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The lichen flora of the cape Lardier area (Port-Cros National Park, Var, France)

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Abstract. A survey of the lichen flora was carried out on the whole area of the cape Lardier area from October 2021 to March 2022, as part of the Stoechas[1] Project. All environments were prospected from the coastal areas of the supralittoral zone to the northern limits of the territory. This inventory, on the basis of 958 collected data, allowed the identification of 225 taxa, including 4 taxa reported for the first time in France (*Lecanora rubrofusca* var. *monstruosa, Rinodina santorinensis* var. *olivieri, Xanthoparmelia mexicana, Xanthoparmelia plitii*), 4 taxa previously reported in the Var department in old literature but not confirmed since 1959 (*Acarospora subrufula, Buellia abstracta, Lecidella scabra, Polyblastiopsis subericola*) and 27 taxa newly reported in the Var (*Amandinea maritima, A. pelidna, Athallia holocarpa, Buellia caloplacivora, B. sequax s.l, Caloplaca cecericola, Diploschistes euganeus, Endohyalina kalbii, Flavoplaca confusa, Gyalecta schistidicola, Heteroplacidium phaeocarpoides, Lecidea erythrophaea, L. sarcogynoides, Lepraria jackii, Micarea byssacea, Opegrapha conferta, Pertusaria werneriana, Physconia petraea, Porina leptospora, Trapelia glebulosa, Verrucaria fusconigrescens, Xanthoparmelia cumberlandia, X. glabrans, X. luteonotata, X. pulla* chemo. *perrugata, X. pulla* chemo. *pulla*). Overall, the study of the lichen flora shows a territory rich in species despite the fact that a large part of the inner area was burned by the fire of 2017 and has not yet been recolonized. The richest areas are the coastal parts (subject to maritime influences), the saxicolous lichen flora of the east side of the cap Taillat and corticolous lichen flora in some of the wooded ravines which are still off the west coast of cap Lardier. The study, carried out on all the populations of saxicolous, terricolous and corticolous lichens, revealed 32 groupings which could be attached communities already described (18 saxicolous communities, all siliceous, 11 epiphytic communities, all corticolous, 3 terricolous siliceous communities). Taking into account the former studies, the lichen flora currently known on the area of the cap Lardier amounts to 227 lichens and 8 lichenicolous fungi. A study of threatened species, based on a threat level ranking method, is also presented. Some proposals for management, aiming at the ecological improvement of the environment for the preservation of lichen flora, are described. The complete list of inventoried taxa with scientific names, authorities and station numbers is given in Appendix II.
Keywords: cap Lardier, heritage value species, lichens, threatened species.

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[1] The Stoechas project (2021-2026), funded by the Prince Albert II of Monaco Foundation, responds to the important need for species inventories and mapping of terrestrial habits. It aims to update the level of knowledge about the biodiversity of new areas of the Port Cros National Park (the "accession area" and the "optimal accession area") and to consolidate conservation efforts and research carried out in the core areas to promote an ecosystem-based management.

***Résumé*. Les lichens de l'aire du cap Lardier (Parc national de Port-Cros, Var, France).** Un inventaire de la flore lichénique a été réalisé sur l'ensemble de l'aire du cap Lardier d'octobre 2021 à mars 2022, dans le cadre du projet Stoechas[2]. Tous les milieux ont été prospectés depuis les zones côtières de l'étage supralittoral jusqu'aux limites nord du territoire. Cet inventaire, basé sur 958 données collectées, a permis de recenser 225 taxons, dont 4 taxons signalés pour la première fois en France (*Lecanora rubrofusca* var. *monstruosa, Rinodina santorinensis* var. *olivieri, Xanthoparmelia mexicana, Xanthoparmelia plitii*), 4 taxons anciennement signalés dans le Var mais non confirmés depuis 1959 (*Acarospora subrufula, Buellia abstracta, Lecidella scabra, Polyblastiopsis subericola*) et 27 taxons nouvellement signalés dans le Var (*Amandinea maritima, A. pelidna, Athallia holocarpa, Buellia caloplacivora, B. sequax* s.l.*, Caloplaca cecericola, Diploschistes euganeus, Endohyalina kalbii, Flavoplaca confusa, Gyalecta schistidicola, Heteroplacidium phaeocarpoides, Lecidea erythrophaea, L. sarcogynoides, Lepraria jackii, Micarea byssacea, Opegrapha conferta, Pertusaria werneriana, Physconia petraea, Porina leptospora, Trapelia glebulosa, Verrucaria fusconigrescens, Xanthoparmelia cumberlandia, X. glabrans, X. luteonotata, X. pulla* chémo. *perrugata, X. pulla* chémo. *pulla*). Globalement, l'étude de la lichénoflore montre un territoire riche en espèces bien qu'une grande partie de la zone intérieure ait été brûlée par l'incendie de 2017 et ne soit pas encore recolonisée. Les zones les plus riches demeurent les parties littorales (soumises aux influences maritimes), aussi bien pour la lichénoflore saxicole (face est du cap Taillat) que pour la lichénoflore corticole dans certains vallons boisés encore protégés (côte ouest du cap Lardier). L'étude, réalisée sur toutes les populations de lichens saxicoles, terricoles et corticoles, a mis en évidence 32 groupements ayant pu être rattachés à des associations ou peuplements déjà décrits (18 groupements saxicoles tous calcifuges, 11 groupements épiphytiques tous corticoles, 3 groupements terricoles calcifuges). Compte tenu des études antérieures, la flore lichénique connue actuellement sur l'aire du cap Lardier compte désormais 227 lichens et 8 champignons lichénicoles non lichénisés. Une étude sur les espèces patrimoniales, basée sur une méthode de hiérarchisation des niveaux de menace, est également présentée. Quelques propositions de mesures simples de gestion, visant l'amélioration écologique des milieux pour la préservation de la flore lichénique, sont formulées. La liste complète des espèces inventoriées avec nom scientifique, autorités et numéros de stations est données en annexe II.
Mots-clés : cap Lardier, lichens, espèces menacées, espèces patrimoniales.

1. Introduction

As part of a study and research program to contribute to the knowledge of the biodiversity of its territory and to identify areas for appropriate management, the Port-Cros National Park (PCNP) launched in 2021 an inventory of the lichen flora in the sector of cap Lardier. The collection of scientific data was carried out within the common framework of biodiversity data acquisition of the Stoechas

[2] Le projet Stoechas (2021-2026) financé par la fondation Prince Albert II de Monaco répond à un besoin important d'inventaires d'espèces et de cartographie des habitats terrestres afin de mettre à niveau les connaissances sur la biodiversité des nouveaux territoires du Parc national de Port-Cros (Aire d'adhésion et Aire optimale d'adhésion), et de consolider les efforts, travaux et recherches menés sur les zones cœurs, afin de promouvoir une gestion écosystémique de nos territoires.

Program. The present document is the report of a study and inventory of lichens-forming fungi and lichenicolous fungi. The field investigations were conducted from October 2021 to March 2022.

The cap Lardier area is made up partly of land parcels acquired by the *Conservatoire de l'espace littoral et des rivages lacustres*[3] (hereafter *Conservatoire du Littoral*) and partly of private land that has been the subject of an agreement to join the Park (Fig. 1). The whole territory is managed by the Port-Cros National Park since 1984 (Barcelo and Boudouresque, 2012).

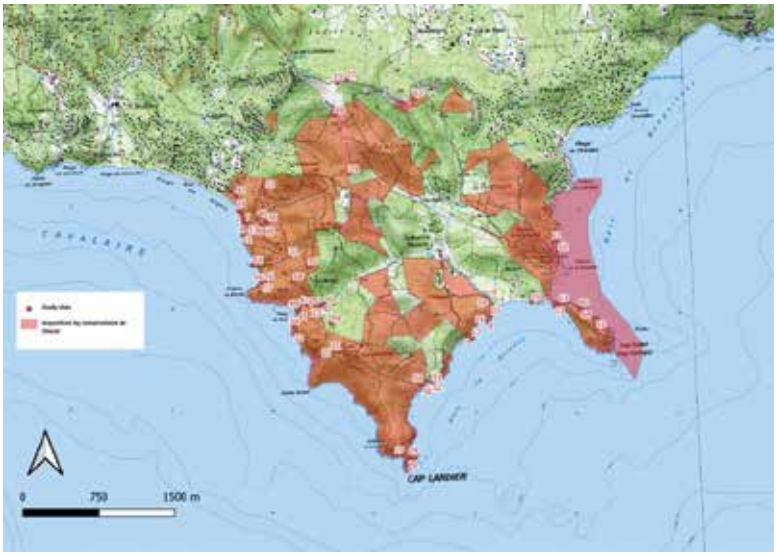

Figure 1. Terrestrial domain of the cap Lardier area and acquisitions by the *Conservatoire du Littoral* in brown (the numbers correspond to study sites: see Fig. 2 and 3 and Appendix I).

The area of cap Lardier, located on the Peninsula of Saint-Tropez, forms part of the Adhesion Area of the PCNP (see Boudouresque *et al.,* 2020, for the zoning of the PCNP). The area is in the communes of La Croix Valmer and Ramatuelle and covers an area of about 420 hectares (sectors of cap Lardier and cap Taillat). The whole territory of cap Lardier thus defined constitutes a southern extension of the peninsula, and shares a similar latitude to cap Corse and the Island of Levant. The area studied in this work extends from the beach of Gigaro in the west, to the Escalet in the east (including cap Lardier and cap Taillat) and has

[3] Conservatoire du littoral et des rivages lacustres: Society for the conservation of the coastlines and lakesides.

for its northern limit the Collebasse pass, including the ridge lines west of the pass. The site consists of a hilly terrain, with a dominant point culminating at 204 m altitude in the north (west of Collebasse) which offers a panoramic view of the entire park area and with three other significant high points, one of 178 m at the Vigie, another of 147 m at the old semaphore station of cap Lardier, and with cap Taillat itself culminating at 63 m altitude. The south-western part of the study area, which is steeply sloping into the sea and is sometimes difficult to access, is protected from prolonged exposure to the sun, while the eastern part of the sector facing the Bay of Briande is more open, less steep and more strongly exposed to drought and to the influence of the southeast winds (from Italy) and the sea. It is in these last areas of wave exposed coasts that the most beautiful outcrops of supralittoral lichens have been found (on the east face of cap Taillat). No permanent watercourse is present, although some temporary watercourses (Jovat, Brouis, Huissière) may flow a little depending on the year, but none of them is sufficiently perennial for the installation of aquatic or subaquatic lichen flora.

2. Natural environment

2.1. Geology

Figure 2. Location of the study sites (northern part of the survey area).

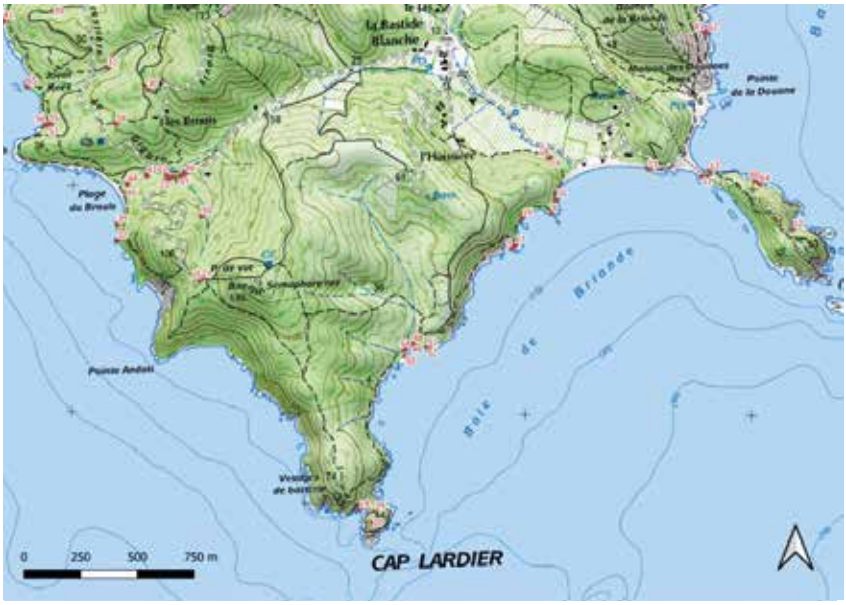

Figure 3. Location of the surveys (southern part of the survey area).

The Peninsula of Saint-Tropez is essentially constituted of a Hercynian base where the Camarat-Lardier massif presents a relatively high relief up to 204 m altitude at the highest point, south-east of the Collebasse pass. The base is crystalline with a large northern part constituted of Camarat granite (granites and granulites with more or less coarse grains) and a southern part formed by varied gneisses with often small-scale transitions to micaschists and feldspathic gneisses. Some amphibolites are noted between the beach of Brouis and the Andati point (Fig. 4).

