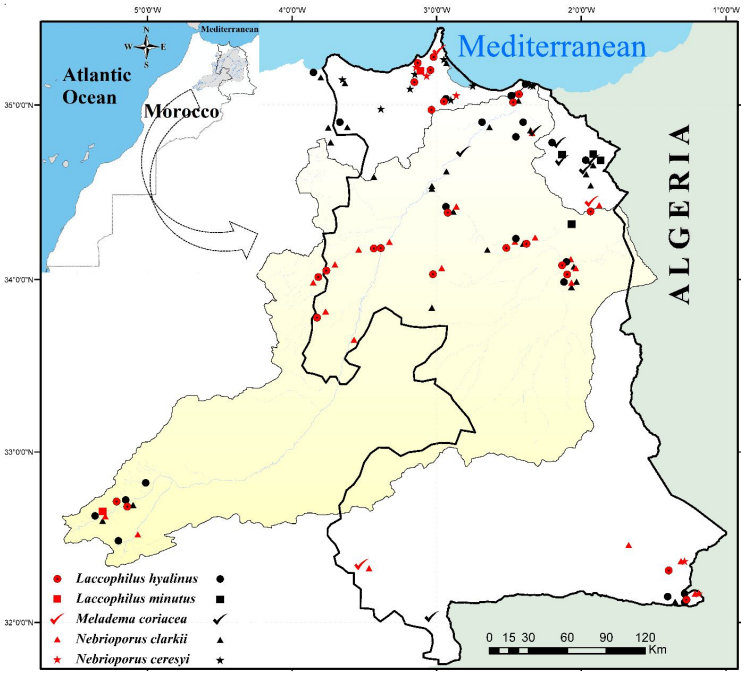

Fig. 6. Distribution of *L. hyalinus*, *L. minutus*, *M. coriacea*, *N. clarkii* and *N. ceresyi* (new records in red, old records in black).

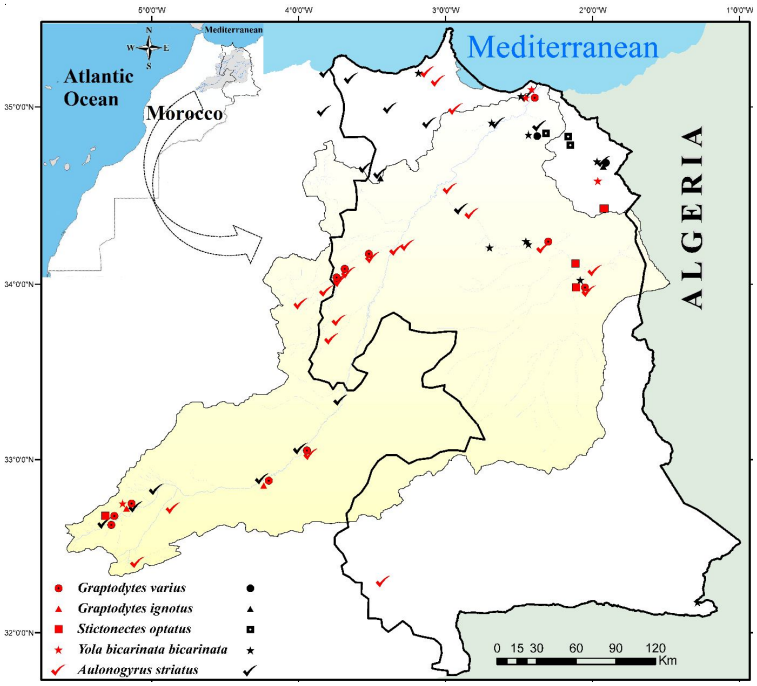

Fig. 7. Distribution of *G. varius*, *G. ignotus*, *S. optatus*, *Y. bicarinata* and *A. striatus* (new records in red, old records in black).

