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Lichen diversity in the Edough Peninsula, North East of Algeria

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Abstract. This study was carried out with the aim of enriching the list of lichens of Algeria, for this reason we have prospected 2 stations "Les Cascades des Vautours" and "Dar smayer" at 442 and 856 m of altitude, Edough Peninsula on the North East Algerian coast. The annual precipitation is relatively abundant, of the order of 1000 mm. Seventy-three taxa were registered belonging to 15 families of which 8 taxa: *Cladonia cervicornis* subsp. *verticillata* (Hoffm.) Ahti, *C. ramulosa* (With.) J.R. Laundon, *C. humilis* (With.) J.R. Laundon, *Nephroma parile* (Ach.) Ach., *Parmelinopsis afrorevoluta* (Krog & Swinscow) Elix & Hale, *Ramalina siliquosa* (Huds.) A.L. Sm., *Usnea esperantiana* P. Clerc and *Xanthoparmelia conspersa* (Ehrh. ex Ach.) Hale, which were never mentioned in Algerian lichen flora.
Keywords: Lichens; North Africa.

[es] Diversidad liquénica en la península Edough, noreste de Argelia

Resumen. Se ha realizado este estudio con el objetivo de enriquecer la lista de líquenes de Argelia donde se han prospectado 2 estaciones "Les Cascades de Vautours" y "Dar smayer" situadas a 442 y 856 m de altitud respectivamente de la Península de Edough en el NE de Argelia. La precipitación anual es abundante y cercana a los 1000 mm. Se han encontrado 73 taxones pertenecientes a 15 familias diferentes, con 8 taxones: *Cladonia cervicornis* subsp. *verticillata* (Hoffm.) Ahti, *C. ramulosa* (With.) J.R. Laundon, *C. humilis* (With.) J.R. Laundon, *Nephroma parile* (Ach.) Ach., *Parmelinopsis afrorevoluta* (Krog & Swinscow) Elix & Hale, *Ramalina siliquosa* (Huds.) A.L. Sm., *Usnea esperantiana* P. Clerc y *Xanthoparmelia conspersa* (Ehrh. ex Ach.) Hale, que constituyen novedad para la flora liquénica argelina.
Palabras clave: líquenes; norte de Africa.

Introduction

The lichens, as a group of the symbiotic organisms, composed by the association of photobiont (generally Cyanobacteria and Chlorophyta) and fungi, produce a range of secondary compounds, most of which specific (Rundel 1978). Since the mycobiont is unique in the symbiotic association and usually dominates the association, lichens are traditionally classified as a lifeform of fungi. The fungal partners are mostly Ascomycota (98%) and the others belong to the Basidiomycota and anamorphic fungi. Approximately 21% of all fungi are able to act as a mycobiont (Honegger 1991, Gilbert & Giavarini 2000); thus, lichens form the largest mutualistic group among fungi. Only 40 genera are involved as photosynthetic partners in lichen formation: 25 algae and 15 cyanobacteria (Kirk et al. 2008) in Rankovic (2015). In lichen associations, both partners have benefit. The mycobiont has two principal roles in the lichen symbiosis: to protect the photobiont from exposure to intense sunlight and desiccation and to absorb mineral nutrients from the underlying surface or from minute traces of atmospheric contaminants. The photobiont also has two roles: to synthesis organic nutrients from carbon dioxide and, in the case of cyanobacteria, to produce ammonium (and then organic nitrogen compounds) from N_2 gas, by nitrogen fixation (Hale 1983, Nash 1996) in Rankovic & Kosanić (2015).

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The first botanical research in Algeria was carried out at the end of the 18th century and we owe the first inventories and descriptions to Jean-Louis Marie Poiret (Poiret 1789) and René Louiche Desfontaines with Flora Atlantica (Desfontaines 1798-1799). As early as 1837, the multiple exploration missions allowed many botanists to constitute the first collections and the first herbaria. Those of Ernest Saint-Charles Cosson and Michel Charles Durieu De Maisonneuve (1854-1867) are among the most illustrated. Amrani et al. (2015) give a very good overview of the history of the lichenology in Algeria since 1799 until 2013, nevertheless the knowledge of the Algerian lichen flora remain quite fragmented and incomplete.

