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Menaces et conservation des zones humides d'Afrique du Nord : le cas du site Ramsar de Beni-Belaid (NE algérien)

Threats to and conservation of North African wetlands: The case of the Ramsar site of Beni-Belaid (NE Algeria)

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RÉSUMÉ

En raison de leur contexte biogéographique et géomorphologique, les zones humides du Nord-Est de l'Algérie présentent une grande richesse spécifique et coenologique. L'étude de la végétation du site Ramsar de Beni-Belaid (Petite Kabylie) a montré l'existence de quatre principales communautés végétales réparties sur des gradients d'hydrologie et de perturbation. Les résultats obtenus révèlent d'importantes menaces sur le court terme : le surpâturage entraîne l'envahissement du lac par le sable érodé des dunes littorales ; l'agriculture est à l'origine de défrichements illégaux, d'une pollution des eaux et de pompages excessifs dans la nappe phréatique ; enfin, la chasse et la pêche sont illégalement pratiquées au sein même du site Ramsar. Une prise de conscience des pouvoirs publics est nécessaire pour : (1) mettre en défens la zone humide dans le but de restaurer une ceinture forestière tampon et (2) d'initier une campagne de sensibilisation et d'implication de la population locale dans la gestion conservatoire du site.

Keywords:
Biodiversity
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Hydrophytic vegetation

ABSTRACT

Because of their biogeographical and geomorphological context, the northeastern Algeria wetlands present high species and community richness. The vegetation study of the Ramsar site of Beni-Belaid (Kabylia) showed the existence of four main communities, distributed along gradients of hydrology and disturbance. The obtained results reveal worrying threats on short term: overgrazing results in the lake invasion by the sand eroded from the coastal dune; agriculture induces illegal cutting, water pollution and excessive groundwater pumping; finally, hunting and fishing are illegally practiced into the Ramsar site. The awareness of public authorities is needed in order: (1) to completely protect the wetland with the aim of restoring a riparian forest belt; and (2) to initiate a campaign for increasing the local population awareness, and its involvement in conservation programs.

Abridged English version

Wetlands deserve a number of functions, comprising inundation control, groundwater recharge, chemical trapping and nutrient recycling, and harbour remarkable

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habitats and adapted floras and faunas. In Mediterranean regions, and more particularly in North Africa, wetlands contain a very rich, but declining biodiversity. In Algeria, wetlands are mainly concentrated on the northeastern coast and are very rarely protected from anthropogenic disturbances, even if they are recognised as conservation priorities, for instance through the 'Ramsar site' status. Previous investigations underline the exceptional richness of the wetlands of Kabylia, Numidia and Kroumiria. However, very few studies dealt with them, and most of them focused on the great wetland complexes of Annaba-El Kala and Guerbès-Senhadja. No scientific study has ever been published on other wetlands of northeastern-Algeria, which, like Beni-Belaid Wetland (36°52′36″N ; 06°06′16″E ; 0–3 m), are completely unknown by the international community. A preliminary report revealed in 2000 the major interest of this wetland, which notably houses *Lutra lutra*, *Mauremys leprosa*, *Emys orbicularis*, *Porphyrio porphyrio*, *Ixobrychus minutus*, *Alcedo atthis*, *Aythya nyroca*, *Acrocephalus scirpaceus*, as well as the endemic fish *Pseudophoxinus callensis*. Despite its recognition as a Ramsar site in 2003, neither study nor management has been still implemented, with the exception of a discontinuous enclosure installed in 2008 on the southern shore of the lake. The wetland is presently highly threatened on its sea side by the inward displacement of the coastal dune, and on its inland side by human activities, including agriculture, pumping, grazing, hunting and fishing. This worrying situation motivated the present study, which aims at: (1) evaluating the species and community richness of the Beni-Belaid Wetland, and specifying the ecological controls of its hydrophytic vegetation; (2) assessing its conservation status just after its election as Ramsar site; and (3) proposing avenues for its long-term conservation management. The work is based on phytoecological data recovered at each season during three consecutive years (2003–2005).