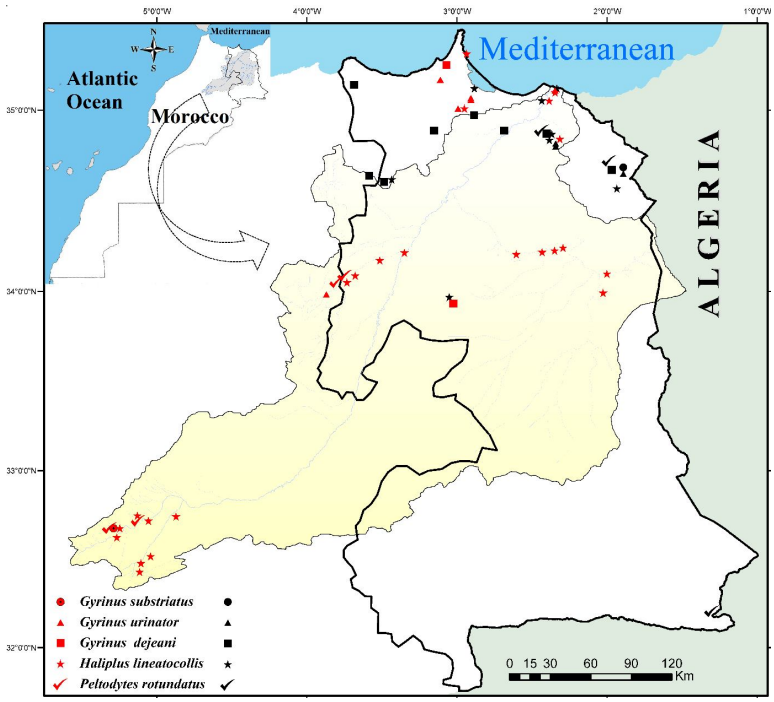

Fig. 8. Distribution of *G. substriatus*, *G. urinator*, *G. dejeani*, *H. lineatocollis* and *P. rotundatus* (new records in red, old records in black).

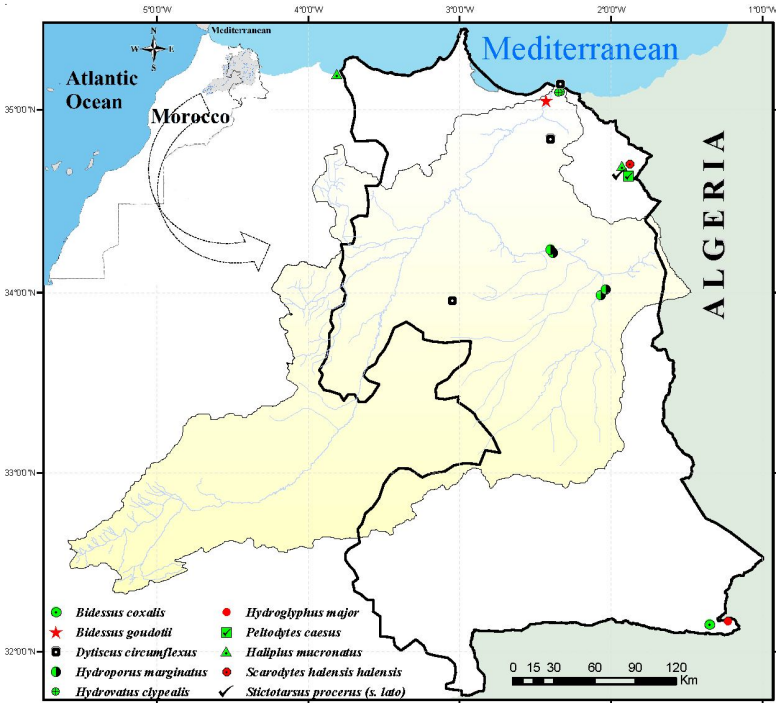

Fig. 9. Distribution of *B. coxalis*, *D. circumflexus*, *H. marginatus*, *H. clypealis*, *H. mucronatus*, *P. caesus*, *S. halensis*, *H. major* and *S. procerus* (literature data; not confirmed by a new material).