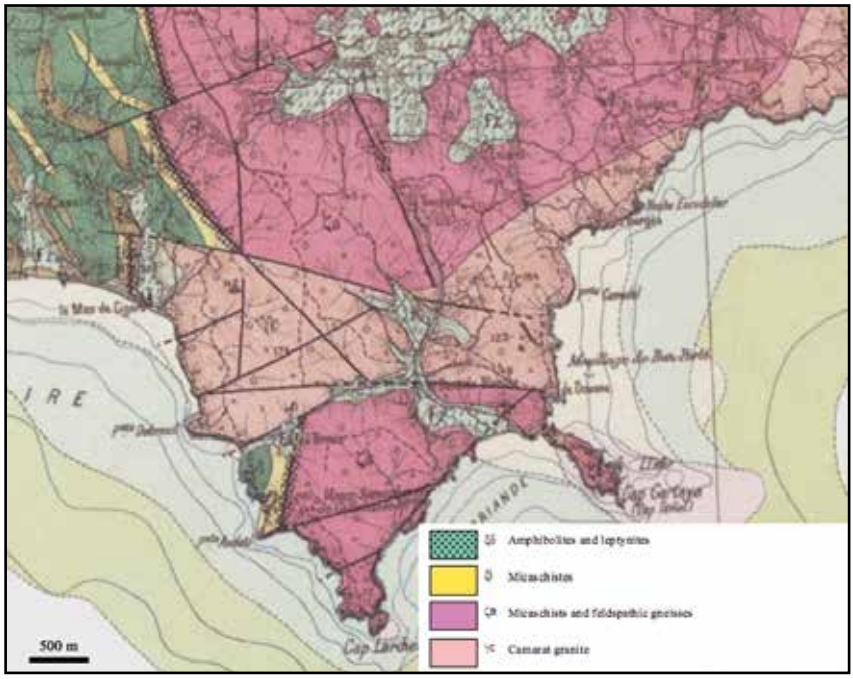

Figure 4. Geological map of the cap Lardier area (source*: www.geoportail.gouv.fr*).

The rocky nature of the base also imposes a rather varied relief and an indented coastline, favorable to the establishment of coastal saxicolous lichens communities wherever the frequency of waves and spray allows their growth, because the mostly southern exposure of the peninsula makes the area relatively dry and subject to strong sunshine wherever there is not much shelter.

The Bastide Blanche valley has a base of recent alluvia and eluvia mainly resulting from the rapid erosion of granites (arenisation) and opens widely onto the Briande Bay.

All these rocky substrata support siliceous saxicolous and terricolous lichen floras on both the seaward facing rocks and in the interior of the park.

2.2. Macroclimate of the studied areas

Cap Lardier is covered by two reference weather stations: Cavalaire station and Ramatuelle-cap Camarat station.

The climatological data for both stations has changed little in comparison to the data presented by Lavagne (1984) for the period 1951-1971: the average annual precipitation (714.3 mm in Cavalaire and 850.8 mm in Camarat for 1951–1971) is quite similar, with three

months of drought, despite a sub-insular influence that makes it slightly less rainy in Camarat and corresponds to a subhumid rain regime. However, compared to the data provided by Lavagne (1984), we note that temperatures appear to be slightly warmer by 2°C, averaging 17.3°C over the period 1991–2020 (versus an annual average of 15.5°C for Cavalaire for the period 1951–1971).

With an average maximum in the warmest month of 30.5°C and an average minimum in the coldest month of 6.8°C, the Emberger coefficient recalculated on the basis of 1991-2020 data, Q2 = 101, still places the Cavalaire - cap Lardier area in the sub-humid Mediterranean climate zone with a mild winter.

Table I. Average data (temperature and precipitation) for Cavalaire and Ramatuelle-cap Camarat for the period 1991–2020, provided by the online database, *https://www.infoclimat.fr*.

		Cavalaire station	Ramatuelle-cap Camarat station
Average annual temperature	° *C*	17.3	16.5
Extreme maximum temperature	° *C*	37.9	37.0
Average maximum temperature	° *C*	21.6	20.1
Average minimum temperature	° *C*	12.9	12.9
Extreme minimum temperature	° *C*	-1.8	-8.6
Average annual precipitation	*mm*	702.3	822.0

The relatively high precipitation in the area is explained by the southerly latitude of the peninsula, as its latitude is almost as far south as the island of Levant, which exposes it to the winds from the Gulf of Genoa. The influence of the maritime inputs and haline mist coming in from the east, is also considerable, on the exposed rocky coasts, and these influences can penetrate into some small valleys, which also being well exposed are favorable to the establishment of some communities of lichens.

2.3. Disturbance of the natural environment by fires

The area of cap Lardier has been subject to significant disturbances that are not without consequences for the preservation of the natural environment and on the current distribution of the lichen flora. Two historical fires occurred in the area, one in 1979 and a second and more important one in 2017. The latter, which started in the eastern

foothills of Gigaro (in the valleys of Collebasse) has burned a significant part of the territory from the inland areas right up to the coastal edge of the Bay of Briande and the coastal path from Escalet to cap Taillat (including the peninsula of cap Taillat though the eastern side was spared).

In spite of the natural regeneration of these sectors by the higher plants forming a low scrubland (*maquis*), some explorations at the time of the study of the lichens showed the persistence of the damage caused by these disasters on the lichen flora which remains very impoverished or even almost non-existent in large areas. We took this into account in the distribution of our field investigations, which were mainly limited to the parts not affected by the fires and to adjacent areas, although certain incursions allowed us to locate relevant control plots for a possible long-term follow-up (Fig. 5).

3. Previous knowledge

If the phanerogamic vegetation of the cap Lardier area has been studied several times (Lavagne, 1984, 1985; Lacosse and Aboucaya, 2003, 2005; Lacosse *et al*., 2016, 2017; Lacosse 2021), few old or previous works report dedicated surveys of the lichen flora in the cap Lardier area itself or in its close periphery. Among the oldest, Flahaut and Hue (1899) and de Crozals (1924, 1926, 1929) have provided very interesting works for the knowledge of the local flora of the Var or the Maures, but no precise data on the area of cap Lardier.

- Flahaut and Hue (1899) enumerate collections made between Hyères and the most eastern part, Brégançon, but they did not reach the Peninsula of Saint-Tropez.
- de Crozals (1924) presents the most important old work realized in the Maures upland and lists 370 species collected in the whole area. Some parts of the Port-Cros National Park are mentioned there including the islands of Hyères, peninsula of Giens, Brégançon, but not the area of the cap Lardier.
- de Crozals (1926) studies 77 species of lichens of the family Collémacées, collected in the limestone uplands north of Toulon, as well as in the western and southern parts of the Maures. But there is no mention of the cap Lardier area.
- de Crozals (1929) (in the monograph on the islands of Hyères by E. Jahandiez) presents some 223 species of lichens found in the islands of Hyères and the peninsula of Giens.

The inventory of the islands of Hyères is completed by Rondon (1971, 1972, 1973, 1977) respectively on the epiphytic, rupicolous and terricolous lichens (28 terricolous species listed), as well as by Rondon-Seidenbinder (1983), which gives a list of 87 corticolous species. But

these works remain confined to the islands of the Port-Cros national Park.

Some scattered data by Roux (1982) and Bricaud and Roux (1990) also refer to the Var coast.

- Roux (1982) mentions, amongst relatively nearby sites, some species collected in Le Lavandou and in La Londe-les-Maures.

- Bricaud and Roux (1990) mention for the first time the area of cap Lardier (Ramatuelle, l'Escalet, which is on granulite rock and in the spray zone) where they discovered *Caloplaca ora* Poelt et Nimis, a species newly described in 1987.

But the most numerous and detailed descriptions of the area of the cap Lardier were made by Ménard (1997) in his doctoral of thesis, *L'étude phytosociologique et écologique des peuplements lichéniques saxicoles calcifuges du sud-est de la France*, published in 2009. Ménard prospected several sites in the area of cap Lardier, carried out 12 site lists representing 5 associations (table 12, § 9) and described several new associations and subassociations, four of which are of particular interest in the area of cap Lardier: *Buellietum subdisciformis-sardiniensis, Caloplacetum orae, Solenopsoretum vulturiensis* and *Pertusarietum gallicae ramalinetosum breviusculae*.

Thus, the total list of lichens having been previously recorded in the area concerned by the present work is mainly restricted to the one resulting from the work of Ménard (1997) and reported hereafter, corrected according to their current understanding or name or corrected according to the revision of Claude Roux (Ménard, 2009) : *Flavoplaca ora, Buellia crozalsiana, Buellia tesserata, Diplotomma glaucoatrum, Buellia sardiniensis, Buellia saxorum, Buellia* cf. *sequax, Buellia subdisciformis, Variospora thallincola, Candelariella vitellina, Catillaria chalybeia* éco. *chalybeia, Diploicia subcanescens, Dirina fallax, Lecania atrynoides, Lecanora polytropa, Lecanora praepostera, Lecanora sulphurea, Myriolecis hagenii* morpho. *umbrina, Myriolecis oyensis, Lecidella asema* var. *elaeochromoides, Pertusaria pluripuncta, Pertusaria rupicola, Physconia petraea, Acarospora privigna, Protoparmelia montagnei, Ramalina breviuscula, Rhizocarpon polycarpum, Rinodina alba, Rinodina tephraspis, Rinodina confragosa, Rinodina santorinensis, Roccella phycopsis, Scoliciosporum umbrinum, Xanthoria calcicola, Xanthoria parietina, Martinjahnsia resendei.*

The same applies to the lichenicolous fungi listed by Ménard (1997): *Chaenothecopsis hospitans, Endococcus rugulosus* s.l., *Muellerella pygmaea, Stigmidium ramalinae, Polycoccum* cf. *arnoldii, Polycoccum microsticticum.*

This updated list totals 35 lichens and 6 lichenicolous fungi confirmed and mentioned in the area of the cap Lardier before the present study.

In addition, several other works, concerning the Mediterranean flora of the Var, have contributed to the extent of the knowledge of the local lichen flora, by the description of new species and typical lichens communities in the region: Abbassi Maaf and Roux (1984, 1985, 1987); Bouly de Lesdain (1907, 1909, 1924, 1925, 1956); Bricaud *et al*. (1991, 1992, 1993a, 1993b); Clauzade (1963, 1969a, 1969b); Clauzade and Roux (1977); Roux and Bricaud (1991). These works have been also useful for the identification of the species collected in the cap Lardier area.

4. Methods

4.1. Brief presentation of the investigations and sampling

A preliminary inventory of the various habitats hosting lichens is necessary before any survey. This preliminary reconnaissance was carried out using the available habitat maps, geological maps, local topographic maps and other information provided by the PCNP. It allows us to see the different habitats of the higher plants, the different rocky substrata and the different exposures that exist locally and that are potentially favorable to the establishment of a lichen flora. The daily exchanges with the PCNP wardens were also an important element and often the basis of the success of our investigations.

For each station, the ecological characteristics (location, living environment, substratum, local and general orientation, altitude) and the geographical coordinates (decimal degrees) were noted, so as to obtain a complete set of data per site and which was associated with the list of identified taxa there.

Sampling was carried out using the partial sampling method (Roux, 1990). This is a classic survey, with the identification by naked eye and magnifying lens of the greatest possible number of taxa, followed by the sampling of those not identified on a given surface. The size of this surface is usually a few square meters. This survey is completed by the sampling of a sufficient quantity of specimens (per substrata) carried out at random in the surface considered. This enables laboratory identification of taxa that have gone unnoticed in the field. This method is sufficient here and makes it possible to obtain very satisfactory qualitative results and to approach exhaustiveness within the context of an inventory of lichens.

All the surveyed sites detailed are compiled in Appendix I.

4.2. Determination of taxa

For the determinations, we used a dissecting stereomicroscope (Olympus SZX7, 8 to 56 times magnification), a compound microscope (Olympus CX41, 100 to 1 500 times magnification) equipped with a camera (Euromex CMEX), and the usual chemical reagents used in lichenology: K (20 % aqueous potassium hydroxide solution), C (aqueous sodium hypochlorite solution: commercial concentrated solution diluted 2 times), N (50 % aqueous nitric acid solution), I (iodine-iodide solution: lugol), P (paraphenylene diamine: freshly prepared alcoholic solution). Some taxa have been chromatographed following the techniques used in lichenology compiled by Orange *et al.* (2001). Some recently described taxa that are particularly difficult to confirm have been sequenced.

For general information on lichens, see Ozenda and Clauzade (1970).

Identifications were confirmed using relevant field guides, taxonomic keys and monographs.

Flora: Clauzade and Roux (1985) and its supplements (1987 and 1989); Smith *et al*. (2009); Wirth *et al*. (2013); Italic the Information System of the Italian Lichens, version 07 (see Nimis and Martellos 2023), specific monographs.

Nomenclature: Nimis (2016); Roux et coll. (2020, and unpublished data).

Phytosociology: Barkmann (1958), James *et al*. (1977), Egea and Llimona (1987), Bricaud (2006), Ménard (2009).

5. Results

5.1. Overall results

Over the whole area of cap Lardier, 65 sites were surveyed. Taxa identifiable in the field were noted during the survey, some field identifications were amended during microscopic checks and a significant number of additional taxa that were indeterminate in the field could only be identified in the laboratory. The total inventory of lichens with their sites is in Appendix II.