The peninsula of Edough has never the subject of a study of lichens, this work has been undertaken currently at 2 stations to better appreciate the site interest in the diversity of lichen flora.

Materials and Methods

The Edough Mountains are lying east-west. The 26 km long rectilinear ridge line begins north of Lake Fetzara, passes through Koudiat el Roha (616 m), reaches 1008 m at Kef Sabâa, the highest point of the region, descends 867 m towards the village of Seraidi, then lowers to the end of the Cap de Garde (161 m) north of Annaba (Toubal-Boumaza 1986). The Edough massif, located on the Algerian coast in the region of Annaba, appears as an antiforme of gneiss and mica schists 50 km long by 20 km wide and axial orientation N 60 with intercalation of marble-amphibolite and of shale satin (Vila 1980). This massif is characterized by a varied lithology, distinguishing a crystallophyllian complex which is the essential part of the massif, of the magmatic and sedimentary formations which are located mainly in the eastern part of the massif. It is considered part of the internal zones of the Alpine chain of North Africa, associated with the collision of the African and European plate during the Oligo-Miocene period (Saboua 2010). The Pliocene marine transgression phases were able to flood the lowlands surrounding the Edough Peninsula and formed a temporary island, an important biogeographic phenomenon described as the "Continental Fossil Island" (Lanza 1984). Different terrains in the Edough Peninsula are of limestone nature, siliceous, which give acidic soils, strongly humiferous, deep enough to resemble brown forest soils and brown soils. The deep soils after hydrolysis of the silicates transform into sands (quartz and micas) and white clays such as kaolinite (Toubal & Toubal 1998). The coastline is occupied by the quaternary dunes covering old red sands (Aouadi 1989). The Algerian eastern Tell and especially its north slope, is very watered. Coastal resorts receive rainfall of 1000 mm per year. The Edough benefits from a Mediterranean climate and is part of the wet bioclimatic belt.

The choice of the station is conditioned not only by ecological factors, namely the abundance of the support, but also by physical factors such as topography and accessibility. Station 1: Vautours Cascade at 442 m altitude, 36°55'54''N 007°38'59''E, locality of Bouzizi. Station 2: Dar smayer at 856 m altitude, 36°55'35.21"N; 7°40'52.23"E, locality of Seraidi (Fig. 1).

The *Quercus* species has a high plasticity with respect to altitude. It develops from the sea level to the highest point of Edough (Kef Sabâa 1008 m). The harvest of the species was done on oak (*Quercus suber* L.) at the station Vautours cascade (VC) and on oak zeen (*Quercus canariensis* Willd.) at Dar smayer station (DS). Several outings were carried out at the level of the two stations during the year 2014.

The identification of the different species was made by Pr. Ali Ahmed Monia, using different flora (Ozenda & Clauzade 1970, Van Haluwyn et al. 2009) and the web site: AFl (www.afl-lichenologie.fr) and LIAS light (liaslight.lias.net/). We follow the index fungorum nomenclature.

Some of foliose and fruticose lichens were identified directly on site. In the laboratory, chemical reactions or spot tests with potassium hydroxide (KOH), sodium hypochlorite (C), para-phenylendiamine (PD) or the combined effect of the first two reagents (KC) were used, as well as the use standard microscopic techniques for use in the identification of lichens. A cut of the thallus to check which alga is in the algal layer (and possibly in the cephalodia), then if necessary, crush the cut to observe in detail the algal cells. We also used the TLC to confirm the identification of some species. The different specimens were deposited in the Laboratory of plant biology and Environment, Department of Biology, Badji Mokhtar University, Algeria.

Figure 1. Location of stations studied in Edough Peninsula (north-eastern coast of Algeria).

Results and Discussion

Species identified at each station are recorded in Table 1 and Table 2 according to the type of substrate. The species identified in this study are found in different growth-form thallus, foliose, fruticose, crustose, squamulose, gelatinous, leprose, distributed on 15 families (Fig. 2): Parmeliaceae 21, Physciaceae 12, Ramalinaceae 9, Cladoniaceae 9, Collemataceae 3, Nephromataceae 3, Lecanoraceae 2, Lobariaceae 2, Teloschistaceae 2, Graphidaceae 1, Chrysothricaceae 1 Pannariaceae 2, Peltigeraceae 1, Pertusariaceae 2, Phlyctidaceae 1, the most representative are Parmeliaceae and Physciaceae.