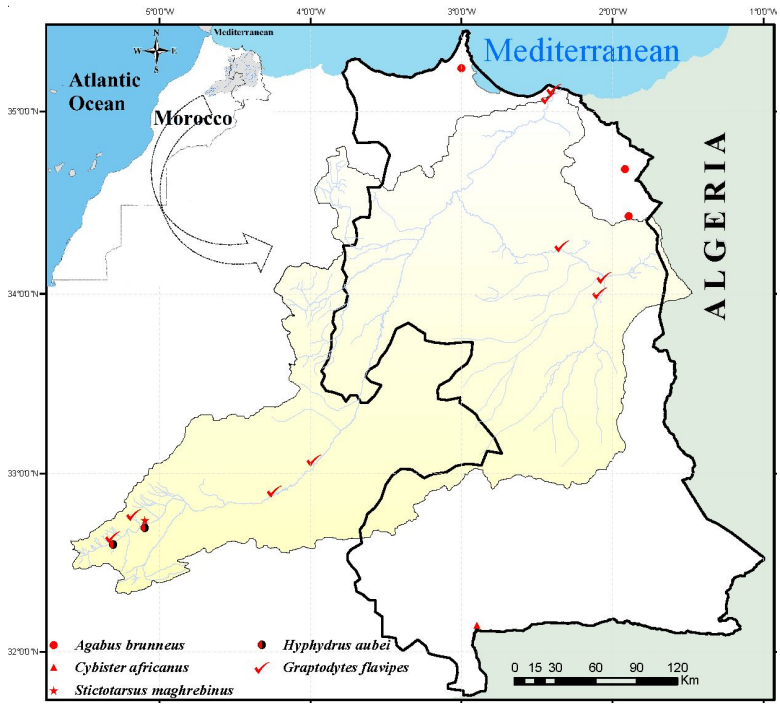

Fig. 10. Distribution of *A. brunneus*, *C. africanus*, *G. flavipes*, *H. aubei* and *S. maghrebinus*

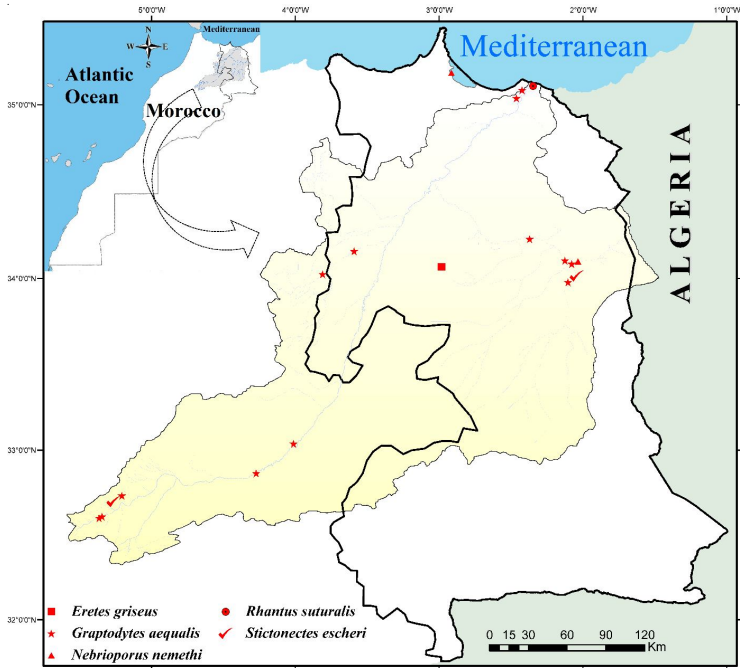

Fig. 11. Distribution of *E. griseus*, *G. aequalis*, *N nemethi*, *R. suturalis* and *S. escheri*

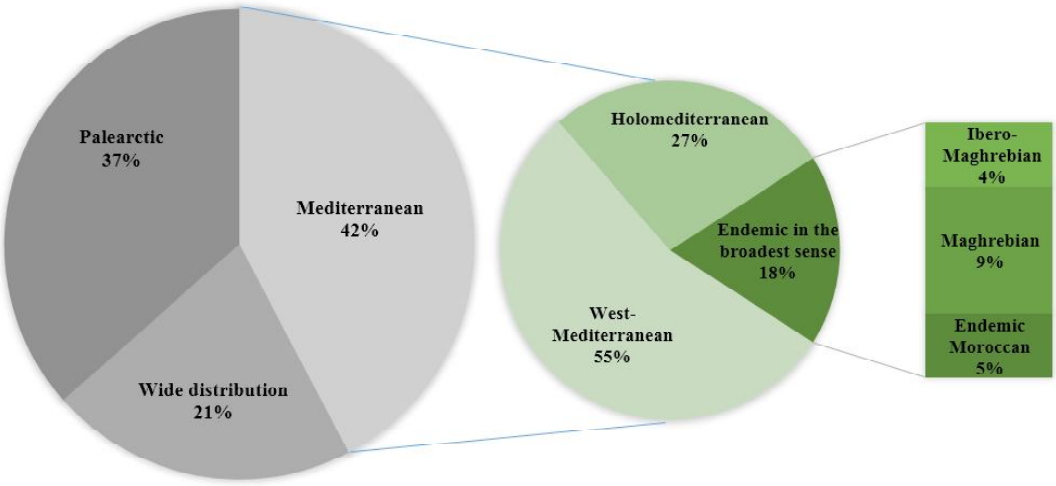

Fig. 12. Chorological categories of the studied species.