Two additional sites outside the perimeter of the cap Lardier area were sampled. These samples were carried out with the PCNP wardens as part of an assessment of the interest of the small valley of the Ricarde in Croix-Valmer. They provided some interesting taxa completing the inventory and bring the total number of study sites to 67. These are mainly distributed over the whole of the sectors not affected by the fire of 2017, except for the surveys 28, 29, and 30 which are located in the area undergoing regeneration. Some surveys in these burnt areas, despite a good start to phanerogam regeneration, showed a poor lichenological flora. In terms of substrata, the surveys sites are distributed as follows.

Table II. Distribution of lichen surveys by substrata type.

Substratum	Ecology type	Survey site number	%
Free lime rocks	Siliceous saxicolous	37	55.2
Non calcareous soil	Siliceous terricolous	3	4.5
Non calcareous soil in rock crevices	Saxiterricolous	3	4.5
Bark	Corticolous	24	35.8
Total		**67**	**100**

These 67 locations are quite representative of the different sectors of interest present on the site. The absence of calcareous soils explains the dominance of a siliceous lichen flora, on rather acid rocks like the granites and granulites of Camarat and also on less acid rocks like the micaschists. There were few surveys of terricolous lichens due to the lack of old or pristine environments. Most of the soils of the interior have been burnt by fire and the rest of the area is subject to drought and these conditions are not very favorable to the development or rapid colonization of lichens. The corticolous taxa were collected in dense *maquis* scrub in the valleys of Brouis and Aiguebonne or in undergrowth of *Quercus suber* groves and in *Quercus ilex-Pinus* forests which have largely been spared by the fires.

A few surveys were carried out in areas which had been burnt and regenerated such as at 28, 29, 30 and a few others on the edge of burnt areas. But these showed either a significant disturbance of the environment by fire (the rocks were barewith a few rare exceptions where some rock faces remained more or less unharmed for example at 29), or a significant drying of the shaded environments (e.g., at 30, on a very old *Quercus ilex* where some perithecia of *Porina aenea* and *Strigula* sp. are largely dried out).

Site 29 was the subject of a complete survey to serve as a control plot for the subsequent evolution of the colonization by lichens of the surrounding bare rocks (see § 6.4.1).

Concerning the vegetation belts, we followed the methods of Roux et coll. (2020). To describe the littoral zonation, we considered the supralittoral and adlittoral belts and the qualifier of proxilittoral convenient to take into account the distance from the sea:

- Supralittoral belt (= hygrohaline zone).

- Adlittoral belt (= aerohaline zone) periodically subjected to the spray, and not to the waves, making this belt a transition with the terrestrial environment and so it is colonized by the aerohaline lawns, *maquis* and the chasmohalophilitic groupings.

- Proxilittoral (thermo-Mediterranean and meso-Mediterranean proxilittoral zone), developing not far from the coast and beyond the adlittoral belt towards the interior and not subject to sea spray or haline aerosols.

In relation to nearshore vegetation zones, the 67 sites studied are distributed as follows.

Table III. Distribution of the survey sites per vegetation zones.

Vegetation zones	Characteristics	Survey site number	%
Supralittoral (= hygrohaline zone)	Zone of approximately constant sea spray	11	16.4
Adlittoral (= aerohaline zone)	Periodically subject to sea spray and transitioning to the terrestrial environment	27	40.3
Proxilittoral meso- and thermo-Mediterranean	Terrestrial, beyond the adlittoral, not far from the shoreline, not subject to spray	29	43.3
Total		**67**	**100**

5.2. List of surveys

The 67 survey sites are listed and detailed with their ecological characteristics and geographical information in Appendix I.

The map with all field surveys shows the distribution of the surveys over the whole territory, with respect to the fire footprint (Fig. 5). More detailed maps are presented with northern and southern part of the territory (Fig. 2 and 3).

Figure 5. Cap Lardier area with footprint (in brown) of the fire of 2017 (PCPN data).

5.3. Lichen flora

According to the known phytosociological data in the south-east of France, 32 of the observed groupings could be attached to associations or stands already described:

- 18 siliceous saxicolous groupings, all siliceous;
- 11 epiphytic groupings, all corticolous;
- 3 siliceous terricolous groupings, including 1 terricolous grouping in crevices rocks.

For light requirements, 12 groupings are heliophilous, 12 are photophilous and 5 are sciaphilous. This shows that all types of environments whether open or closed, show a fairly well-established lichen flora.

However, due to the 2017 fire in the cap Lardier area, more than 80 % of the inland area was burnt and so probably some previously described groupings were not encountered as they have been lost.

5.3.1. Saxicolous lichen communities

All the saxicolous lichen communities of the studied area grow on siliceous substrata (Camarat granite, gneiss, micaschists, amphibolites). No outcrop of calcareous rocks exists here, so all the groupings surveyed are more or less strictly siliceous. In accordance with the various phytosociological studies published, all the groupings

observed are classified according to their affinity to water in different forms (rain, runoff, substratic, atmospheric), to light (heliophilous, photophilous), to the nutrient enrichment by bird excrements (nitrophilous, heminitrophilous, non-nitrophilous groupings) and also, for the littoral zone, to saline influences (halophilous and halotolerant groupings).

5.3.1.1. Marine and maritime communities (very halophilous groupings)

These groupings, essentially situated in the supralittoral zone and belonging all to the class of *Lichinetea confinis*, are favoured by regular immersion or by regular exposure to sea spray. The most remarkable areas are those exposed to the east, such as the east coast of cap Taillat, with beautiful groupings. Two alliances are visible there.

The alliance of ***Verrucarion maurae*** in which we find an association with ***Hydropunctaria symbalana***, situated slightly above sea level, up to 1 m above depending on the amplitude of the oscillation of the waves, wetted by the surf and often also by the permanent spray. It forms more or less imposing black patches, like tar, in the cracks and rocky cavities (Fig. 6). In the studied area, it is represented, exclusively by *Hydropunctaria symbalana*: no other accompanying species was observed, neither *Collemopsidium* s.l., nor *Verrucaria halophila*. This was also the case on the stormier coast in the east and on the less sunny parts of the creeks exposed to the west. This Mediterranean association is distinguished from the Atlantic *Hydropunctarietum amphibiae* and *Hydropunctarietum maurae.* Where the first is located in the upper mediolittoral (*H. amphibia*), just below the second (*H. maura*), in which both *H. amphibia* and *H. maura* are considered as Atlantic species.

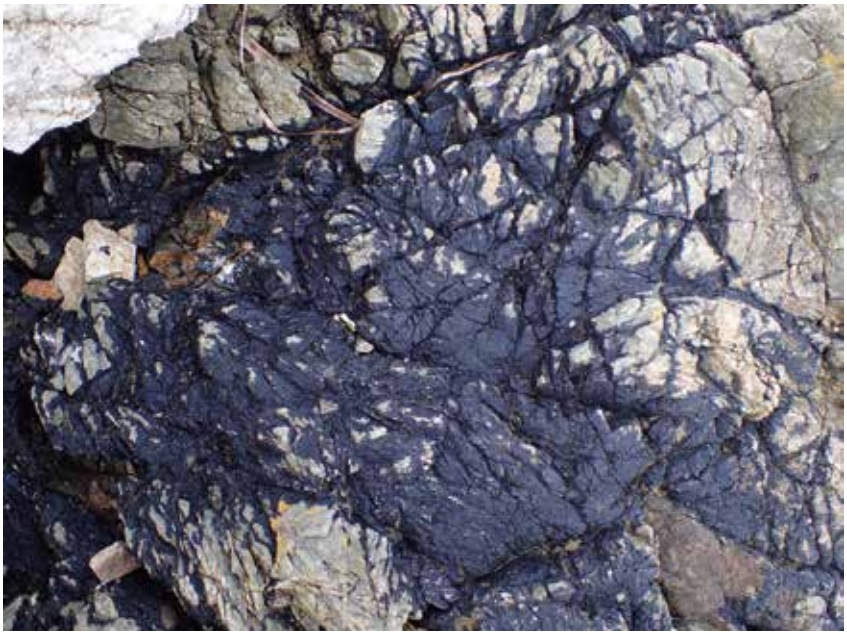

Figure 6. *Hydropunctaria symbalana*, lower supralittoral, cap Taillat. © Bertrand.

The ***Caloplacion marinae*** alliance with dominant orange crustose communities, not wetted by the permanent surf but only by the spray. It includes:

- in the lower and middle supralittoral zone, ***Caloplacetum marinae*** Klement 1955 (with *Flavoplaca marina*; the atlantic species *Lecanora helicopis* and *L. actophila* are absent), which is possibly a Mediterranean vicariant (Fig. 7). It is present in several sites and sometimes very well developed over several meters high on the exposed eastern coast of cap Taillat, with *Flavoplaca marina, Lecania atrynoides, Diplotomma glaucoatrum, Diplotomma chlorophaeum, Myriolecis oyensis* and *Variospora thallincola*, the latter in the upper part. This association was not distinguished from the following one by Ménard (2009) because of the non-distinction of *Caloplaca marina* which, at that time, was considered absent from the Mediterranean;

- in the upper supralittoral and lower adlittoral zones, the ***Caloplacetum orae*** Ménard 2009, characterized by the presence of *Flavoplaca ora* (Ménard, 2009), associated with *Lecania atrynoides, Variospora thallincola, Sanguineodiscus aractinus, Myriolecis* sp.

Figure 7. *Flavoplaca marina*, supralittoral zone of cap Taillat. © Bertrand.

5.3.1.2. Hydrophilous and subhydrophilous communities

Although we have extensively surveyed the studied area and despite its extent, no truly aquatic communities have been observed either because of the absence of a more or less permanent stream or because of the absence of a favourable substratum linked to a few run-offs as in the Aiguebonne valley. The relatively long period of dryness (on average three months per year in periods of high temperature) is not favourable to their implantation.

The subhydrophilic groupings, subject to more or less prolonged runoff or seepage after the rains, are present but rarely so, and were noted only a few times. They belong mainly to the *Peltulion euplocae* alliance. The ***Peltuletum euplocae*** Wirth 1972, was reduced to only *Peltula euploca* and found along cracks in the sun. No *Lichinella*, *Spilonema*, or *Collemataceae* were observed. Curiously, we found it under a head of rocks fed by a very temporary pool of water, at the top of the peninsula of cap Lardier. There also, very dry conditions and probably insufficiently porous substrates do not allow the development of the complete association.

The substratohygrophilous groupings which are subject to brief seepages after the rains but dry quickly, mainly refer to the association of ***Solenopsoretum vulturiensis*** Ménard 1997, whose two

characteristics, *Solenopsora vulturiensis* and *Catillaria chalybeia*, are particularly frequent in these environments. They are found from the adittoral to the thermo-Mediterranean level (littoral of the beach of Gigaro to the beach of Brouis and also along the interior track of the cap Lardier, on slightly humid slopes).

In some places, we have also found, on small walls and humid slopes without any seepage, communities with *Lepraria lobificans* and *Leprocaulon quisquiliare*. They have been notably observed in the valley of Brouis, at the bottom of the valley of Terre Blanche and on a slope of the edge of the runway at Gigaro.

The very sciaphilous substratohygrophilous groupings such as those with *Porina chlorotica* and *Psilolechietum lucidae,* which are generally present inland, have not been observed. They are usually found on humid walls without seepage. They have probably not been found, for lack suitable remaining habitat after the fire.

5.3.1.3. Ombrophilous communities (rain-wet)

These communities correspond – mainly to astegophilous[4] and heliophilous groupings – to the class ***Rhizocarpetea geographici*** Mattick 1951 em. Wirth 1972, comprising, in the study area, several associations either of the heliophilous type, or of the non-heliophilous but strongly photophilous type.

On the **southern walls at the seaside which receive high insolation and are nutrient enriched:**

- The ***Xanthorietum resendei*** Llimona 1976 heliophilous association, very thermophilous and nitrophilous. It is characterized by *Martinjahnsia resendei* (=*Xanthoria resendei*) which probably reaches the northern limit of its range in the coastal part of the Provence (area including La Ciotat and Marseilles and especially the islands of Riou and Frioul). On the top of the rocky headlands, *Xanthoria calcicola* and sometimes some thalli of *Xanthoria parietina* were found and on the walls, as an interloper species, *Diploicia subcanescens*. This association is very present in the bay of Briande but more discreet on the west coast between the beach of Gigaro and the cap Lardier (Fig. 8).

[4] Refers to species that grows on substrates that are not protected from rain.

Figure 8. *Martinjahnsia resendei* - cap Taillat. © Bertrand.

