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Chapter 6. The status and distribution of freshwater crabs

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6.1 Overview of the regional fauna

The northern African region from Morocco to Egypt is home to three species of freshwater crabs that belong to two genera, *Potamon* Ortmann, 1896, and *Potamonautes* MacLeay, 1837. These are assigned to two families (the Potamidae Ortmann, 1896, and Potamonautidae Bott, 1970, respectively) (Cumberlidge 1999). All of these species have recently been revised, and they now have a stable taxonomy (used here) whereby both families are included in the superfamily Potamoidea Ortmann, 1896 (Brandis *et al*. 2000, Cumberlidge 2009).

The Potamidae is the largest of all freshwater crab families, and includes 95 genera and more than 505 species distributed throughout the southern Palaearctic and Oriental zoogeographical regions from Morocco as far east as Japan, and as far south as Indonesia (Cumberlidge *et al*. 2008, Yeo *et al*. 2008). The northern African representative of this family, *Potamon algeriense* Bott, 1959, from Maghreb, is included in the subfamily Potaminae Ortmann, 1896, whose members are found around the Mediterranean, the Middle East, and the Himalayas. In fact, *P. algeriense* in northern Africa represents the westernmost extension of this subfamily. *Potamon algeriense* is found in the temperate rivers of Maghreb and in seasonally arid freshwater bodies where crabs tend to be semi-terrestrial and live in burrows (Bott 1967, Brandis *et al*. 2000).

The Potamonautidae is a predominantly Afrotropical family that is represented by 18 genera and 133 species (Cumberlidge 1999, Cumberlidge *et al*. 2008, Cumberlidge *et al*. 2009). The presence of members of this family outside the Afrotropical region in northern Africa is due to the presence of two species in the Nile River that flows north from eastern Africa to the Mediterranean Sea (Palaearctic region) (Bott 1955, Cumberlidge 1999). More than 70 species of *Potamonautes* are found throughout continental Africa, but only two of these are present in the northern African region in northern Egypt. These two species of *Potamonautes* are predominantly riverine in habit and do not leave the Nile River and its tributaries to forage on land (Bott 1955; Cumberlidge 1999, 2009).

The low species richness and diversity of freshwater crabs in northern Africa reported on here is probably valid because it is based on large numbers of specimen records from throughout the region that have been collected over the past 100 years. Despite this, the distribution data used here are likely to be incomplete, and further collections are necessary to understand the actual distribution of these northern African taxa. Nevertheless, it is clear that freshwater crabs are absent from the more arid regions of the Sahara including Libyan Arab Jamahiriya, and the desert regions of Morocco, Algeria, and Egypt. It is also clear that northern Africa's freshwater crab fauna is also dramatically impoverished compared to that of western Africa (29 species, 7 genera) (Cumberlidge, 1999), eastern Africa (35 species, 3 genera) (Bott 1955; Cumberlidge 1997, 1998; Corace *et al*. 2001; Cumberlidge and Vannini 2004; Reed and Cumberlidge 2004, 2006), central Africa (24 species, 5 genera) (Bott 1955, Cumberlidge *et al*. 2002, Cumberlidge and Boyko 2000; Cumberlidge and Reed 2004), southern Africa (19 species, 1 genus) (Cumberlidge and Daniels 2008), and Madagascar (only 15 species, but 7 genera) (Cumberlidge *et al*. 2008, Cumberlidge and Meyers 2009).

The three species of northern African freshwater crabs are similar in terms of their breeding strategy (they all have direct development from egg to hatchling crabs, and they

Oued Zegzel in the Moulouya River basin in Morocco, habitat of the freshwater crab *Potamon algeriense* Photo © Jean-Pierre Boudot

all lack larval stages) but they differ in their choice of habitat within freshwater ecosystems (Cumberlidge 1999). These freshwater crabs are omnivores that mostly consume plant matter and scavenge detritus, and are found wherever year round water is present. Freshwater crabs also form an integral part of the food chain in river systems because they are vital components of the diet of a number of natural piscine, amphibian, reptilian, avian and mammalian predators (Collen *et al.* 2008,a Cumberlidge *et al.* 2009).