DISCUSSION

Based on the new and published data, Oriental Region of Morocco and the basin of Moulouya River is inhabited by 55 species of aquatic adephagous beetles (excluding Noteridae).

The most interesting species are *Hydroglyphus signatellus, Hydroporus planus, H. discretus, Graptodytes ignotus, Agabus biguttatus, Gyrinus substriatus* are new to the watershed of the Moulouya. While *Graptodytes flavipes, G. aequalis, Stictonectes escheri, Rhantus suturalis, Cybister tripunctatus africanus, Eretes griseus* and the Moroccan endemic *Nebrioporus nemethi* are new to the entire study area. Finally, *Agabus bipustulatus* and *Cybister lateralimarginalis lateralimarginalis* are rediscovered after 90 and 80 years of absence respectively.

The stand composition of the Oriental Morocco and the watershed of the Moulouya, can be subdivided into three main chorological categories (Fig. 12): the Mediterranean that are slightly dominant and which constitute 42% of the recorded species; Followed by the Palearctic corotype which constitutes 37%. While the Cosmopolitan elements and those whose distribution extends beyond the Mediterranean either in India or in the Afrotropicale region comes in the third place (21%). Within the Mediterranean Hydradephaga's elements, it has a clear predominance of the West-Mediterranean corotype (55%), followed by the Holomediterranean corotype (27%) and finally the Endemic in the broadest sense (18%). Despite being a Maghrebian country, the Ibero-Maghrebian endemics outweigh the Maghrebian endemics; this same remark was made for the Adephaga of all the Moroccan territory (Benamar, 2015).
A dozen species mentioned early in the Oriental region have not been found (Fig. 9), our study clearly demonstrates that a reduction in permanent water bodies, notably with the drying up of several wadis between 80-90 years (Isly wadi, source of Sidi Yahya and its tributary, etc.). With the drying up goes the disappearance of all the wildlife that characterized these environments. Many species of beetles see their regional distribution greatly reduced, this same finding was observed for other macroinvertebrates (Mabrouki et al. 2016b, 2017b; Taybi et al. 2017).

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Appendix. The prospected stations with indications of the locality, altitude, geographic coordinates and type of the aquatic environment (pp. 105 - 106)