On horizontal or slightly sloping surfaces, **clearly well-lit and sunny, but poorly nutrient enriched**:

- The ***Caloplaco nesodis-Aspicilietum intermutantis*** Ménard 1997 largely dominated by crustose thalli is very common here, with *Aspicilia intermutans* with both morphotypes intermutans and ammotropha, *A. viridescens*, *Athallia necator* (= *Caloplaca nesodes*) the latter rarely present, and often *Aspicilia cupreoglauca,* accompanied by little nitrophilous taxa: *Acarospora umbilicata, Blastenia crenularia* var. *contigua, Diploschistes scruposus, D. euganeus, Lecanora campestris, Kuettlingeria fuscoatroides, Lecanora gangaleoides, Lecidella asema* var. *elaeochromoides, Rinodina confragosa*;

- **Communities dominated by large foliose lichens**, association with *Xanthoparmelia plittii* (a species with stictic acid, but without norstic acid, formerly confused with *X. conspersa*) and groupings with *Xanthoparmelia mexicana* (a species with salazinic acid but without norstic acid, formerly confused with *X. tinctina*), the latter more thermophilous than

the former. Previously, these communities were known as *Xanthoparmelietum conspersae* and *Xanthoparmelietum tinctinae* respectively. Chemical analysis by thin layer chromatography (TLC) of specimens of the two characteristic *Xanthoparmelia* of the grouping areas showed that they are in fact close related but distinct species from *X. conspersa* and *X. tinctina*, respectively *X. plittii* and *X. mexicana*, so far not recognized in France (only in Italy and Spain). *Xanthoparmelia plittii* and *X. mexicana* have since been found in Bouches-du-Rhône near Marseilles by Méric *et al*. (2022). In the studied area we also found *X. stenophylla*, but not *X. sublaevis* (though known in La Ciotat by Méric *et al.,* 2022), probably due to lack of observations.

In the two previous groupings, in addition to *Xanthoparmelia* with yellowish-green thallus (*X. mexicana* or *X. plittii*), there are numerous *Xanthoparmelia pulla* s.l. which can only be determined by chemical analysis. All samples collected were analyzed by TLC, which confirmed the presence of *X. delisei, X. glabrans, X. luteonotata, X. pulla* chemotype perrugata, *X pulla* chemotype pulla, *X. verruculifera*.

These groupings of large foliose lichens are very common on the rocky outcrops of the adlittoral, inland as far as the Collebasse pass.

On the **walls in indirect light, non-heliophilous but photophilous and not very nitrophilous** associations belonging to the suborder ***Pertusarienalia leucosorae*** Egea et Llimona 1987 are observed:

- The ***Buellietum subdisciformis-sardiniensis*** Ménard 1997, association of crustose lichens on more or less vertical walls, very frequent on the edge of the coast, here free of ***Buellia sardiniensis*** (as in La Ciotat). The *Buellietum* is often mixed with the *Pertusarietum gallicae* and with the community of *Lepra monogona.* The association varies from very photophilous to not very photophilous (on the less lit walls). *Buellia leptoclinoides, Buellia tesserata* and *Buellia saxorum* are often found there;

- The ***Pertusarietum gallicae ramalinetosum breviusculae*** Ménard 1997, which is established on non-vertical rocky surfaces, is exclusively maritime (upper adlittoral zone), often facing the sea. It hosts *Pertusaria pluripuncta* (= *P. gallica*), *Ramalina breviuscula, Rinodina beccariana, Rinodina santorinensis* (a quite rare parasite of *Pertusaria*), as well as *Protoparmelia montagnei* and its *aquilina* variety, *P.*

olivascens, Lecanora sulphurea, L. praepostera, Lecidella asema (var. *asema* and var. *elaeochromoides*) and *Myriolecis liguriensis*;

- The community with *Lepra monogona* (*Pertusaria* s.l. white, K+ red), on very sloping walls, not sunny but well lit, where *P. monogona, Buellia tesserata, Rinodina alba, Lecanora gangaleoides, Lecanora praepostera* live together. We saw its companions there, but unfortunately, we could not find evidence of *P. monogonal*;

- The ***Pertusarietum rupicolae*** community Wirth et Llimona 1975, clearly photophilous, but not heliophilous nor ombrophilous, is less thermophilous than the previous ones. It is frequently found inland and throughout the mesomediterranean on north-facing walls with indirect light, where *Pertusaria rupicola* grows together with *Lepra amara* var. *flotowiana, Lepra mammosa, Pertusaria digrediens, Ochrolechia parella, Lecanora praepostera, Lecanora sulphurata, L. sulphurea, Tephromela atra*.

5.3.1.4. Very ombrophilous communities (in overhanging areas not wet by rain)

In the studied area, these communities - the mainly stegophilous[5] and non-heliophilous groupings - are located under overhangs and concave rock faces. They so are completely sheltered from rainfall and consist of aerohygrophilous lichens. They are rather monotonous in the sector with only *Dirina fallax* (distinguished for some years from *Dirina massiliensis* by their DNA and their calcifuge character) and its sorediate morphotype. They constitute the association with *Dirina fallax*, the calcifuge vicariant of the calcicolous *Dirinetum massiliensis*. These two characteristics are accompanied by *Roccella phycopsis*, indifferent to the nature of the rock, a little more photophilous, more hygrophilous, more developed at the edge of the coast and more halotolerant, although it also exists in the proxilittoral.

Due to the fire of 2017, the disappearance of the saxicolous lichen flora noted on a large part of the inland, probably deprived us of a good number of interesting species typical of this thermomediterranean environment.

[5] Refers to species that grows on substrates protected from rainfall.

5.3.2. Terricolous and muscicolous communities

On the *maquis* floor, which in a few places is undisturbed, neither by fire nor by excessive trampling, we find among the dry grasses and small stones on the ground, the ***Cladonietum foliaceae*** Klement 1955, with *Cladonia foliaceae* subsp. *foliaceae*, *Cladonia furcata* morphotypes *furcata* and *corymbosa*, *Cladonia rangiformis* morphotype *pungens*, *Cladonia cervicornis, Cladonia ciliata* f. *flavicans*; we also found *Cladonia glauca*, less common, with *Cladonia ramulosa* and *C. pyxidata*. On the small siliceous stones on the ground, the ***Porpidietum crustulatae*** Klement 1950 was also found. It is typical of microclimatically unstable pioneer stands with *Porpidia crustulata* and *Rhizocarpon reductum* and here also with *P. cinereoatra*.

On slightly more humid soils, not sunny but sufficiently lit and on the edge of the slope, we find stands of leprose crustose lichens with *Lepraria jackii* and *Leprocaulon quisquiliare* and stands with *Cladonia humilis* sometimes barely visible accompanied by *Micarea byssacea*.

In the upper part of the Brouis valley, a foliose lichen with cyanobacteria, *Nephroma laevigatum* (usually corticolous) accompanied by *Lepraria finkii* and *Solenopsora vulturiensis*, was observed on the darker and wetter edge of the slope.

5.3.3. Epiphytic lichen communities

Trees and shrubs in the scrubland were examined, but due to the 2017 fire, much of the inland area has become drier despite slow regeneration by scrub which has yet to gain much height. In addition, we noticed that the lichens show that some areas adjacent to burnt areas, are drier than expected. It is likely that the original lichen flora resulting from an old forest continuity, has been disturbed by the general drying of these sites.

The most interesting observations are confined to the western part of the surveyed area, in the small valleys that have been protected from the fire, and which lie between the beach of Gigaro and cap Lardier. These valleys, perpendicular to the coastline, benefit from regular maritime inputs allowing the establishment of aerohygrophilous lichens groupings which are completely lacking elsewhere.

All the groupings mentioned below are essentially corticolous and occur mainly on deciduous trees, more rarely on conifers. No foliicolous community was seen (these require conditions of high humidity not present in the cap Lardier area), nor were strictly lignicolous groupings. The dry woods which were burnt in the interior and the areas which are somewhat less exposed to the sun and so a bit less dry, have perhaps not been explored enough. We may have missed the anthracophilous lichens which may be present. On wood lying on the ground, we meet

occasionally *Cladonia chlorophaea*, or on old stumps, *Trapeliopsis flexuosa*.

5.3.3.1. Heliophilous and photophilous lichens communities

Primary communities dominated by crustose lichens (pioneer communities)

- ***Lecanoretum horizae*** Barkmann 1958, a thermophilous and clearly heliophilous association, is located on the branches of deciduous trees (*Quercus pubescens, Q. suber, Phillyrea latifolia*). In the survey area it is represented by a form without *L. horizae*, but characterized by *Lecanora hybocarpa, Blastenia xerothermica* subsp. *xerothermica, Lecidella elaeochroma, Catillaria nigroclavata, Candelariella vitellina*, etc. This association is well developed east of the Collebasse pass and on the lower slopes west of cap Lardier, where the fire did not have any influence;
- The ***Hyperphyscietum adglutinatae*** Barkmann 1958, succeeds the previous association when the phorophyte ages and its bark evolves and deteriorates (especially that of *Quercus pubescens*). Small crustose lichens, *Lecanora hybocarpa, Lecidella elaeochroma* and *Blastenia xerothermica* subsp. *xerothermica,* are present, as well as small foliose lichens, *Hyperphyscia adglutinata* and *Phaeophyscia orbicularis*.

Secondary communities dominated by foliose lichens

These groupings of large foliose lichens generally appear as a result of the natural evolution of the plant cover and the progressive alteration of the bark. The light level drops from full insolation to just well-lit and the atmospheric and substratum humidity become higher, favoring their establishment.

Nitrophilous or heminitrophilous lichens communities

They belong mainly to the orders *Physcietalia adscendentis* (*Physcia adscendens, Xanthoria parietina*) and *Hypogymnietalia physodo-tubulosae* (*Parmotrema perlatum, Flavoparmelia soredians*):

- The ***Physcietum adscendentis*** Frey et Ochsner 1926, characterized by *Physcia adscendens, P. tenella* (*P. leptalea* was not found here), which colonizes small branches, while *Phaeophyscia orbicularis, P. hirsuta, Physcia biziana, Physconia enteroxantha, Xanthoria parietina*, are established mainly on deciduous trunks (*Quercus suber, Q. pubescens*).

Non-nitrophilous lichens communities

- The ***Flavoparmelietum caperatae*** Felföldy 1941 nom. mut., replaces the previous one in the forest when there are few nutrient inputs. This association is mainly composed of large foliose lichens, *Flavoparmelia caperata, F. soredians, Punctelia subrudecta, Parmelia sulcata, Parmelina tiliacea, Parmotrema perlatum*, associated with brown *Parmeliaceae Melanelixia subaurifera*, fruticose lichens *Ramalina farinacea, Evernia prunastri* and gelatinous lichen *Collema furfuraceum* on altered bark flows;
- The ***Amandineetum punctatae*** Barkmann 1958 nom. mut., is characterized by *Amandinea punctata*, and is more heliophilous, acidophilous and xerophilous. This develops at the base of some trunks of *Quercus suber, Q. ilex, Pinus pinea*, which can replace the *Flavoparmelietum caperatae* when the trunk becomes sunnier, or drier on the vertical parts;
- The ***Parmotremetum crozalsiano-hypoleucini*** Crespo 1979 nom. mut., is a typically photophilous and aerohygrophilous thermomediterranean association which is only well developed on the west coast of the cap Lardier. Some of the valleys here are subject to maritime inputs which support a taller type of *maquis* scrub with *Erica arborea*. The Aiguebonne valley is a good example. One finds there *Parmotrema hypoleucinum, P. perlatum, P. reticulatum, Melanelixia subaurifera, Parmelina tiliacea, Flavoparmelia soredians, Usnea rubicunda, U. esperantiana, Chrysothrix candelaris*. On the other hand, the characteristics *Parmotrema crozalsianum* (known at Le Muy, Roquebrune Massif) and *Usnea mutabilis* (only known at Port-Cros Island) were not found here;
- In the lower and open *maquis*, with *Pistacia lentiscus*, we observe the **association with *Ramalina canariensis* and *R. pusilla*** Abbassi-Maaf 1987, a more heliophilous and halotolerant association. The two characteristics species are accompanied by *Pyrrhospora quernea* and *Lecanora lividocinerea*. However, *Ramalina pusilla* was only found in the Brouis valley and only to a very limited extent.

5.3.3.2. Sciaphilous lichens communities

These groupings appear when the previous ecological conditions evolve towards forest maturity. The plants are denser and the trees are taller and therefore, a decrease in luminosity in the undergrowth and more stable microclimatic conditions (lower thermal amplitude, higher hygrometry) appear. However, in the cap Lardier area, the evolution of forest and shrub stands in a large part of the territory has been stopped or diverted due to past fires. So, the typical associated physical conditions have also yet to manifest fully. However, there are still some

very small areas where such conditions persist but where the expected associations are often incomplete (many expected species have not been found or are missing). We emphasize that as many of these taxa are very discreet and difficult to spot in the field (hence the obligatory sampling), it is possible that some of them went unnoticed during our surveys. Further research could perhaps make it possible to find other richer sites.

At the periphery of the burned area (in open wooded areas), the drought, favored by the prevailing winds, often penetrates right to the edge of the remaining woodlands. So, at site n° 58, a *Quercus suber* forest, which is relatively well lit but dense, an interesting lichen flora was found, but we noticed while crossing it towards its upper parts, a rapid transition to burnt areas. In these burnt zones the winds dry out the environment considerably and some old *Quercus ilex* on the edge show at their base remains of dried perithecia attributed to *Porina* sp. and *Strigula* sp., indicators of a past forest maturity. This *Strigula* sp., identified by two single perithecia (*S.* cf. *ziziphi*) and for which we could not find stands in good condition to study elsewhere, are supposed to have been present more widely. Similarly, to the north of La Tourraque at site n°63, the undergrowth of the *Quercus suber* forest has been cleared by DFCI[6] and the communities of large foliose lichens on *Quercus suber* trunks and that are likely to give way to more photophilous and heliophilous crustose lichens as the forest continuity has been broken.