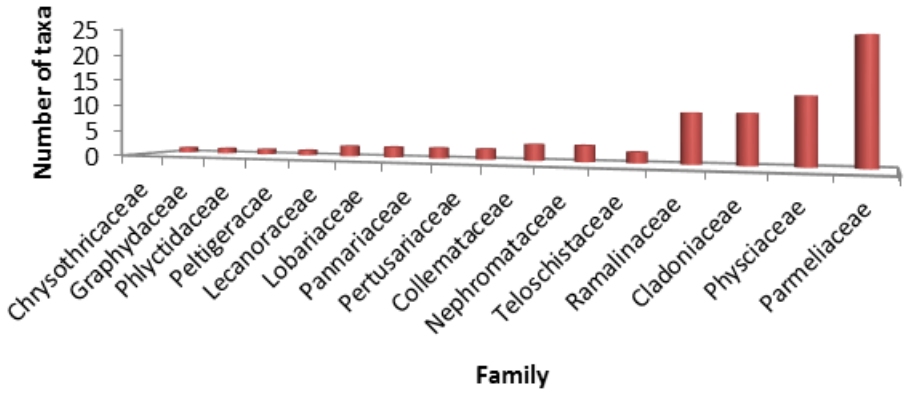

Figure 2. Taxonomic spectrum of different taxa lichen.

In Table 1, there is a clear dominance of the corticolous species that have been identified on *Quercus suber* and *Q. canariensis*, which generally dominate the Edough. Acidity, roughness and crevices make *Quercus* a very good phorophyte for the development of lichens (Öztürk & Oran 2011), the distribution of lichens is determined by the substrate (precisely its chemical nature for crustaceous), habitat (age, history and forest productivity) and climate (Ellis et al. 2007, Gauslaa 2014, Van Herk et al. 2002).

Table 1. Habitat priority of lichen species identified at the station Vautours cascade (VC).

Species	**Substrate**
Anaptychia ciliaris (L.) Körb. ex A. Massal.	corticolous
Acarospora cervina A. Massal.	saxicolous
Bacidia rubella (Hoffm.) A. Massal.	corticolous
Collema nigrescens (Huds.) DC.	corticolous
Collema flaccidum (Ach.) Ach.	muscicolous
Cladonia carneola (Fr.) Fr.	lignicolous
Cladonia cervicornis subsp. *verticillata* (Hoffm.) Ahti	terricolous
Cladonia coniocrea (Florke) Spring.	corticolous
Cladonia fimbriata (L.) Fr.	muscicolous
Cladonia furcata (Huds.) Schrad. subsp. *furcata*	muscicolous
Cladonia humilis (With.) J.R. Laundon	lignicolous
Cladonia ramulosa (With.) J.R. Laundon	terricolous
Cladonia rangiformis Hoffm.	muscicolous
Chrysothrix chlorina (Ach.) J.R. Laundon	saxicolous
Diploschistes muscorum (Scop.) R. Sant.	terricolous
Collema tenax var. *tenax* (Sw.) Ach.	terricolous
Fuscopanaria mediterranea (Tav.) P. M. Jørg	corticolous
Lobaria amplissima (Scop.) Forssell	corticolous
Lobaria pulmonaria (L.) Hoffm.	corticolous
Myriolecis dispersa (Pers.) Śliwa, Zhao Xin & Lumbsch	saxicolous
Nephroma laevigatum Ach.	muscicolous
Nephroma parile (Ach.) Ach.	muscicolous
Parmelina carporrhizans (Taylor) Hale	corticolous
Parmelina pastillifera (Harm.) Hale	corticolous
Parmelina tiliacea (Hoffm.) Hale	corticolous
Parmotrema robustum (Degel.) Hale	corticolous
Punctelia borreri (Sm.) Krog	corticolous
Punctelia subrudecta (Nyl.) Krog	corticolous
Pannaria conoplea (Ach.) Bory	saxicolous, muscicolous
Parmeliopsis ambigua (Wulfen) Nyl.	saxicolous
Parmelinopsis afrorevoluta (Krog & Swinscow) Elix & Hale	saxicolous
Peltigera polydactylon (Neck.) Hoffm	muscicolous
Pleurosticta acetabulum (Neck.) Elix & Lumbsch	corticolous
Physcia leptalea (Ach.) DC.	corticolous
Phlyctis argena (Ach.) Flot.	saxicolous
Ramalina calicaris (L.) Röhl.	corticolous
Ramalina farinacea (L.) Ach.	corticolous
Ramalina fastigiata (Pers.) Ach.	corticolous
Ramalina lacera (With.) J.R. Laundon	corticolous
Ramalina polymorpha (Lilj.) Ach.	corticolous
Ramalina pusilla Le Prévost	corticolous
Ramalina siliquosa (Huds.) A.L. Sm.	corticolous
Usnea esperantiana P. Clerc	corticolous
Xanthoparmelia conspersa (Ehrh. ex Ach.) Hale	saxicolous
Xanthoria candelaria (L.) Th. Fr.	corticolous