Stations	GPS	Alt (m)	Sampling dates	Habitat
Ait Boulmane	32°36'56.6" N 5°19'49.2" W	1650	03.05.14-13.06.14-14.07.14	RV
Ait Oha Ohaki	32°37'28.7" N 5°18'32.8" W	1640	03.05.14-13.06.14-14.07.14	RV
Source Arbalou	32°40'33.4" N 5°17'20" W	1670	03.05.14-13.06.14-14.07.14	RV
Krouchene=Irhdis	32°44'49.6" N 5°10'17.1" W	1616	03.05.14-13.06.14-14.07.14	RV
Boumia	32°43'3.4" N 5°5'52.7" W	1515	02.05.14-14.06.14-15.07.14	RV
Zaïda	32°49'3" N 4°57'33" W	1455	02.05.14-14.06.14-15.07.14	RV
Anzar Oufounas	32°25'45" N 5°9'24.8" W	1895	02.05.14-14.06.14-15.07.14	NS
Aval Anzar Oufounas	32°28'41.66" N 5°8'53.42"W	1780	02.05.14-14.06.14-15.07.14	RV
Anzegmir avant barrage	32°31'4.1" N 5°5'3.2" W	1702	02.05.14-14.06.14-15.07.14	RV
Aval Anzegmir	32°44'32" N 4°54'51" W	1455	02.05.14-14.06.14-15.07.14	RV
Tamdafelt	32°52'43.86" N 4°14'16.4"W	985	02.03.14-14.06.14-15.07.14	RV
Missour	33°3'7.96" N 3°58'41.7" W	870	02.05.14-14.06.14-15.07.14	RV
Outat Al Haj	33°19'46.8" N 3°42'14.2" W	770	02.05.14-14.06.14-15.07.14	RV
Tindint	33°39'11" N 3°35'20.6" W	640	02.05.14-14.06.14-15.07.14	RV
Moulouya amont Melloulou	34°12'59.3" N 3°21'6.8" W	362	23.03.14-24.05.14-07.07.14	RV
Moulouya Aval Melloulou	34°14'29.86" N 3°19'13.4"W	355	23.03.14-24.05.14-07.07.14	RV
Moulouya Amont Za	34°33'36.3" N 3°2'33.4" W	230	23.03.14-24.05.14-07.07.14	RV
Moulouya aval Za	34°33'41.09" N 3°1'49.77"W	222	03.04.14-24.05.14-22.06.14	RV
Sebra	34°53'11" N 2°39'45" W	60	03.04.14-24.05.14-22.06.14	RV
Safsaf	34°54'27.53" N 2°38'8.86"W	50	18.03.14-18.05.14-23.06.14	RV
Pont Hassan II	35°3'5.7" N 2°25'42.4" W	9	18.03.14-18.05.14-23.06.14	RV
Pré-Estuaire	35°5'51.4" N 2°23'19" W	3	18.03.14-18.05.14-23.06.14	RV
Sources O. El Bared	33°54'40.2" N 4°2'40.7" W	931	27.03.14-01.06.14-11.07.14	RV+NS
Amont O. El Bared	33°58'59.01" N 3°52'15.8"W	630	23.03.14-08.06.14-07.08.14	RV
Douar Ifrane	34°2'20.8" N 3°46'34.1" W	570	23.03.14-08.06.14-07.08.14	RV
Sources Berkine	33°42'43.25" N 3°50'5.83"W	1150	22.03.14-14.06.14-07.08.14	RV+NS
Amont Berkine	33°48'58.2" N 3°47'7.4" W	970	27.03.14-15.06.14-15.08.14	RV
Pont O. Zbzit	34°1'36.6" N 3°45'38.6" W	595	23.03.14-08.06.14-15.08.14	RV
Confluence Zbzit O. El Bared	34°3'02.25" N 3°46'34.1" W	565	23.03.14-08.06.14-15.08.14	RV
Douar Imzaghrou	34°5'15.75" N 3°43'14.7" W	525	23.03.14-08.06.14-15.08.14	RV
Pont Taddarte	34°10'21.4" N 3°33'25.4" W	445	23.03.14-08.06.14-15.08.14	RV
Entrée Guercif	34°12'53.5" N 3°23'34.1" W	377	23.03.14-08.06.14-15.08.14	RV
Aval Melloulou	34°13'1.15" N 3°20'40.4" W	363	23.03.14-15.06.14-15.08.14	RV
Oued Charef	33°58'53.5" N 2°5'7.5" W	925	19.03.14-17.05.14- 07.08.14	RV+NS
Pond O. Charef	33°59'33.1" N 2°4'11" W	918	19.03.14-17.05.14-07.08.14	RV
Petite cascade	34°3'56.8" N 2°3'20.2" W	900	19.03.14-17.05.14-07.08.14	RV
Oued Lakhrouf	34°5'54.8" N 2°2'38.1" W	897	19.03.14-17.05.14-07.08.14	RV
Grandes cascades	34°7'5.7" N 2°5'26.8" W	875	19.03.14-17.05.14-07.08.14	RV
Amont Gafait	34°14'31.61"N2°20'11.98"W	785	19.03.14-17.05.14-07.08.14	RV
Pont Gafait	34°13'36.8" N 2°23'34.5" W	767	19.03.14-17.05.14-07.08.14	RV