In these peripheral areas, on the other hand, species belonging to the order *Schismatommetalia decolorantis* (*Dendrographa decolorans, Bactrospora patellarioides, Pertusaria heterochroa*), which are less demanding with regard to atmospheric humidity, are regularly found.

- **Ombrophilous communities** (outside the overhanging zone, i.e., wet by rain)

On smooth or unweathered bark, the ***Opegraphetum vulgatae-niveoatrae*** Barkmann 1958 nom. mut. is established, represented by small crustose species, *Opegrapha vulgata* and *O. nivea.*
On weathered bark (*Quercus ilex* and *Q. pubescens*), within forests of a certain maturity, the following are established:

- The ***Wayneetum stoechadianae*** Abassi Maaf et Cl. Roux 1987 nom. mut., particularly sciaphilous, is rare and not very developed. It has been found on some rare trunks of old

[6] DFCI : Défense des forêts contre les incendies (French national organisation to combat fires).

Quercus ilex east of the semaphore station of cap Lardier, with *Waynea stoechadiana, Coenogonium tavaresianum, Porina aenea, Coenogonium pineti*;

- The association of ***Ramonio-Striguletum ziziphi*** Bricaud et Cl. Roux 1994 nom. mut. is indicative of a very advanced state of maturation of the woodland. Unfortunately, not all characteristics were observed here, probably due to the disturbed state of the initial conditions. Thus, on old *Quercus ilex,* we noted *Gyalecta liguriensis, Biatoridium monasteriense, Porina aenea, Strigula* aff. *zizphi* (in poor condition);

- Assemblages with *Thelopsis corticola* (= *Opegrapha corticola*), were only found on a large *Quercus ilex* in the Ricarde valley, south of La Croix Valmer.

The ***Zamenhofietum coralloidea*** Bricaud et Cl. Roux 1991 has not been observed in the area of cap Lardier, although it is frequent in the islands of Hyères; nor have very sciaphilous and more hygrophilous associations such as the ***Acrocordietum gemmatae*** Barkmann 1958. Only one station, in a *Quercus suber* grove (station 58), provided an example of the ***Normandino-Frullanietum dilatatae*** Delzenne, Géhu et Wattez 1975, a bryolichenic association with *Frullania dilatata* (liverwort) and *Normandina pulchella* (lichen).

- **Ombrophobous communities**

Astegophilous associations, largely protected from rain and run-off, e.g. ***Phlyctidetum argenae*** Ochsner 1928 (with *Phlyctis argena, P. agelaea, Ochrolechia* sp.) and other associations with sterile thalli, have not been observed in the survey area.

5.4. Inventory of lichens

The complete list of lichens taxa found during the inventory is given in Appendix II. The same applies to lichenicolous fungi and to some related non-lichenized fungi.

Each taxon name is followed by the **numbers of the sites** where it has been observed and then, depending on the case, by an abbreviation indicating whether it is a new record (**N**) or the confirmation of a single older record (**CF**), specifying the geographical scale of the new record - France (**F**), Var department (**83**). Thus, **CF83** means confirmed in the Var department, as it is only mentioned there once in the *Catalogue des lichens de France* (3rd edition); **N83**: newly reported in Var department; **NF**: newly reported in France.

Other abbreviations used and borrowed from the *Catalogue des lichens de France* (Roux et coll., 2020):

- **chemo**. chemotype; **eco**. ecotype; **morpho**. morphotype; **phyco**. phycotype.

- **1L**: Lichens; **2FL**: Lichenicolous fungi; **3F**: non-lichenized and non-lichenicolous fungi.

6. Conclusion

6.1. Floristic interest

6.1.1. Richness of the lichen flora

Over the whole of the cap Lardier area and on the basis of the 958 items of data collected, we have identified:

- 225 lichens, to which can be added 2 additional taxa previously mentioned by Ménard (1997, 2009) and which we not been able to find.
- 8 lichenicolous fungi, including those mentioned by Ménard (1997, 2009).
- 4 non-lichenicolous–non-lichenised fungi (non-lichenized corticolous ascomycetes).

The distribution of the species recorded by type of substrates and by vegetation zones is given in the following table. Saxiterricolous species include species that could have been observed both on rock only or on soil only and some species occur in more than one vegetation zone at a time. As a result, the totals per row or per column are greater than the total number of taxa recorded.

Table IV. Distribution of species recorded by group and vegetation zone.

	by type of fungi studied				by vegetation zone		
Taxa	Lichens	Lichenicolous fungi	non-lichenized-non-lichenicolous fungi	Total	Supralittoral	Adlittoral	Proxilittoral
Corticolous	87	1	4	**93**	0	38	81
Saxicolous	129	1	0	**130**	38	107	63
Saxiterricolous	21	0	0	**21**	0	11	15
Terricolous	16	0	0	**16**	0	0	16

Only one taxon reaches the upper mediolittoral fringe (= hydrohaline zone), *Hydropunctaria symbalana,* but it has been counted as supralittoral, because it is very often in the lower supralittoral.

The surveys were mainly carried out on or near the coast, as shown by the distribution of study sites on the map, in areas little

affected by fires (Fig. 5). So, the number of taxa in the proxilittoral zone is probably a little underestimated, since the inland area could have hosted other taxa that were not found owing to its large hilly area, its dry and well-lit character and habitats which are in the process of post-fire regeneration.

The littoral lichen flora is very rich in places (notably on the eastern side of cap Taillat) particularly on the slopes that are very exposed to maritime inputs, and the number of typically calcifuge saxicolous species collected here is significant.

6.1.2. Regional and national novelties

Such an inventory always brings new regional or national discoveries that are worth highlighting here. It is also worth mentioning the taxa that were previously reported in the Var department and that have not been for more than 50 years (confirmations of old data).

- **Taxa formerly mentioned, confirmed in the Var department: 4**

These are taxa that have been mentioned only once in the old literature and listed as such in the *Catalogue des lichens de France* (Roux et coll., 2020) with the notation 83[a].

01 *Acarospora subrufula* (Nyl.) H. Olivier
02 *Buellia abstracta* (Nyl.) H. Olivier (*this identification takes into account the latest understanding of the taxon according to Giralt *et al*., 2011a, 2011b)
03 *Lecidella scabra* (Taylor) Hertel & Leuckert
04 *Polyblastiopsis subericola* B. de Lesd.

- **Taxa newly found in the Var department: 25**

01 *Amandinea maritima* Giralt, van den Boom & Elix
02 *Amandinea pelidna* (Ach.) Fryday & L. Arcadia
03 *Athallia holocarpa* (Hoffm.) Arup, Frödén & Søchting
04 *Buellia caloplacivora* Llimona & Egea
05 *Buellia sequax* s.l. sensu Giralt *et al*. 2010
06 *Caloplaca cecericola* B. de Lesd.
07 *Diploschistes euganeus* (A. Massal.) J. Steiner
08 *Endohyalina kalbii* (Giralt & Matzer) Giralt, van den Boom & Elix
09 *Gyalecta schisticola* Werner
10 *Heteroplacidium phaeocarpoides* (Nyl.) Breuss
11 *Lecidea erythrophaea* Flörke ex Sommerf.
12 *Lecidea sarcogynoides* Körb.
13 *Lepraria jackii* Tønsberg
14 *Micarea byssacea* (Th. Fr.) Czarnota, Guzow-Krzem. & Coppins
15 *Opegrapha conferta* Anzi
16 *Pertusaria werneriana* Boqueras
17 *Physconia petraea* (Poelt) Vězda & Poelt

18 *Porina leptospora* (Nyl.) A.L. Smith
19 *Trapelia glebulosa* (Sm.) J.R. Laundon
20 *Verrucaria fusconigrescens* Nyl.
21 *Xanthoparmelia cumberlandia* (Gyeln.) Hale
22 *Xanthoparmelia glabrans* (Nyl.) O. Blanco, A. Crespo, Elix, D. Hawksw. & Lumbsch
23 *Xanthoparmelia luteonotata* (J. Steiner) O. Blanco, A. Crespo, Elix, D. Hawksw. & Lumbsch
24 *Xanthoparmelia pulla* (Ach.) O. Blanco, A. Crespo, Elix, D. Hawksw. & Lumbsch chémo. perrugata
25 *Xanthoparmelia pulla* (Ach.) O. Blanco, A. Crespo, Elix, D. Hawksw. & Lumbsch chémo. pulla

- **Taxa newly mentioned in France or under study: 4**

01 *Lecanora rubrofusca* var. *monstruosa* B. de Lesd.
02 *Rinodina santorinensis* var. *olivieri* (Samp.) H. Mayrhofer & Sattler
03 *Xanthoparmelia mexicana* auct. ital. [non (Gyeln.) Hale]
04 *Xanthoparmelia plittii* (Gyeln.) Hale

6.2. Threatened species

6.2.1. Method of assessing threats and levels of concern

Lichenicolous fungi, which have not been sufficiently studied, will not be taken into consideration here. Only the most interesting species, i.e., those of European interest (world and national distribution mentioned) or national interest (national distribution mentioned) are dealt with, their distribution and ecology being specified, while species of regional or local interest are not taken into consideration. The numbers indicated are those of the study sites.

For the data on the distribution in France, we will use the data published in the *Catalogue des lichens de France* in its 3rd edition (Roux et coll*.,* 2020) and those of the GBIF (*https://www.gbif.org/fr/),* for the international data, which seem to us to be the most up-to-date.

The classification of threatened lichens is a sensitivities subject, which requires a method adapted to these organisms, an evaluation by experts and a consolidated and argued synthesis. Without strictly following the official IUCN method, we use the following bioassessment tools. The threat assessment is based on the IUCN methodology adapted by CBN Med[7] for the continuous inventory of Znieff[8] in the Occitania region (Hamdi *et al*., 2018) and it was adapted in this report

[7] CBN Med : Conservatoire Botanique National Méditerranéen (National botanical conservatory of the Mediterranean).

[8] Znieff : Zones Naturelles d'intérêt Écologiques, Floristique et Faunistique (Zones of natural interest for the environment, the flora or the fauna).

to the lichen flora, which is distinguished from higher plants by, among other things, the notion of small-scale microhabitats.

Our analysis is based on the data available in France in the *Catalogue des lichens de France* (Roux et coll., 2020). The latter seems to us to be the most relevant in several respects, as it compiles fairly exhaustive data of records from the old and current literature and also recent unpublished data.

The cap Lardier area is studied in relation to the Mediterranean influence zone (complete departments of Alpes-Maritimes, Var, Vaucluse, Bouches-du-Rhône, Gard, Hérault, Pyrénées-Orientales and part of departments of Alpes-de-Haute-Provence, Ardèche and Drôme) and in relation to French records (all departments combined). According to the methodology, the hierarchy of the taxa cited will be the sum of the three main criteria: rarity, relative regional presence and threat, defined below.

- The notion of **rarity** is already integrated in the *Catalogue des lichens de France* (Roux et coll., 2020). This concept has already been evaluated by experts at the time of publication for all species recorded in France. It is mainly based on indications of occurrences and the number of localities recorded. In the present study we have retained only the extremely rare and very rare (ER and TR), rare (R), fairly rare (AR), fairly uncommon (APR) and uncommon (PC) taxa, to which we assign rarity indices ($\mathbf{I_{rarety}}$) of 5, 4, 3, 2 and 1 respectively. The other more frequent taxa, which are already evaluated as very common (TC), common (C), fairly common (AC) and fairly uncommon (APC), were not retained for the selection of the threatened species.

Table V. Rarity indices I_{rarity}.

Rarity	I_{rarity}
ER and TR: extremely rare or very rare	5
R: rare	4
AR: fairly rare	3
APR: fairly uncommon	2
PR and PC: uncommon or rare	1
APC, AC, C, TC, DD: fairly uncommon, fairly common, common, very common, insufficient data	0

- The notion of **relative regional presence**, taken into account in the evaluation, is an important criterion because it indicates the regional importance of a lichen taxon in relation to the whole French lichen flora. Because of the notion of ecological microhabitats that applies to lichens, the calculation of their presence cannot be related to a notion of surface mesh, unlike the distribution of phanerogams over a geographical area. Thus, the criterion is given by the ratio of

the number of departments in the study area (Mediterranean area) where the taxon was cited, to the number of departmental citations in the whole of France, expressed as a percentage. For reasons inherent to the referencing of the French lichen database, the calculation is based on the number of departments in which the taxon is present in the Mediterranean area in relation to the total number of departments in France hosting the taxon concerned. This ratio (number of departments present in Mediterranean area / total number of departments present in France) is significant for the impact of the Mediterranean region on the evaluation of the relative regional presence of the taxon in relation to the French territory. So, a taxon essentially present in Mediterranean area will have a ratio of 100 % whereas a taxon recorded only once in the Mediterranean but more widespread elsewhere may have a ratio of around 10 %. An indice ($\mathbf{I_{regional\ presence}}$) is assigned to the relative regional presence as follows.