Lobaria pulmonaria, *L. amplissima*, *Nephroma laevigatum* and *Pannaria conoplea* provide information on agglomeration forest age, *Lobaria pulmonaria* is also an indicator of the purity of the environment. As well as *Anaptychia ciliaris* which requires a good quality of air to develop. Cyanolichens such as *Lobaria pulmonaria* and *L. amplissima* make important contributions to nutrient cycling in Peninsule of Edough as their cyanobacteria partners fix atmospheric nitrogen (N_2) into a form that is useable by plants. Nitrogen inputs from cyanolichens may be quite substantial, especially in moist, old-growth forests (Antoine 2004).

The acidophilic species are *Arctoparmelia*, *Cladonia foliacea*, *C. furcata*, *C. fimbriata*, *C. ramulosa* as well as *Parmelina tiliacea*, *Flavoparmelia caperata* and *Parmotrema perlatum*; nitrophiles *Physconia distorta*, *P. venusta*, *Physcia aipolia*, *Phaeophyscia orbicularis*. We distinguish the photophilic and heliophilic species *Buellia dispersa*, *B. subdisciformis*, *Bacidia rubella*, *Flavoparmelia caperata*, *Lecanora argentata*, *Parmotrema perlatum*, *Parmelina tiliacea*, *P. pastillifera* and *Pleurosticta acetabulum* (Llop et al. 2012, Paoli et al. 2014).

Table 2. Habitat priority of lichen species identified at the station Dar smayer (DS).

Species	**Substrate**
Arctoparmelia incurva (Pers.) Hale	saxicolous
Buellia dispersa A. Massal.	saxicolous
Buellia subdisciformis (Leight.) Jatta	saxicolous
Bacidia rubella (Hoffm.) A. Massal.	corticolous
Cladonia foliacea (Huds.) Willd. subsp. *foliacea*	terricolous
Evernia prunastri (L.) Ach.	corticolous
Flavoparmelia caperata (L.) Hale	corticolous
Flavoparmelia soredians (Nyl.) Hale	corticolous
Lecanora argentata (Ach.) Röhl.	corticolous
Nephroma resupinatum (L.) Ach.	muscicolous
Parmelia saxatilis (L.) Ach.	saxicolous
Parmotrema sulcatum (Taylor) M. Choisy	corticolous
Parmelina quercina (Willd.) Hale	corticolous
Parmotrema reticulatum (Taylor) M. Choisy	corticolous
Physcia adscendens H. Olivier	corticolous
Physcia aipolia (Ehrh. ex Humb.) Fürnr.	corticolous
Physcia biziana (A. Massal.) Zahlbr.	corticolous
Physcia caesia (Hoffm.) Furnrohr.	corticolous
Physcia dubia (Hoffm.) Lettau	corticolous
Phaeophyscia orbicularis (Neck.) Moberg	corticolous
Physconia distorta (With.) J.R. Laundon	corticolous
Physconia venusta (Ach.) Poelt	corticolous
Pertusaria amara (Ach.) Nyl. f. *amara*	saxicolous
Pertusaria pertusa (L.) Tuck.	saxicolous
Ramalina canariensis J. Steiner	corticolous
Variospora aurantia (Pers.) Arup, Frödén & Søchting	saxicolous