6.1.1 Crab Distribution and Ecoregions

Freshwater crab distribution patterns, whereby one or more species are endemic to an ecoregion, do not conform closely to the majority of the six ecoregions found in northern Africa (Thieme *et al.* 2005, Abell *et al.* 2008). *Potamon algeriense* is the only freshwater crab species that is endemic to northern Africa, and this species is found only in the northwest Mediterranean ecoregion. Both *Potamonautes niloticus* and *P. berardi* are found in the Lower Nile ecoregion but the distributional range of each of these species extends south and includes other Afrotropical ecoregions in the Nile River basin (Thieme *et al.* 2005, Abell *et al.* 2009, Cumberlidge 2009).

6.2 Conservation status (IUCN Red List Criteria: Regional Scale)

Although there is a need to collect more comprehensive information, the available data were sufficient to make valid assessments of the conservation status of most species. All three species of freshwater crabs found in northern Africa have a wide extent of occurrence, and are all found in more than one country. For example,

The freshwater crab *Potamon algeriense* is endemic to the streams and rivers of Morocco, Algeria and Tunisia. It is Least Concern and affected by human induced threats such as habitat loss and degradation linked to population growth and industrial and agrarian development. Photo © Jean-Pierre Boudot

Potamon algeriense occurs in Morocco, Algeria, and Tunisia, *Potamonautes niloticus* occurs in Egypt, Sudan, Ethiopia, Uganda, Rwanda, and Kenya, and *P. berardi* occurs in Egypt, Sudan, Ethiopia, Uganda, and Kenya (Cumberlidge 2009).

The conservation status of each of the three species of freshwater crabs found in northern Africa is summarized in Table 6.1 and 6.3 and is discussed briefly below.

6.2.1 Case Studies

1. Algerian River Crab *Potamon algeriense* (Bott, 1967) (LC)

Potamon algeriense is a medium-sized species of river crab that occurs in temperate streams and rivers of northern Africa that drain into the Mediterranean Sea. Its distribution includes three countries: Morocco (in Kenitra

Table 6.1 The number of crab species in each regional Red List Category in the northern African region (Cumberlidge *et al.* 2009).