Table VI. Relative regional presence indices $I_{regional\ presence}$.

relative regional presence	$I_{regional\ presence}$
> 75 %	**5**
50 ≥ and < 75 %	**4**
25 ≥ and < 50 %	**3**
10 ≥ and < 25 %	**2**
< 10 %	**1**

- The notion of **threat** (IUCN, 2012a, 2012b) is based on the one generally mentioned in Roux et coll. (2020) for the France and follows the IUCN directive in its approach. The threat categories were integrated into the *Catalogue des lichens de France* by expert judgement for all taxa recorded in France. A threat indice ($\mathbf{I_{threat}}$) is also associated with the category.

Table VII. Threat indices I_{threat}.

IUCN category of taxon	I_{threat}
CR: Critically endangered	5
EN: Endangered	4
VU: Vulnerable	3
NT: Near threatened	2
LC: Least Concern	1
DD: Data Deficient	0

An adjustment by a complementary criterion is provided for the following cases

- Rarity of strictly littoral species: for taxa closely linked to the littoral, the maximum surface area potentially covered is always smaller than that of non-littoral taxa. This results in a systematic overestimation of the rarity of littoral taxa. A systematic weighting has been provided for certain species, namely a reduction from 1 to 3 in the ranking calculation (the 3 level corresponds to strictly maritime species that are not specifically rare in their biotope).

- The same principle of reduction was used for taxa belonging to complex groups and whose determination, difficult and possibly questionable, leads to an overestimation of rarity. These are mainly species that cannot be determined without complex DNA or chemical laboratory analyses, so-called cryptic species. These have not been considered in the present work and have been combined with the parent species in a broad sense (e.g., *Parmelia saxatilis* s. l.).

- No endemism is taken into account for lichens, which are not subject to endemism, except on a larger scale, due to their long-distance dissemination by spores and which therefore do not give rise to any adjustment criteria.

Table VIII. Threat levels of lichens. The three previously defined indices are added together and their sum ($I_{rarity} + I_{regional\ presence} + I_{threat}$) allows the evaluation of the importance of the determining character of each taxon in the survey area. The final indices, obtained at the end by summing all the indices range from 0 for less threatened species to a maximum of 15 for those with the highest stakes. The 42 threatened taxa which were selected are evaluated in last column.

Taxa	Rarity		Threat		Relative regional presence				Complementary criterion (4)	SUM (1+2+3-4)
	Rarity	Indices (1)	Cat. IUCN	Indices (2)	Mediterranean area including the present study	France	R/F	Indices (3)		
Acarospora microcarpa	AR	3	NT	2	14	14	100 %	5	0	10
Acarospora subrufula	R	4	NT	2	7	20	35 %	3	0	9
Alyxoria subelevata	R	4	VU	3	10	14	71 %	4	0	11
Amandinea maritima	R	4	VU	3	6	10	60 %	4	0	11
Aquacidia trachona	PC	1	LC	1	11	28	39 %	3	0	5
Biatoridium monasteriense	AR	3	VU	3	15	25	60 %	4	0	10
Buellia abstracta	AR	3	NT	2	5	19	26 %	3	0	8
Buellia caloplacivora	AR	3	VU	3	4	6	67 %	4	3	7
Buellia sequax s.l.	TR	5	EN	4	1	2	50 %	4	3	10
Caloplaca aegatica	AR	3	NT	2	16	16	100 %	5	0	10
Caloplaca cecericola	TR	5	VU	3	3	3	100 %	5	0	13
Caloplaca ligustica	TR	5	EN	4	9	9	100 %	5	0	14
Cladonia peziziformis	AR	3	NT	2	6	53	11 %	2	0	7
Coenogonium tavaresianum	TR	5	CR	5	11	11	100 %	5	2	13
Diploschistes euganeus	APR	2	NT	2	11	25	44 %	3	0	7
Endohyalina kalbii	TR	5	CR	5	7	7	100 %	5	1	14
Gyalecta liguriensis	APR	2	NT	2	18	33	55 %	4	0	8
Gyalecta schisticola	R	4	LC	1	5	6	83 %	5	0	10
Heteroplacidium phaeocarpoides	TR	5	CR	5	3	3	100 %	5	1	14
Lecania koerberiana	R	4	VU	3	15	28	54 %	4	0	11
Lecanora conizella	R	4	VU	3	5	10	50 %	4	0	11
Lecanora lividocinerea	AR	3	NT	2	13	13	100 %	5	0	10
Martinjahnsia resendei	R	4	NT	2	17	17	100 %	5	2	9

Taxa	Rarity		Threat		Relative regional presence				Complementary criterion (4)	SUM (1+2+3-4)
	Rarity	Indices (1)	Cat. IUCN	Indices (2)	Mediterranean area including the present study	France	R/F	Indices (3)		
Micarea byssacea	AR	3	DD	0	1	5	20 %	1	0	4
Opegrapha celtidicola	R	4	EN	4	35	35	100 %	5	0	13
Parmotrema hypoleucinum	R	4	EN	4	18	18	100 %	5	0	13
Pertusaria werneriana	TR	5	CR	5	5	5	100 %	5	1	14
Physconia petraea	TR	5	EN	4	7	8	88 %	5	0	14
Porina leptospora	TR	5	EN	4	1	3	33 %	3	0	12
Protoparmelia olivascens	R	4	NT	2	19	19	100 %	5	0	11
Rinodina oleae	AR	3	NT	2	10	117	9 %	1	0	6
Rinodina santorinensis var. *olivieri*	TR	5	CR	5	1	1	100 %	5	1	14
Rinodina santorinensis var. *santorinensis*	R	4	CR	5	8	8	100 %	5	1	13
Rostania occultata	R	4	EN	4	11	36	31 %	3	0	11
Solenopsora holophaea	PC	1	NT	2	23	40	58 %	4	0	7
Thelopsis corticola	R	4	EN	4	20	31	65 %	4	0	12
Usnochroma carphinea	R	4	VU	3	31	31	100 %	5	0	12
Waynea stoechadiana	R	4	CR	5	14	14	100 %	5	0	14
Xanthoparmelia glabrans	TR	5	DD	0	3	3	100 %	5	3	7
Xanthoparmelia luteonotata	AR	3	DD	0	10	10	100 %	5	0	8
Xanthoparmelia mexicana	AR	3	DD	0	3	3	100 %	5	2	6
Xanthoparmelia plittii	AR	3	DD	0	3	3	100 %	5	2	6

- The **hierarchy of the sum of the indices** (in decreasing order) allows an assessment of the level of conservation importance according to the global approach used in the *Synthèse et analyse des inventaires de la biodiversité méconnue menés sur neuf sites des Alpes occidentales* (Guimier and Braud, 2022) and the latter summarised in the table IX.

Table IX. Definition of the conservation importance according to Guimier and Braud (2022).

Conservation importance	Criterion
Major	- CR (critically endangered) classification in the national or European red list, - microendemic species (range less than 20 km^2), - highly threatened throughout their range, to the extent that the range has become highly fragmented.
Strong	- CR (critically endangered) or EN (endangered) regional red list classification, EN or VU (vulnerable) national or European red list classification, - endemic to a relatively small area (less than 10,000 km^2) and moderately threatened, - threatened over their entire range (in the process of proven decline), - strict determining for ZNIEFF.
Quite strong	- VU classification in the regional red list, or NT (near threatened) in at least two red lists (regional, national or European), - endemic to a relatively small area (less than 10,000 km^2), but not threatened.
Noticeable	- NT on only one red list (regional, national or European), - remarkable or determining with criteria for ZNIEFF, - at the limit of its range, or rare in the biogeographical area concerned
Very weak	Ordinary taxon

Finally, a listing of the sum of the indices in ascending order (Table X) gives a good approach to the positioning of each taxon in relation to the others. However, the limit between the levels of importance should not be considered as fixed, but our best assessment, on the basis of our current knowledge of the lichen flora.

In conclusion, following this inventory, no taxa of major concern (i.e. showing a threat of extinction) appeared in the list of taxa surveyed. However, some fairly rare taxa deserve special attention as they were of high conservation importance.

Table X. Hierarchy of threatened lichens by level of threat and protection issue.

Taxa	Sum of the indice	Stake level
Pertusaria werneriana Boqueras	14	
Waynea stoechadiana (Abbassif Maaf & Cl. Roux) P. Clerc & Cl. Roux	14	
Rinodina santorinensis var. *olivieri (*Sampaio) H. Mayrh. & Sattler	14	
Physconia petraea (Poelt) Vězda & Poelt	14	
Heteroplacidium phaeocarpoides (Nyl.) Breuss	14	
Endohyalina kalbii (Giralt & Matzer) Giralt, van den Boom & Elix	14	
Caloplaca ligustica B. de Lesd.	14	
Rinodina santorinensis var. *santorinensis* J. Steiner	13	**Strong**
Parmotrema hypoleucinum (J. Steiner) Hale	13	
Opegrapha celtidicola (Jatta) Jatta	13	
Coenogonium tavaresianum (Vězda) Lücking, Aptroot & Sipmann	13	
Caloplaca cecericola B. de Lesd.	13	
Usnochroma carphinea (Fr.) Sochting, Arup & Frödén	12	
Thelopsis corticola (Coppins & James) Sanderson & Ertz	12	
Porina leptospora (Ny.) A. L. Smith	12	
Rostania occultata (Bagl.) Otalora, P. M. Jorg. & Wedin	11	
Protoparmelia olivascens (Nyl.) Llimona	11	
Lecanora conizella Nyl.	11	
Lecania koerberiana J. Lahm	11	
Amandinea maritima Giralt, van den Boom & Elix	11	
Alyxoria subelevata (Nyl.) Ertz & Tehler	11	**Quite strong**
Lecanora lividocinerea Bagl.	10	
Gyalecta schisticola Werner	10	
Caloplaca aegatica Giralt, Nimis & Poelt	10	
Buellia sequax s.l. sensu Giralt et al. 2010	10	
Biatoridium monasteriense J. Lahm ex Körb.	10	
Acarospora microcarpa (Nyl.) Wedd.	10	
Martinjahnsia resendei (Poelt & Tav.) S. K. Kondr.	9	
Acarospora subrufula (Nyl.) H.Olivier	9	
Xanthoparmelia luteonotata (J. Steiner) O.Blanco, A. Crespo, Elix, D. Hawksw. & Lumbsch	8	**Noticeable**
Gyalecta liguriensis (Vězda) Vězda	8	

Taxa	Sum of the indice	Stake level
Buellia abstracta (Nyl.) H. Olivier	8	
Xanthoparmelia glabrans (Nyl.) O. Blanco, A. Crespo, Elix, D. Hawksw. & Lumbsch	7	
Solenopsora holophaea (Mont.) Samp.	7	
Diploschistes euganeus (A. Massal.) J. Steiner	7	
Cladonia peziziformis (With.) J. R. Laundon	7	
Buellia caloplacivora Llimona & Egea	7	
Xanthoparmelia plittii (Gyeln.) Hale	6	**Weak**
Xanthoparmelia mexicana auct. ital. [non (Gyeln.) Hale]	6	
Rinodina oleae Bagl.	6	
Aquacidia trachona (Ach.) Aptroot	5	
Micarea byssacea (Th. Fr.) Czarnota, Guzow-Krzem. & Coppins	4	

6.2.2. List of threatened or interesting lichens

The following comments focus on some uncommon species, species newly found in the geographical area or those of which are threatened.

Acarospora microcarpa (Nyl.) Wedd. - Quite rare in France, present in the south Mediterranean (Pyrénées-Orientales, Hérault, Var) and in Corsica. In Europe, present only around the Mediterranean. Saxicolous, on silicate rocks and boulders, calcifuge, heliophilous, thermophilous. It is a discreet species because it is not very widespread and yet visible because of its bright yellow colour, a parasite of various lichens, almost always of *Diploschistes actinostoma.* On xap Lardier, it has been observed twice, as a parasite of *Diploschistes euganeus,* on the coast between Aiguebonne and Brouis (sites 07 and 65). It was found on in Mesomediterranean zone in a subhumid ombroclimate. Level of threat: NT (Near Threatened).

Acarospora subrufula (Nyl.) H. Olivier - Considered rare until now. Present in the Massif armoricain, Var and in Corsica. Saxicolous, on silicate rocks and boulders, calcifuge, heliophilous. In Europe it is found on granitic coasts from Great Britain to Portugal, Italy and Greece. This species, not easy to spot in the field because of its small size and often scattered areoles, has long remained little mentioned, but several discoveries in recent years show that the taxon is relatively widespread, mainly in the adlittoral. Several discoveries on cap Lardier (sites 07, 41, 49, 61, 65) show that it is almost not rare in this type of environment. Our records confirm an old record (Roux et coll., 2020) in the

department. Present at the adlittoral, Mesomediterranean, especially not far from the coast. Subhumid and humid ombroclimates. NT.

Alyxoria subelevata (Nyl.) Ertz & Tehler - Rare. Present in Brittany, Provence and Corsica. Not yet mentioned in the Var. Several records in Europe in the Mediterranean basin (Portugal, Spain, Greece, Italy), in Great Britain and Ireland and the cape Verde Islands. Saxicolous, on calcareous or non-calcareous rocks and mortar, more or less sciaphilous. Collected at cap Lardier, in a single site on the coast (site 61) where it was found in the company of *Opegrapha conferta*, from which it is well distinguished by its open and often slightly pruinose lirellae, this constitutes the first mention in the Var department. This species could be easily overlooked. Thermo-Mediterranean, lower Meso-Mediterranean and hilly zones. Dry and subhumid ombroclimates. VU (Vulnerable).