Lichens are highly valued ecological indicators known for their sensitivity to a wide variety of environmental stressors like air quality and climate change. According to our observations throughout our field trips at the Edough level, we can observe a high lichen richness, while anthropogenic activity is a major source of loss of diversity in these forests such as overgrazing, which severely affects the development of lichen terricolous species, which will disappear as a result of grazing and trampling, clearing which reduces the structural diversity of forests (Boncina 2000,

Humphrey et al. 2012), which particularly affects epiphytic lichens that prefer mature trees, their richness is closely related to primitive (Dymytrova et al. 2014) or ancient forests (Nascimbene et al. 2009). According to Hamel (2013), 12432.58 ha are destroyed by fires in the Edough peninsula during the years (2000-2010) compared to the total forest area which is 47350 ha.

In order to compare the lichen taxa we have just identified with the literature, we have referred to several recent references (Ali Ahmed et al. 2013, Slimani et al. 2013, Ait hammou et al. 2014, Boutabia et al. 2015), due to the lack of a checklist of Algerian lichen species. Table 2 shows the presence of 8 newly identified lichen taxa in Algeria.

Table 3. List of lichens inventoried in the Edough peninsula.

Taxa	**Cited in Algeria by**
Anaptychia ciliaris (L.) Körb. ex A. Massal.	Haina &Bendechach (2004), Ali Ahmed et al. (2013), Slimani et al. (2013).
Arctoparmelia incurva (Pers.) Hale	Hale (1986).
Acarospora cervina (Ach.) A. Massal.	Nylander (1854), Flagey (1896), Haina & Bendechach (2004).
Buellia dispersa A. Massal.	Flagey (1896), Haina & Bendechach (2004).
B. subdisciformis (Leight.) Jatta	Egea (1989), Haina & Bendechach (2004).
Bacidia rubella (Hoffm.) A. Massal.	Werner (1949), Faurel et al. (1953), Semadi, (1989), Djellil (1989), Boutabia (2000), Egea (2003), Haina & Bendechach (2004), Slimani et al. (2013).
Collema flaccidum (Ach.) Ach.	Flagey (1896), Haina & Bendechach (2004), Rebbas (2011), Fadel (2012).
C. nigrescens (Huds.) DC.	Nylander (1854), Flagey (1896), Lapie (1909), Werner (1949, 1955), Boutabia (2000), Haina & Bendechach (2004), Fadel (2012), Slimani et al. (2013).
Cladonia carneola (Fr.) Fr.	Djellil (1989), Haina & Bendechach (2004).
C. cervicornis subsp. *verticillata* (Hoffm.) Ahti	This paper
C. coniocrea (Florke) Spring.	Djellil (1989), Haina & Bendechach (2004), Boutabia et al. (2015).
C. foliacea (Huds.) Willd. subsp. *foliacea*	Maire (1928), Werner (1949, 1955), Djellil (1989), Haina & Bendechach (2004), Bendaikha (2006), Rebbas et al. (2011), Slimani et al. (2013), Ali Ahmed et al. (2013).
C. furcata (Huds.) Schrad. subsp. *furcata*	Nylander (1854), Flagey(1896), Maheu(1906), Werner (1949,1955), Djellil (1989), Haina & Bendechach (2004).
C. fimbriata (L.) Fr.	Nylander (1854), Flagey (1896), Lapie (1909), Werner (1940, 1949, 1955), Haina & Bendechach (2004), Bendaikha (2006), Rebbas et al. (2011), Khedim (2012).
C. humilis (With.) J.R. Laundon	This paper
C. ramulosa (With.) J.R. Laundon	This paper
C. rangiformis Hoffm.	Flagey (1896), Lapie (1909), Werner (1949, 1955), Djellil (1989), Haina & Bendechach (2004), Rebbas et al. (2011), Ali Ahmed et al. (2013).
Chrysothrix chlorina (Ach.) J.R. Laundon	Maire (1928), Haina &Bendechach (2004).
Diploschistes muscorum (Scop.) R. Sant.	[Slimani et al. (2013), Haina & Bendechach (2004).
Evernia prunastri (L.) Ach.	Rahali (2003), Haina & Bendechach (2004), Rebbas et al. (2011), Khedim (2012), Hamer el ain (2013).
Collema tenax (Sw.) Ach. var. *tenax*	Nylander (1854), Flagey (1896), Maheu (1906), Werner (1949, 1955), Egea (1989), Haina & Bendechach (2004), Rebbas et al. (2011).
Flavoparmelia caperata (L.) Hale	Ait Hammou (2013), Slimani et al. (2013), Boutabia et al. (2015).