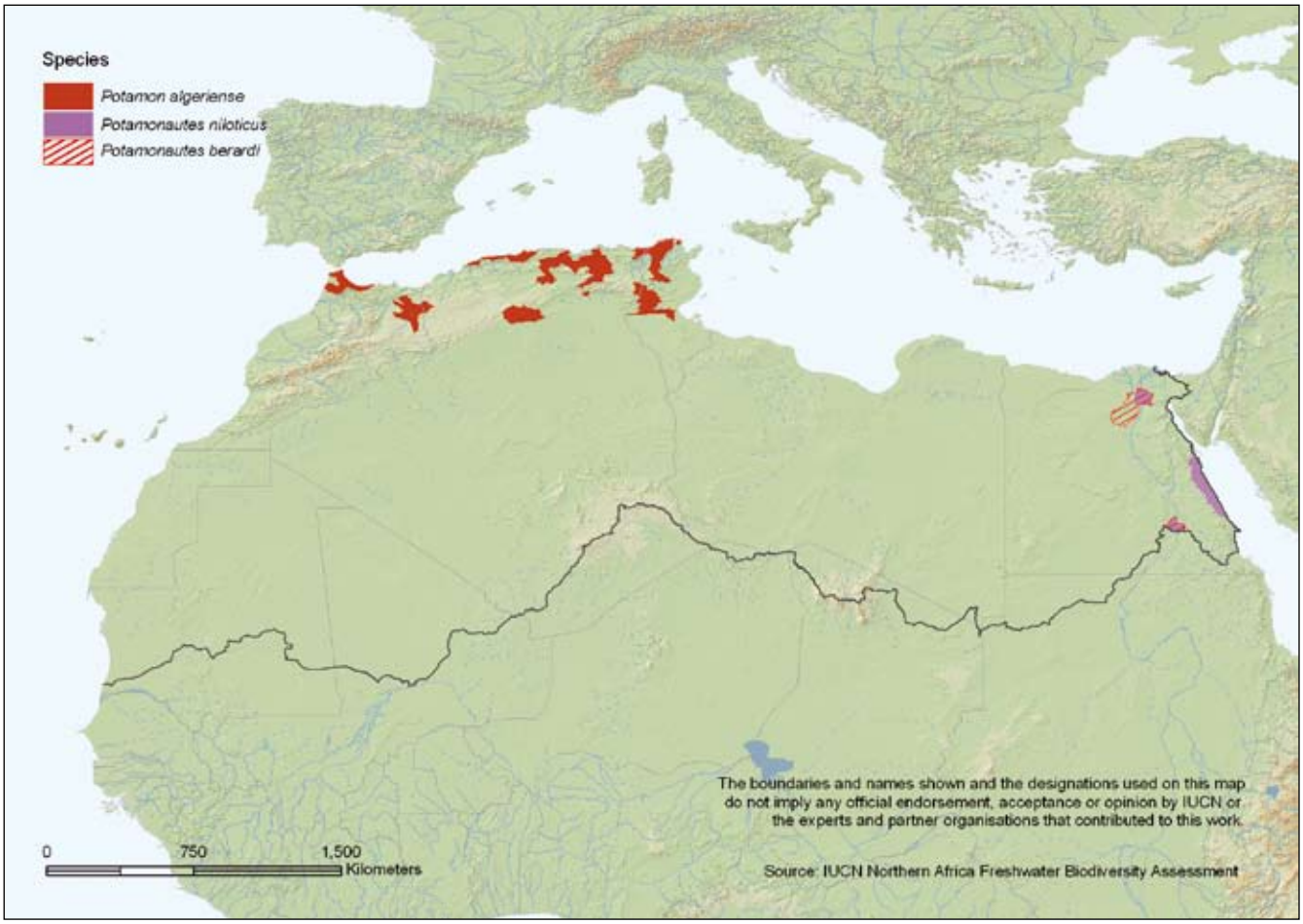
	IUCN Red List Category	Number of Species (%)	Number of regional endemics (%)
Threatened categories	Critically Endangered (CR)	0	0
	Endangered (EN)	0	0
	Vulnerable (VU)	0	0
	Near Threatened (NT)	0	0
	Least Concern (LC)	3	1
	Data Deficient (DD)	0	0
	Total number of taxa assessed*	**3**	**1**

* Excluding species that are considered Not Applicable.

and Fes Provinces), Algeria (in Algiers, Lemdiyya, and Bejaia Provinces), and Tunisia (in Jenduba, Beja, Kairouan, and Gafsa Provinces). This species is neither found in the Libyan Arab Jamahiriya nor in Egypt (or elsewhere in the Mediterranean region) and it is endemic to the Maghreb of northern Africa (Bott 1967, Brandis *et al*. 2000). The past distributional range of this species has been uncertain because of its unstable taxonomy whereby past authors considered it to be a subspecies of the eastern Mediterranean species *P. fluviatilis* that is found in Italy and Greece (Bott 1967, Pretzmann 1976). *Potamon algeriense* was not recognized as a valid species until relatively recently (Cumberlidge 1998, Brandis *et al*. 2000). The present population levels of *P. algeriense* are estimated to be stable based on the relatively high number of localities (more than 30) in the three countries where this species is known to occur. However, despite its relatively wide distribution many of these localities are discontinuous and fragmented and there may be cause for concern for the future stability of some of its isolated subpopulations. For example, in parts of its range (such as Fez and Kenitra Provinces in Morocco) *P. algeriense* has not been seen for many years, and here it might be threatened (or may even be in danger of extirpation). The Sebou River in Fez and Kenitra Provinces is the most polluted river in all of Morocco due to water pollution from industrial and domestic sources, and might be described as a dead river from a biological point of view. These rapid anthropogenic changes that affect habitat (such as water diversion, drainage, habitat disturbance, and pollution), are especially hard on those crab populations found near centres of human population. *Potamon algeriense* was collected in 2009 from several localities in the Moulouya catchment (by the project UICN/ABHM) where it is threatened by water diversion (as at Zegzel), water pollution (as at l'Oued Zebra), or by violent floods and mud slides (as l'oud Za). (pers. comm. from Mohammed Melhaoui, University Mohamed I, Morocco)