Amandinea maritima Giralt, van den Boom & Elix - Rare. Species described recently in 2011. Present in Manche, Finistère, Gironde and Corsica. Corticolous, on branches of deciduous trees and especially on *Juniperus* in coastal dunes, sometimes lignicolous, heliophilous. Collected at cap Lardier twice in the adlittoral (sites 45 and 55), in the Brouis valley on *Quercus ilex* branches and in the Jovat valley on *Pistacia lentiscus* (first mention in the Var). Adlittoral, Thermomediterranean and hilly zones. Subhumid ombroclimate. There are not enough records to objectively assess the threats, but they are probably significant given its corticolous nature. VU.

Aquacidia trachona (Ach.) Aptroot - Listed as fairly uncommon by Roux et coll. (2020) but with a fairly wide distribution (Armorican massif, Central massif, Pyrenees, Mediterranean and sub-Mediterranean Midi), saxicolous (on vertical walls or overhanging rocks), calcifuge, very rarely corticolous, moderately to very aerohygrophilous, sciaphilous or photophilous, but not heliophilous. This species surprised us by its location on a smooth trunk of a young *Quercus ilex* in a very dark, rather humid environment, rather close to the sea (site 44), but the characters agree very well with those of the species. This is the second record in the Var after that of Bricaud (2006). It is found in the mesomediterranean to the montane level in subhumid and humid ombroclimates. Although the species is not threatened, it is interesting to note its rare corticolous habitat. LC (Least Concern).

Biatoridium monasteriense J. Lahm ex Körb. - Quite rare, but present in many departments from the Ardennes and Brittany to the south of France, requiring sufficient forest maturity. Corticolous (on deciduous trees: *Acer, Quercus, Fraxinus, Ulmus, Sambucus*), aero- and substrato-hygrophilous, sciaphilous or photophilous but not heliophilous. It was found here on a *Quercus suber* trunk in a dense *Q. suber* forest (site 58). Its range is upper thermo-Mediterranean, meso-

Mediterranean and (rarely) supramediterranean and hilly. In a subhumid ombroclimate. VU.

Buellia abstracta (Nyl.) H. Olivier - Quite rare, but present here and there in a large part of France. This species, whose taxonomic definition is still under study due to confusions with related species, described or not, is here mentioned with caution, as it corresponds for the moment to the definition of Giralt *et al*. (2011a, 2011b). Poorly known, it is still little mentioned. The specimens of cap Lardier show a whitish thallus poorly developed (K+ yellow then red crystals), medulla I-, apothecia 0.2-0.6 mm with epihymenium brown and ascospores 9.7–12.6 × 4.5–6.5 µm. Saxicolous, calcifuge, acidophilous, xerophilous or mesophilous, heliophilous, little or no nitrophilous; sometimes invades the thallus of other crustose lichens. From the adlittoral to the montane level. Subhumid and humid ombroclimates. NT.

Buellia caloplacivora Llimona & Egea - Quite rare, but actually poorly known. This taxon is also being studied to clarify its taxonomic position. Two chemotypes have been identified by Giralt *et al*. (2011a), but there is not yet enough data to have a sufficient understanding of its distribution and to assess the threats to which it is subject. In France, apart from the Var, it is mainly known in Brittany, Vendée, Corsica and Hérault coasts. At cap Lardier, the specimen was found in site 02, east of Gigaro Beach, where it shows a whitish ochraceus thallus K+ yellowish and K+ yellow then red crystal under the hypothecium, apothecia 0.2–0.4 adnate with aeruginose proper exciple and epihymenium which react N+ red violet and with ascospores 10–11 × 5,5–6,5 µm. It fits fairly well with the norstictic acid chemotype II of Giralt *et al*. (2011a) This would confirm its distribution on the maritime siliceous rocks of the southern Mediterranean (Roux et coll., 2020) and constitutes a first record in the Var. It does not seem to be common there as only one specimen was found, but it is difficult to distinguish from other *Buellia* in the field. Adlittoral zone. Dry and subhumid ombroclimates. VU.

Buellia sequax s.l. (Nyl.) Zahlbr [not auct.] - A poorly known species due to much historical confusion with other taxa, including *Buellia caloplacivora*. Proven records of this taxon according to Giralt *et al*. (2011a, 2011b) are rare in France and only one record in Haute-Vienne is retained by Roux et coll. (2020). The specimens collected in the Var are considered in a broad sense, as they show all the characters of the taxon according to Giralt *et al*. (2011a, 2011b), but with a slightly different chemistry. Thallus epilithic or chasmolithic, whitish, K+/- yellowish orange, medulla I-, apothecia 0.2-0.5 mm immerged then adnate with disc slightly pruinose to epruinose, excipulum *aethalea*-type, epihymenium brown N- and ascospores (8.5–)11–15 × 5–8 µm. Saxicolous, calcifuge. Terrestrial and montane zone, but relatively few

records exist. Humid ombroclimate. These specimens are to be re-evaluated later. The taxon (*s. s.)* is rare. EN (Endangered).

Caloplaca aegatica Giralt, Nimis & Poelt - A rather rare species, from the Mediterranean coast, mentioned mainly in Corsica, Var and Aude. Corticolous, on trunks and branches of *Quercus ilex*, heliophilous, heminitrophilous. Reported in Europe, mainly around the Mediterranean basin (Spain, France, Italy, Sardinia, Greece, Israel and Crimea,). In the present study, it was collected only in two sites (33 and 45) on branches of *Phillyrea latifolia* and *Quercus ilex*, respectively in the proxilittoral mesomediteranean zone and adlittoral zone, exposed to the maritime inputs. Lower mesomediterranean and thermomediterranean zones. Subhumid ombroclimate. Typically, a Mediterranean taxon, rather rare. NT.

Caloplaca cecericola B. de Lesd. - A little known species and therefore very little mentioned: Bouches-du-Rhône very recently (Méric *et al.,* 2022) and Alpes-Maritimes (Roux et coll., 2020). In Europe, mentioned only in Italy by the holotypus. It was found in site 27, not far from the coast, and is the first record from the Var. The specimen here has thallus areolate, grey, K- with dark hypothallus, apothecia 0.3-0.4 mm, disc and exciple C-, ascospores 9.4–14.3 x 5.1–7.8 µm and septum 4.3–5.8 µm. It differs from *C. scotoplaca* by a clearer thallus without *sedifolia*-grey and ascospores slightly longer equatorial thickening also and so, has been determined here as a different species. Saxicolous, on non-calcareous rocks (sandstone and shale), calcifuge, heliophilous, heminitrophilous. Meso- and supra-Mediterranean zone. VU.

Caloplaca ligustica B. de Lesd. - Very rare. An inconspicuous and probably somewhat overlooked species, already recorded in the Var by Bricaud et al. (1992) and Ménard (2009). Found in the area of cap Lardier (site 07), on rocky outcrops at the edge of the path. Saxicolous, on silicate rock faces subject to brief run-off after rainfall, calcifuge, moderately to very heliophilous, thermophilous, heminitrophilous. Thermo-Mediterranean and lower Meso-Mediterranean zones. Dry and subhumid ombroclimates. EN.

Cladonia peziziformis (With.) J.R. Laundon - Fairly rare, but probably overlooked because difficult to distinguish in the field from other *Cladonia* with a small foliose primary thallus. Occurs in much of France but is rarely mentioned in the South. Numerous occurrences in Europe (Central Europe, Britain, Scandinavia, Spain, Italy, Greece) and North and Central America. Found in the survey area at only one site (n° 53), on soil. Terricolous (on clay or sandy-clay soil) or saxiterricolous (soil between rock cracks), calcifuge, photophilous or heliophilous. From the mesomediterranean to the lower montane zone. Subhumid and humid

ombroclimates. In its present known distribution, it's threat level is assessed at NT.

Coenogonium tavaresianum (Vězda) Lücking, Aptroot & Sipman - Very rare. Corticolous (on weathered bark of *Quercus ilex*, more rarely of *Pinus* sp.), sometimes lignicolous, sciaphilous. Thermo-Mediterranean zone. Subhumid ombroclimate. Reported in Corsica, in the Var and the Alpes-Maritimes. It is a typical species of old thermomediterranean *Quercus ilex* forest of long maturity. Very difficult to find in the area of cap Lardier (site 25), probably due to the fires, in old woodland. In Europe, also reported in Spain, Italy and southern England. Due to its very specific ecology, CR (Critical).

Diploschistes euganeus (A. Massal.) J. Steiner - Not very rare. The species has been recorded in several parts of France. Also reported from Southern and Central Europe, South Africa and Australia. Saxicolous, on basic silicate rocks, more rarely on tiles and bricks, calcifuge, rather xerophilous, heliophilous. In the survey area it was found in several sites (07, 40, 57, 65), and once it was found parasitized by *Acarospora microcarpa*. Meso-, supra-mediterranean and hilly zones. Subhumid ombroclimate. NT.

Endohyalina kalbii (Giralt & Matzer) Giralt, van den Boom & Elix - Very rare. Found only once in Corsica. Mentioned in Europe also in Spain, Canary Islands, Greece and Italy. Found at a single station in the cap Lardier area (site 28), on cork oak trunks. Corticolous, on rough bark of trees and shrubs of the coast (*Tamarix, Juniperus, Quercus*), heliophilous, halotolerant. Adlittoral zone, more rarely thermomediterranean zone near from the coast. Dry and subhumid ombroclimates. CR.

Gyalecta liguriensis (Vězda) Vězda - Not very rare. In France recorded in Normandy, Centre and especially in the South; elsewhere in Europe, known from Portugal, Spain and Italy. Recorded here at a single site (n° 66) outside the area of cap Lardier, in the Ricarde valley South of Croix-Valmer, abundant on a very old *Querus ilex*. It has not been found elsewhere on the peninsula, probably also due to the lack of a certain maturity of the woodlands. Corticole, on the bark of deciduous oaks and *Quercus ilex*, sciaphilous or photophilous but not heliophilous. Mesomediterranean and lower Supramediterranean zones, near or far from the coast, and hilly zone (especially warm variant). Subhumid and humid ombroclimates. NT.

Gyalecta schisticola Werner - Rare. Mainly known in the southern part of France; elsewhere in Europe, mentioned in Macaronesia and the Mediterranean (Italy). Recorded on the east coast (Canadel Point), in the adlittoral zone on exposed eroded granite (site 61). Specimen with apothecia 0.5-0.7 mm and with a low hypothecium (30-40 µm thickness), differentiating it from the more common *G. jenensis.*

Saxicolous, on calcareous or non-calcareous rocks, aero- and substrato-hygrophilous, not very heliophilous. Thermo-Mediterranean, Meso-Mediterranean and hilly zones. Subhumid and humid climates. LC.

Heteroplacidium phaeocarpoides (Nyl.) Breuss - Very rare. Long known from a single station (*locus classicus*) in La Ciotat where it has recently been found again (Méric *et al.,* 2022). Elsewhere in Europe, mentioned only in Spain. The record from cap Lardier is the second station in France (site 02, on the rocky coast from Gigaro to Aiguebonne, on eroded granite, at the adlittoral zone). Saxicolcous, calcifuge, on sandstone that is not or hardly calcareous, xerophilous, heliophilous. Thermo- and meso-Mediterranean zones. Dry ombroclimate. CR.

Lecania koerberiana J. Lahm - Rare. A very discreet, small species, present here and there in France, mainly in its southern half and in Corsica. Reported elsewhere in Spain, Central Eastern Europe, up to Scandinavia and Greece. Found several times on the cap Lardier area (sites 21, 37, 45, 58) on *Quercus suber* and *Quercus ilex*, from exposed adlittoral to proxilittoral mesomediterranean. Corticolous, on isolated or sparse deciduous trees, fairly xerophilous, heliophilous. Meso-, Supra-Mediterranean, hilly and montane zones. Dry, subhumid and humid climates. VU.

Lecanora conizella Nyl. - Rare. Present in the southern half of France and mostly known from old records. Otherwise mentioned only in Spain and Morocco. Collected twice in the cap Lardier area at stations 31 and 35, on *Quercus ilex* and *Erica arborea*. Corticolous, on trunks and branches of deciduous or coniferous trees, heliophilous. From the thermomediterranean to the hilly zone. Subhumid ombroclimate. The numerous records in Spain, following several studies of the lichen flora, show that the taxon is perhaps more present in France. VU.

Lecanora lividocinerea Bagl. - Quite rare. Only on the Mediterranean coast, on the islands of Hyères and in Corsica. A typically Mediterranean species, also reported from Spain, Morocco, Italy and Greece. Several occurrences in the area of cap Lardier (sites 43, 46, 55, 59) show that the species is often found on trees and shrubs (*Quercus ilex, Olea europaea, Pistacia lentiscus*)**,** though it is probably at the northern limit of its range. Corticolous, on trunks, branches and twigs of deciduous trees, on isolated or sparse trees or shrubs especially in the *maquis*, heliophilous. Thermo-Mediterranean and lower Meso-Mediterranean levels. Subhumid climate. NT.