Gafait	34°14'21.6" N 2°24'34.8" W	750	19.03.14-17.05.14-07.08.14	RV+AS
Barrage Za	34°12'23.1" N 2°38'52.3" W	625	19.03.14-17.05.14-07.08.14	RV+DM
Amont Taourirt	34°25'15.6" N 2°52'52.9" W	370	07.06.14-19.07.14-19.07.14	RV
Aval Taourirt	34°28'44.51" N 2°59'10.3"W	295	03.04.14-07.06.14-19.07.14	RV
Melg el Ouidane	34°32'46.51" N 3°1'31.1" W	240	03.04.14-07.06.14-19.07.14	RV
Debdou	33°57'32.64"N 3°2'26.9"W	1344	27.04.16	AS
Mare à Debdou	34°3'51.4"N 2°58'54.1"W	880	27.04.16	PD
Source Tiffert	N35°2'16.8" 2°25'36.0"W	83	28.04.16	NS
Aval Zeghzel	34°53'08.3"N 2°20'34.1"W	268	28.04.16	RV
Ain chabbak	N35°6'18.7" 2°20'45.0"W	2	28.04.16	PD
Bassin Oujda	34°39'03.5"N 1°53'59.2"W	627	07.11.15 - 26.02.16 - 23.04.16	AP
SIBE Saïdia	35°07'09.8"N 2°20'15.3"W	0	21.02.16	PD
canal de Saïdia	35°05'59.0"N 2°19'42.1"W	9	22.02.16	AC
Jbel Mehser	34°29'24.1"N 1°54'57.6"W	1268	19.09.15	AS
Source Himer	34°25'32,5"N 1°53'54"W	1030	18.11.15	NS
Amont Himer	34.2530,2 N 1.5331,1 W	1019	18.11.15	RV
Source Zeghzel	34°50'20.3"N 2°21'21.6"W	442	01.02.15	AS
Ain Sfa	34°45'12.3"N 2°08'36.0"W	652	01.02.2015	AS
Ain Almou	34°50'15.2"N 2°10'22.5"W	1200	06.06.2016	AS
Cherraa	34°56'43.6"N 2°24'48.5"W	80	06.06.2016	PD
Carrière Oujda	34°34'50.8"N 1°56'13.9"W	719	17.07.2016	AQ
Source Aghbal	34°55'14.0"N 2°06'52.5"W	307	27.07.16	AS
Saguia Selouane	35°05'14.3"N 2°56'03.8"W	84	30.04.16	AC
Kariat Arkmane	35°06'16.5"N 2°44'55.1"W	19	01.05.16	AC
Dardoura	35°03'11.0"N 2°54'18.9"W	134	02.05.16	RV
Oued Ouzej	35°00'21.8"N 2°59'30.8"W	168	30.04.16	RV
O. Selouane	35°04'36.7"N 2°55'29.1"W	52	30.04.16	RV
O Messoussate	35°03'48.6"N 2°54'23.0"W	68	02.05.16	RV
Marchica (1)	35°10'47.2"N 2°55'19.3"W	5	22.05.15	PD
Marchica (2)	35°09'19.9"N 2°54'24.3"W	3	02.05.16	LG
Rio de Oro	35°17'14.9"N 2°56'37.7"W	12	18.05.15	RV
Mont Gourougou	35°13'55.2"N 2°59'57.1"W	542	05.02.15-06.02.15-07.02.15	RV
Oued Tifassour	N35°16'21.0" 3°5'14.4"W	17	12.05.16	RV
Oumassine	N35°9'50.0" 3°6'36.0"W	79	12.05.16	RV
Kert	N35°12'48.9" 3°11'1.4" W	6	12.05.16	RV
Mariouari	35°18'21.6"N 2°58'38.9"W	85	12.05.16	RV
Barrage Arabat	35°01'03.9"N 2°52'36"W	102	05.04.14	DM
Raknat Naam	32°27'11.3"N 1°41'18.7"W	1168	21.05.16	DM
Barrage Zriga	32°21'29.5"N 1°19'36.4"W	1026	21.05.16	DM
Barrage Sfissef	32°20'23.9"N 1°21'04.6"W	1005	21.05.16	DM
Seguia de Figuig	32°06'47.3"N 1°14'08.8"W	902	22.05.16	AC
Abbou Lekhal	32°10'05.3"N 1°13'42.4"W	868	22.05.16	RV
Dayat Lahjal	32°29'29.9"N 1°39'47.6"W	1161	22.05.16	PD
O. Anwal	32°40'46.60"N 3°5'39.74"W	1194	21.01.2016	RV
Aït Aïssa	32°19'N 03°29'W	1121	10.04.14-09.05.14615.06.14-11.07.14-12.09.14-17.01.15	RV
Barrage Zelmou	32°08'N 02°54'W	880	12.06.2011	DM

Abbreviations. M: station at the Moulouya Wadi; S: station at Melloulou River; Z: station at ZA river; N: station at Nador province; O: station at Oujda province; F: station at Figuig province; DM: dam; AQ: abandoned quarry; AC: artificial channel; AP: artificial pond; RV: river; LG: Lagoon; PD: pond; AS: arranged source; NS: natural source.