Taxa	Cited in Algeria by
F. soredians (Nyl.) Hale	Hale (1984).
Fuscopanaria mediterranea (Tav.) P.M. Jørg.	Slimani et al. (2013), Boutabia (2015).
Lecanora argentata (Ach.) Röhl.	Bendaikha (2006), Rebbas (2011), Khedim (2012), Slimani et al. (2013).
Lobaria amplissima (Scop.) Forssell	Werner (1949, 1955), Haina & Bendechach (2004), Slimani et al. (2013).
L. pulmonaria (L.) Hoffm.	Nylander (1854), Flagey (1896), Werner (1940, 1949, 1955), Djellil (1989), Rahali (2003), Haina & Bendechach (2004), Slimani et al. (2013).
Myriolecis dispersa (Pers.) Śliwa, ZhaoXin & Lumbsch	Flagey (1896), Werner (1949, 1955), Egea et al. (1990), Semadi (1989), Rahali (2003), Haina & Bendechach (2004), Bendaikha (2006), Mosbah (2007), Merabti (2007), Hamer el ain (2013).
Nephroma laevigatum Ach.	Flagey (1896), Trabut (1914), Faurel et al. (1951a), Werner (1949, 1955), Djellil (1989), Boutabia (2000), Rahali (2003), Haina & Bendechach (2004), Slimani et al. (2013).
N. parile (Ach.) Ach.	This paper
N. resupinatum (L.) Ach.	Nylander (1854), Flagey (1896), Dubuis & Faurel (1945), Werner (1949), Faurel et al. (1951a), Haina & Bendechach (2004).
Parmelia saxatilis (L.) Ach.	Ali Ahmed et al. (2013), Slimani et al. (2013), Boutabia et al. (2015).
Parmelina carporrhizans (Taylor) Hale	Slimani et al. (2013).
P. pastillifera (Harm.) Hale	Djellil (1989), Haina & Bendechach (2004).
P. quercina (Willd.) Hale	Hamer el ain (2013).
P. sulcata (Taylor) M. Choisy	Ali Ahmed et al. (2013), Slimani et al. (2013), Boutabia et al. (2015).
P. tiliacea (Hoffm.) Hale	Khedim (2012).
Parmotrema perlatum (Huds.) M. Choisy	Ali Ahmed et al. (2013), Slimani et al. (2013), Serradj Ali Ahmed et al. (2014).
P. reticulatum (Taylor) M. Choisy	Semadi (1989), Boutabia (2000), Haina & Bendechach (2004), Fadel (2012).
P. robustum (Degel.) Hale	Boutabia et al. (2015).
Punctelia borreri (Sm.) Krog	Flagey (1896), Haina & Bendechach (2004), Boutabia et al. (2015).
P. subrudecta (Nyl.) Krog	Boutabia et al. (2015).
Pannaria conoplea (Ach.) Bory	Bory (1828).
Parmeliopsis ambigua (Wulfen) Nyl.	Flagey (1896), Debuis & Faurel (1945), Werner (1949), Haina & Bendechach 2004).
Parmelinopsis afrorevoluta (Krog & Swinscow) Elix & Hale	This paper
Peltigera polydactylon (Neck.) Hoffm.	Werner (1949), Faurel et al. (1951), Nylander (1854), Flagey (1896), Haina & Bendechach (2004).
Pleurosticta acetabulum (Neck.) Elix & Lumbsch	Nylander (1854), Brongnart (1881), Flagey(1896), Lapie (1909), Werner (1940), Debuis & Faurel (1945), Djellil (1989), Semadi (1989), Rahali (2003), Boutabia (2000), Haina & Bendechach (2004).
Physcia adscendens H. Olivier	Semadi (1989), Egea et al. (1990), Egea & Llimona (1991), Boutabia (2000), Rahali (2003), Bendaikha (2006), Rebbas et al. (2011), Fadel (2012), Ali Ahmed et al. (2013), Slimani et al. (2013).
P. aipolia (Ehrh. ex Humb.) Fürnrohe	Semadi (1989), Djellil (1989), Mosbah (2007), Egea (2003), Haina &Bendechach (2004), Khedim (2012), Ali Ahmed et al. (2013), Slimani et al. (2013).