The inventory of the flora of Beni-Belaid Wetland reveals the local occurrence of 201 species, representing five biogeographical elements: eurasiatic/circumboreal (37.3%), circum-Mediterranean (30.3%), cosmopolitan/subcosmopolitan (12.9%), western Mediterranean (10.0%) and tropical/subtropical (7.5%). The local flora moreover contains two endemics (*Battandiera amoena*, *Biscutella raphanifolia*), and at least three introduced species (*Cotula coronopifolia*, *Cyperus eragrostis*, *Ludwigia peploides*). Four communities are discriminated by a correspondence analysis: (1) the psammophilous community (class *Ammophiletea*); (2) the hydrophytic community (class *Potamogetonetea pectinati*, order *Potamogetonetalia pectinati*, alliance *Nymphaeion albae*); (3) the helophytic community (class *Phragmiti-Magnocaricetea*, orders *Phragmitetalia australis* and *Scirpetalia compacti*); and (4) the forest community (class *Querco-Fagetea*, order *Populetalia albae*, alliance *Populion albae*). This richness mainly reflects the diversity of microhabitats and ecological conditions, but the diversified biogeographical affinities of the species also reveal the importance of past migrations during pluvial-interglacial periods for tropical/subtropical and Atlantic species, and during interpluvial-glacial periods for eurasiatic/circumboreal species. However, the rarity of endemics in North African wetlands suggests the long-term persistence of genetic fluxes, maybe due to migratory waterbirds.

The plant mosaic of Beni-Belaid is mainly controlled by hydrology and human-induced disturbances, which appear as the major controls of North African wetlands. The hydrological gradient, from permanent open waters to rarely inundated soils, is clearly related to the deltaic origin of the wetland. The hydrology is also characterised by an intra-annual cyclicity, mainly due to the summer development of hydrophytic and helophytic plants. The complex influence of hydrology allowed the local development of five rare plants, classed vulnerable (*Nymphaea alba*, *Persicaria amphibia*, *Rumex palustris*) or near threatened (*Baldellia ranunculoides*, *Helosciadium crassipes*) on the red list of wetland plants of North Africa. The influence of anthropogenic disturbances is revealed by aerial photographs and multivariate analyses, which show the spread of nitrophilous and adventice species (translating the proximity of fields), and of stress-tolerant ones (translating the influence of overgrazing). The livestock pressure for several decades is moreover responsible for the erosion of the coastal dune, which progressively overruns the lake. Like other Mediterranean ecosystems, Mediterranean wetlands are however adapted since the Neolithic to an extensive grazing. Grazing suppression, likely to lead to habitat closing and to favour competitive monospecific communities, should be avoided. In return, a moderate disturbance regime could be used in order to generate and manage an optimal biodiversity by increasing the spatial heterogeneity. The conservation of Beni-Belaid Wetland implies first its protection from agricultural impacts and invasive species introductions, by restoring the riparian forest. For this, grazing should be at least temporarily excluded from large parts of the lake rive and from the surrounding dune complexes. Intensive pumping, associated to dam constructions are likely to modify on the short term the hydrology of the alluvial plain, to affect the transport and deposition of sediments by rivers and to lead to soil salinisation. The summer water-table lowering observed for 10 years at Beni-Belaid has already triggered vegetation changes: several species regressed (*H. crassipes*, *N. alba*), while some others spread (*Ceratophyllum demersum*, *Myriophyllum spicatum*, *Lemna minor*, *Phyla nodiflora*). These changes could have favoured invasive species such as *Cotula coronopifolia*, *Cyperus eragrostis*, *Ludwigia repens* and *P. nodiflora*, and indigenous opportunistic species such as *Juncus acutus* and *Bolboschoenus glaucus*. Finally, hunting and fishing are practiced without management or restriction, and are likely to affect waterbird, fish and mammal communities.

The present-day situation of Beni-Belaid Wetland is similar to most other exceptional wetlands of northeastern Algeria. This questions the efficiency and consistency of the 'Ramsar site' status (http://www.ramsar.org), which does not result in sufficient conservation managements. Methods and knowledge allowing control of the increasing anthropogenic pressure however exist and are already applied in diverse Mediterranean regions. Locally, maintaining the hydrological functioning of Beni-Belaid Wetland appears as the main conservation goal. The first