Despite the local extirpation of *P. algeriense* in parts of Morocco, healthy populations of this species have been found recently in a number of new localities in other regions of that country. For example, *P. algeriense* has been collected from the from Oued Zegzel (Beni Snassen) from Branche south west, Arougene, Zaoui, My Ahmed,

Figure 6.1 Distribution map of the freshwater crabs *P. bernardi*, *P. niloticus* and *P. algeriensis* in the northern African region.



My Idriss, and Grotte Chameau, Tazaghine (Bas Zegzel), and from Oued Cherraa (Zegzel at Berkane). It has also been reported to occur recently in the Bassin de l'Oued Za (haut plateaux) from the southern affluents of Oued Za (Melga El Widan, Oulad Lefkir) near the confluence with the Moulouya River and its tributaries, as well as Oued Za (Guefait), Ammont Oued Za; and Oued Charef (from the spring at Ain Bni Mathar). Additional recent localities include the basin of the Moulouya River (Oued Zebra, from a small affluent of the Moulouya River, and from near Zaio (Mohammed Melhaoui pers comm.). Other records from the literature include the basin of the Oued Laou (Rif) in a small Oued near Chefchaouen, as well as from the basin of the Oued Oum Rbia (Middle Atlas), and near the road to Khénifra 4 km before El-Borj (Middle Atlas) (Aymerich 2002).

This species is also found at high altitudes in the Middle Atlas from two localities: (1) Lac Ouiouane, 68 km from Khénifra, at 1,600 m asl, and (2) near Oued Oum Rbia close to lake Bin El Widan (Middle Atlas south of Meknes) in a region rich in water resources that includes the origins of the rivers that drain into the Mediterranean Sea and the Atlantic Ocean; this species is also present in the region of Khénifra where it has colonized small watercourses (Figure 6.1).

2. Nile River Crab *Potamonautes niloticus* (H. Milne Edwards, 1837) (LC)

Potamonautes niloticus is a large and conspicuous river crab found in the Nile River in Egypt. This species is easily recognized by a row of distinct spines along the anterior margins of its carapace. Its presence in the Lower Nile in Egypt represents the northern-most extension of the range of this species, which has a wide distribution throughout the entire length of the Nile and its tributaries and is known to occur in more than 60 localities in six countries (Egypt, Sudan, Ethiopia, Uganda, Kenya, and Rwanda). *Potamonautes niloticus* is endemic to the Nile River basin and it has never been found outside this system and has not been reported to occur in Tanzania, despite its presence in Lake Victoria (Reed and

Potamonautes niloticus is an African endemic freshwater crab found in the streams and rivers of the Nile River from Cairo in Egypt to Rwanda in East Africa. Although this species is assessed as Least Concern in northern Africa, it is possible that populations near centres of human settlements might be in the future threatened by water diversion, pollution and over-harvesting for food. Photo © Neil Cumberlidge

Cumberlidge 2006, Cumberlidge 2009) (Figure 6.1). *Potamonautes niloticus* occurs in a range of aquatic habitats including the major channels of the Nile itself and its lowland tributaries, in small and large lakes associated with the river basin, as well as in small clear fast-flowing mountain streams with rocky beds, and sluggish warm lowland streams with muddy bottoms (Bott 1955; Williams 1964; Cumberlidge 1997, 1998). This species is completely dependent on aquatic habitats and it never leaves the water whether it is found in streams, rivers, or lakes. In the southern parts of its range in Kenya and Uganda, *Potamonautes niloticus* serves as a host for the aquatic larvae of the biting blackfly, *Simulium* sp., that are the vectors of *Onchocerca volvulus*, the parasite that causes river blindness in humans (Crosskey 1990). There is no evidence that *P. niloticus* is associated with this disease in the northern part of its range in Egypt and the Sudan. *Potamonautes niloticus* is listed as Least Concern (LC) in view of its wide distribution (it is known to occur in more than 60 localities and in six countries), estimated stable population size and abundance (it supports small-scale local fisheries in Lake Victoria in Uganda and Kenya), and the lack of known widespread threats. Crab populations may nevertheless be under threat in the future from rapid anthropogenic changes affecting their habitat such as water diversion, pollution, and it could also suffer population declines from over-harvesting in Lake Victoria. Recent surveys of freshwater ecosystems in Egypt in the Nile River from Cairo to Aswan failed to find either *Potamonautes niloticus* or *P. berardi* and it is of some concern that our only records of the presence of these species in Egypt are now over 90 years old. These specimens were collected at a time before the Aswan Dam and cataracts on the Nile River, and before the human population of the country increased to its present levels with it's accompanying demands for water and farmland that may both impact freshwater habitats negatively.