Taxa	Cited in Algeria by
P. biziana (A. Massal.) Zahlbr.	Reichert (1936, 1937), Werner (1940), Semadi (1989), Boutabi (2000), Haina & Bendechach (2004), Bendaikha (2006).
P. caesia (Hoffm.) Furnrohr.	Nylander (1854), Flagey (1896), Egea & Llimona (1991), Haina & Bendechach (2004).
P. dubia (Hoffm.) Lettau	Semadi (1989), Egea & Llimona (1991), Hamer el ain (2013), Haina & Bendechach (2004).
P. leptalea (Ach.) DC.	Boutabia (2000), Rebbas et al. (2011), Slimani et al. (2013), Mosbah (2007), Khedim (2012), Hamer el ain (2013).
Phaeophyscia orbicularis (Neck.) Moberg	Semadi (1989), Boutabia (2000), Mosbah (2007), Haina & Bendechach (2004), Hamer el ain (2013).
Physconia distorta (With.) J.R. Laundon	Egea (2003), Haina & Bendechach (2004), Mosbah (2007), Khedim (2012), Hamer el ain (2013).
P. venusta (Ach.) Poelt	Egea (2003).
Pertusaria amara (Ach.) Nyl. f. *amara*	Werner (1955), Semadi (1989), Djellil (1989), Egea et al. (1990), Egea & Limona (1991), Haina & Bendechach (2004).
P. pertusa (L.) Tuck.	Nylander (1854), Flagey (1896), Faurel et al. (1951a), Djellil (1989), Haina & Bendechach (2004).
Phlyctis argena (Ach.) Flot.	Djellil (1989), Haina & Bendechach (2004), Merabti (2007), Fadel (2012), Ali Ahmed et al. (2013), Slimani et al. (2013).
Ramalina calicaris (L.) Röhl.	Nylander (1854), Brongnart (1881), Flagey (1896), Maheu (1906), Lapie (1909), Werner (1949), Haina & Bendechach (2004), Hamer elain (2013).
R. canariensis J. Steiner	Semadi (1989), Djellil (1989), Haina & Bendechach (2004), Ali Ahmed et al. (2013), Slimani et al. (2013), Hamer el ain (2013).
R. farinacea (L.) Ach.	Flagey (1896), Werner (1940, 1949), Egea (2003) Haina & Bendechach (2004), Rebbas (2011), Khedim (2012), Ali Ahmed et al. (2013), Slimani et al. (2013), Hamer el ain (2013).
R. fastigiata (Pers.) Ach.	Flagey (1896), Semadi (1989), Haina & Bendechach (2004), Slimani et al. (2013), Hamer el ain (2013).
R. lacera (With.) J.R. Laundon	Boutabia et al. (2015).
R. polymorpha (Lilj.) Ach.	Nylander (1854), Flagey (1896), Werner (1949, 1955), Haina & Bendechach (2004), Rebbas et al. (2011).
R. pusilla Le Prévost	Nylander (1854), Flagey (1896), Werner (1949, 1955), Haina & Bendechach (2004), Boutabia et al. (2015).
R. siliquosa (Huds.) A.L. Sm.	This paper
Usnea esperantiana P. Clerc	This paper
Variospora aurantia (Pers.) Arup, Frödén & Søchting	Flagey (1896), Steiner (1902), Bouly (1911), Werner (1949, 1955), Haina & Bendechach (2004), Rebbas et al. (2011).
Xanthoparmelia conspersa (Ehrh. ex Ach.) Hale	This paper
Xanthoria candelaria (L.) Th. Fr.	Flagey (1896), Hochreutiner (1904), Werner (1949), Haina & Bendechach (2004).

Conclusion

The present study contributes on the one hand to enrich the literature by the identification of new lichen taxa in Algeria, on the other hand to seriously examine the future of this flora and to say that it is therefore imperative to protect our forests, and more particularly ancient forests such as the Edough peninsula, which is considered a refuge area, and which must benefit from superior protection in order to ensure the viability of its lichen flora.

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