3. Berard's River Crab *Potamonautes berardi* (Audouin, 1826) (LC)

Potamonautes berardi is a common river crab recognized by its uniform brown colour, its small size at maturity, and the smooth margins of its anterior carapace. This species is widely distributed throughout the basin of the Nile River and its tributaries in Egypt and south along the Nile River basin in Sudan, Ethiopia, Uganda, Tanzania, and Rwanda (Williams 1976; Cumberlidge 1997, 1998). *Potamonautes berardi* is endemic to the Nile River basin and it has never been found outside this system (Cumberlidge 2009). *Potamonautes berardi* was listed as Least Concern (LC) in view of its wide distribution (it is known to occur in more than 21 localities in five countries), estimated stable population size and abundance, and the lack of known widespread threats. Crab populations may nevertheless be under threat in the future from rapid anthropogenic changes affecting its habitat such as water diversion, drainage, habitat disturbance, and pollution, especially those crab populations found near centres of human population in Egypt (Figure 6.1).

Potamonautes berardi is endemic to the African continent and classified as Least Concern due to its wide distribution throughout the basin of the Nile River in Egypt, Sudan, Ethiopia, Uganda, and Tanzania. The major and future threats to this species include habitat loss and degradation due to industrial and agrarian development. Photo © Neil Cumberlidge

6.3 Patterns of species richness

The Nile River basin in northern Egypt is where two common and widespread Afrotropical species (*P. berardi* and *P. niloticus*) come into close proximity with (but are not sympatric with) the widespread Palaearctic species *Potamon potamios,* which is an eastern Mediterranean taxon whose range extends south into the Sinai Peninsula (Brandis *et al.* 2000). Because of this juxtaposition the freshwater crab species list for Egypt includes three species in two genera and two families (but none is endemic to that country), and although this list is short, it is the richest in northern Africa (Cumberlidge *et al.* 2009). However, *P. potamios* is not discussed here because the Sinai Peninsula lies outside of the northern African region as defined in the present work.

Only one of the species dealt with in the present study (*P. algeriense*) occurs exclusively in northern Africa (from Morocco to Tunisia). The other two species in northern Africa are on the northern end of a wider distributional range that extends into Egypt. The range of each of the two potamonautid species extends south along the Nile River basin into east Africa. The taxonomic diversity of northern Africa (two genera, three species) is lower than that of the Mediterranean region as a whole (two genera and 12 species), and lower than the whole of the rest of continental Africa (five genera, 120 species) and Madagascar (7 genera, 14 species). Species diversity within the northern African region clearly depends on the availability of permanent surface water and the low

Table 6.2. Number of species of freshwater crabs per country that occur in the northern African region*

Country	No. Species	Family	Species
Morocco	1	Potamidae	*Potamon algeriense*
Algeria	1	Potamidae	*Potamon algeriense*
Tunisia	1	Potamidae	*Potamon algeriense*
Egypt	2(3)	Potamonautidae	*Potamonautes niloticus, Potamonautes berardi Potamon potamios* (not discussed here)

* Northern African countries with no freshwater crabs are not displayed in this table. The number in parentheses is total number of species found in Egypt

number of species of freshwater crabs found there is typical of arid ecosystems such as those found in northern Africa. The distributional data indicate that there is a low degree of endemism in northern Africa's freshwater crab fauna at the species level (1 out of 3, 33%), but not at the genus and family levels (0 out of 2 (0%) (Cumberlidge *et al*. 2008). The majority of species (2 out of 3, 66%) occur in Egypt, only 33% of the region's species are found in Morocco, Algeria and Tunisia, whereas Libyan Arab Jamahiriya completely lacks freshwater crabs (Table 6.2).

The generally low species richness in the countries of northern Africa is not entirely unexpected because these countries include vast areas of arid land in the form of sahel and desert ecosystems. Nevertheless, it is still likely that at least some of the apparent species poverty reported on here may be due to under-sampling. For example, the lack of records of any species of freshwater crabs below the Draa River basin and Libyan Arab Jamahiriya may be real or it may equally be an artefact resulting from under-collection. Further exploration is needed throughout northern Africa where it is probable that the species-count for the freshwater crab fauna of the region will increase as taxonomic discrimination improves and collection efforts intensify.

6.3.1 Extirpated species

No species of freshwater crab from the northern African region is known to have been extirpated and none are Extinct (EX) or Extinct in the Wild (EW).

6.4 Major threats to crabs in northern African freshwater ecosystems

Threats to crabs in northern African freshwater ecosystems include habitat destruction driven by increasing agriculture and industrial development, the alteration of fast flowing rivers for the creation of hydroelectric power, and the drainage of wetlands for farming and other uses (Collen *et al.* 2008, Cumberlidge *et al.* 2009). In addition, excessive water abstraction leaves rivers with little or no flow in the drier months, and sedimentation associated with farming activities further decreases habitat quality. Potential future threats to aquatic

Table 6.3. Summary of the Red List categories and the distribution of the species of freshwater crabs found in northern Africa. **

Species	RL Category	Range (km^2)	# Loc	PA	Zone
Potamonautes niloticus	LC	> 1,000,000	> 60	Y	NILE
Potamonautes berardi	LC	> 1,000,000	> 21	Y	NILE
Potamon algeriense	LC	> 500,000	> 23	N	MAGR

** Range = estimation of species distribution range based on distribution polygon of all known specimens; #Loc = Number of discontinuous localities from which the species was collected; PA = found in a protected area; Y = yes, N = no, NILE = Nile River basin, MED = Mediterranean region, MAGR= Maghreb. See text for taxonomic authorities.

communities in rivers associated with cities and towns tend to be polluted by sewage, industrial and general waste, and agricultural pesticides used by farmers may prove to be lethal to freshwater crabs once more research has been carried out. All of the above combine to increase the overall level of threat to range-restricted endemic species of freshwater crabs, and the careful management of water resources in the future will have the biggest impact on their survival.

6.5 Conservation recommendations

None of the three species of freshwater crabs from northern Africa are currently assessed as threatened, and the region's freshwater crab fauna does not appear to be in immediate trouble when compared with other assessed freshwater groups, such as fish, molluscs, and dragonflies, found in the same freshwater habitats. The three northern African freshwater crabs assessed as Least Concern have a wide distribution in the lowland rivers and wetlands of the region and so far have proved to be relatively tolerant to changes in land-use affecting freshwater ecosystems. The persistence of these more adaptable species in lowland rivers and streams that are already disturbed and visibly polluted in parts is encouraging. Loss of natural vegetation and pollution as a result of land development and agriculture is, however, likely to affect the lowland rivers, and many of the wholly aquatic species that live here could be vulnerable. Even species assessed as LC could suffer catastrophic declines should there be abrupt changes in land development, hydrology, or pesticide-use regimes. The on-going human-induced loss of habitat in many parts of the region is a primary cause for concern for the long-term survival of this fauna.

Significant areas of this region still remain insufficiently explored and new species of freshwater crabs are sure to be discovered as collection efforts in the remote areas intensify and taxonomic skills become more refined. Although taxonomic knowledge has advanced considerably in recent years and museum collections of freshwater crabs have improved, a great deal of work still needs to be done. There is a need for surveys to discover new species, refine species distributions, define specific habitat requirements, describe population levels and trends, and identify specific threats to northern Africa's important freshwater crab fauna.

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