Lecanora rubrofusca var. ***monstruosa*** B. de Lesd. - A rare variety described by Bouly de Lesdain, based on specimens collected by Sbarbaro around Genoa (Italy) and corresponding to a *Lecanora rubrofusca* with adnate apothecia of 1.0–1.5 mm whose thallin margin

soon excluded reveals a sort of dark grey proper margin. The specimen, here in cap Lardier, has thick, convex, agglomerated areoles, adnate apothecia with a dark brown disc of 0.3-1.4 mm in diameter showing a thallin margin excluded and a distinct dark grey to brown proper margin, ascospores 12–14 × 4.5–5.5 µm and hymenium 50–55 µm high. It differs quite clearly from the description of the type species by Bouly de Lesdain and the neighbouring specimens of *L. rubrofusca* collected and would correspond better to that variety described by Bouly de Lesdain. Rare taxon never reported in France. Collected once in the cap Lardier area at site 05, on outcrops of eroded granite in the Aiguebonne valley. Data are insufficient for threat assessment.

Martinjahnsia resendei (Poelt & Tav.) S.Y. Kondr. - Rare. In France, known only from the coast of Provence and Corsica. Reported elsewhere in the Mediterranean in the west Iberian Peninsula, Italy, northwest Africa, Canary Islands, cape Verde Islands. Frequent on almost all rocky coasts of cap Lardier and cap Taillat (sites 11, 19, 20, 49, 61), always near the coast. Saxicolous, on exposed rocky walls or summits, calcicolous and especially calcifuge, thermophilous, fairly photophilous or heliophilous, nitrophilous. Upper thermo- or meso-Mediterranean zones. Dry and subhumid ombroclimates. It is a Mediterranean taxon, probably at the northern limit of its range. NT.

Micarea byssacea (Th. Fr.) Czarnota, Guzow-Krzem. & Coppins - Fairly rare, but still little known. So far reported from Brittany and the Var, but probably more widespread, as difficult to determine and requiring chromatographic analysis. In Europe, reported in Great Britain (by numerous records), Scandinavia and Central Europe. There is still a lot of confusion between some species of the *Micarea prasina* group (of which *M. byssacea* is a part), and their distribution is still poorly known. The sample from cap Lardier (site 14), in the middle of *Cladonia humilis* on wet siliceous soil, was chromatographed which showed the presence of methoxymicareic acid alone). Corticolous (on deciduous or coniferous tree trunks, more rarely on shrubs or branches), sometimes also on coniferous wood, aero- and substrato-hygrophilous. From the mesomediterranean to the montane zone. Humid and hyperhumid ombroclimates. Threats and risks difficult to assess due to insufficient data.

Opegrapha celtidicola (Jatta) Jatta - Rare. In France, mainly on the Mediterranean coast. In Europe, also recorded in Spain, Italy, Greece and also more widely in Turkey and the Canary Islands. In the cap Lardier area found in a single site (58) in the Brouis valley, on *Quercus suber* trunks. Corticolous or lignicolous, on deciduous trees (*Quercus coccifera, Q. ilex, Olea europaea, Fraxinus ornus, Ceratonia siliqua, Pistacia* spp.*, Phillyrea* spp.*, Myrtus communis.*, etc.) or conifers (*Pinus halepensis, Juniperus phoenicea*, etc.), very acidophilous to subneutrophilous, photophilous and above all, heliophilous. Lower

thermo- and meso-Mediterranean zone. Subhumid and humid ombroclimates. EN.

Parmotrema hypoleucinum (J. Steiner) Hale Rare. In France, only near the coast in Hérault, Var and Corsica. Elsewhere in Europe in the Iberian Peninsula, Italy, Greece. Also, in the Canary Islands and very present on the southeast coast of the USA and in California. In the cap Lardier area, it is very present (sites 06, 21, 22, 26, 28, 30, 33, 35, 37, 38, 45, 55, 58, 63) on *Quercus suber, Q. ilex, Erica arborea, Pistacia lentiscus* (but not always abundant), especially in patches of woodland that escaped the 2017 fire. On the other hand, it forms very abundant populations in the Aiguebonne and Brouis valleys. Corticole, on shrubs and trees in the high *maquis*, in intermediate formations between the *maquis* and the *Quercus suber* forest and in the *Q. ilex* forest, aerohygrophilous photophilous or heliophilous. Upper thermo-Mediterranean and lower meso-Mediterranean zones, not far from the coast. Subhumid ombroclimate. EN.

Pertusaria werneriana Boqueras - Very rare. So far reported only from Corsica. Also known from Spain and Portugal. Found in two sites on cap Lardier (sites 43 and 44), on *Quercus ilex*. Corticolous, on leafy trees, especially on small branches, photophilous thermophilous Thermo- and mesomediterranean, more rarely supra-mediterranean zones. Subhumid and humid ombroclimates. This taxon seems to be a rare Mediterranean species. CR.

Physconia petraea (Poelt) Vězda et Poelt - Rare. So far recorded only from Vendée, Alpes-Maritimes and Corsica. Also known from Sardinia, Spain, Austria, Turkey and Armenia. We found it at cap Lardier under the summit ridges of cap Taillat, on the north-east face (site 12) where several populations have become widely established. This taxon was misunderstood at the beginning and may have been confused with *Physconia subaquila*, and its records may not be exhaustive. The specimens of *P. petraea* collected here have all the upper cortex paraplectenchymatous (prosoplectenchymatous in *P. subaquila*). It is possible that the record of Ménard (2009) results from such a confusion, because we did not find *P. subaquila* in the whole of the area close to his records. Saxicolous (on rocks and blocks of basic silicate rocks, rarely calcareous), more rarely muscicolous or terricolous (soil on rocks), calcifuge, more rarely calcicolous, xerophilous, heliophilous thermophilous. From the adlittoral to the montane zone. Subhumid and humid ombroclimates. EN.

Polyblastiopsis subericola B. de Lesd. - Very rare. A non-lichenized ascomycete. Only two known stations in France in the Var, towards Toulon. The only other records are in Spain (east and south coasts). We found it on the cap Lardier trail, in a rather old wood on a cork oak trunk (site 21). This non-lichenized taxon appears to be Mediterranean.

Corticolous on oak, photophilous, thermophilous, Thermo- and meso-Mediterranean zones. Subhumid and humid ombroclimates. CR.

Porina leptospora (Nyl.) A.L. Sm - Very rare. Taxon long confused with *P. borreri*, from which it differs by its longer and narrower spores (here in cap Lardier, 37–50 × 2.5–3.5 µm with 7-9 septa). It was recently found in Brittany (Esnault 2020, unpublished) and also reported from Great Britain, the Azores, and the Canary Islands. We found it in the valley of Brouis, in a very shady and rather humid *Quercus ilex* undergrowth (site 43). Corticolous, on deciduous trees with smooth bark (*Carpinus, Quercus ilex, Fagus,* etc.) aerohygrophilous moderately to very sciaphilous. From the thermo-Mediterranean to the hilly zone, not far from the coast. Humid and hyperhumid ombroclimates. EN.

Protoparmelia olivascens (Nyl.) Llimona - Rare. Mentioned in France, only in the Mediterranean South and in Corsica. Also occurs in Spain and Greece. Probably under recorded in the Mediterranean basin. In the area of cap Lardier, we found it quite often (sites 01, 12, 17, 41, 57, 61, 64, 65), always in the adlittoral and close to the supralittoral zone where it is sometimes abundant. Saxicolous, on rocks, boulders and stones of silicate rocks, calcifuge, heliophilous, thermophilous. Upper thermo-Mediterranean, meso- and supra-Mediterranean zones. Subhumid ombroclimate. Can be confused with *Protoparmelia montagnei* from which it differs well by its chemistry (medulla K+ slowly strong wine red). NT.

Rinodina oleae Bagl. - Quite rare. Several stations in France in various regions but mostly not far from the coast: Massif Armoricain, Gironde, Eastern Provence, Corsica, Meuse, Marne. Elsewhere in Europe, mentioned widely in Great Britain, Netherlands, Denmark, Sweden and around the Mediterranean basin. This taxon has been confused with other *Rinodina*. We found it only once (site 58) on *Quercus suber* trunks in a still undisturbed *Q. suber* forest. Corticolous (especially on deciduous trees with rough bark) or lignicolous, on more or less isolated trees or in sparse forests, photophilous to very heliophilous Thermo-Mediterranean, Meso-Mediterranean and hilly (warm variant) zone. Subhumid and humid ombroclimates. NT.

Rinodina santorinensis var. ***santorinensis*** J. Steiner - Rare. Recorded only from Alpes-Maritimes, Var and Corsica. Otherwise known from the Canary Islands, Portugal, Spain, Sardinia and Greece. Can be confused with *Rinodina beccariana*, but differs in its chemistry and parasitism. We found it only once in the rocky adlittoral between Gigaro and Aiguebonne (station 01), parasiting *Pertusaria pluripuncta*. Ménard (2009) often mentions it and curiously does not mention *Rinodina beccariana*, which is much more frequent, even common. The confusion between the two species is easy to make, but *R.*

santorinensis is difficult to visually identify in the field (need chemical testing). However, the two species coexist well in the survey area. Saxicolous, on steeply sloping walls or surfaces of silicate rocks, calcifuge, photophilous but not or only slightly heliophilous, usually parasitic on other lichens (various crustose species). Lower Mesomediterranean and Thermoméditerranean zones, subhumid ombroclimate. EN.

Rinodina santorinensis var. ***olivieri*** (Samp.) H. Mayrhofer & Sattler - Very rare. Never recorded in France before and then only known from the Canary Islands, Portugal and Spain. A rare variety distinguished by its thin crustose thallus, with almost scattered areoles, and its non-parasitic character. We found it only once, in the same station as the type variety (site 01) where the ecological conditions seem to be the same for both varieties. The variety *olivieri* seems very rare to us, as we did not observe any other similar thallus despite our sustained surveys on the coast. CR.

Rostania occultata (Bagl.) Otálora, P.M. Jørg. & Wedin - Rare. A small, inconspicuous species that can easily be overlooked. Recorded in several departments in France, but its occurrences are scattered over the territory. Also reported from Scandinavia, Great Britain, Italy, Switzerland, Germany, Austria, Spain. Found only once in the cap Lardier area (site 58) on *Quercus suber* trunks in a well-established *Q. suber* forest. Corticolous, on smooth or rough bark of leaf trees, aerohygrophilous, photophilous. Meso- and supra-mediterranean, hilly and montane zones. Subhumid and especially humid ombroclimates. EN.

Solenopsora holophaea (Mont) Samp. - An uncommon, rather discreet species, in France reported from the Armorican Massif, the Mediterranean South and Corsica, always near or not far from the coast. Also found in Great Britain, Iberian Peninsula, Italy, Greece, Canary Islands. Observed only once in the cap Lardier area in the Gigaro adlittoral (site 01) at the edge of area of rocky slabs, but probably more frequent, as less visible in dry weather. Saxicolous (on basic silicate rocks or rocks containing traces of limestone, fissured) or saxiterricolous (on soil in rock crevices), calcifuge or barely calcicolous, substratohygrophilous, photophilous but not heliophilous. Adlittoral, thermo-, meso-Mediterranean or hilly (warm variant) zones. Dry and subhumid ombroclimates. NT.

Thelopsis corticola (Coppins & P. James) Sanderson & Ertz - Rare. Recorded in Seine-et-Marne, the Armorican Massif, the France South and Corsica. Otherwise mostly known from Britain besides a few rare occurrences in Europe, especially Italy. In the survey area it was found in a single site (n° 67), outside the area of cap Lardier, South of Croix-Valmer in the Ricarde valley near a stream. At this site the environment

is semi-open but with a lot of cover from old *Quercus ilex*. It has not been found elsewhere on the studied area, probably due to a lack of favourable ecological conditions. Corticole, on the weathered bark of old leaf trees, especially at the base of the trunk, aero- and substrato-hygrophilous moderately sciaphilous. Thermal and meso-Mediterranean zones, rarely in the supramediterranean or hilly zones. Subhumid and humid ombroclimates. EN.

Usnochroma carphinea (Fr.) Søchting, Arup & Frödén - Rare. In France, only in the Mediterranean region including Corsica. Elsewhere, also reported from Macaronesia, Iberian Peninsula, Italy, Greece. In the cap Lardier area, found in a single site inland (site 29), on a rock that escaped the fire in the middle of regenerating *maquis*. This taxon is normally frequent on siliceous sites in the Var, not far from the coast, but here it is probably one of the saxicolous species impacted by the fire, as it was not found anywhere else. Saxicolous, on sunny walls but known to grow on pebbles in the Crau area, or on very cohesive silicate rocks, calcifuge, very xerophilous, heliophilous, thermophilous. Thermo- and Meso-Mediterranean zones. Dry and subhumid ombroclimates. VU.

Waynea stoechadiana (Abbassi Maaf & Cl. Roux) P. Clerc & Cl. Roux - Rare in France, but frequent when ecological conditions are favourable (especially at Port-Cros). Only in Mediterranean Provence, not far from the coast, especially on the islands of Hyères. Also found in Macaronesia, Italy and the Iberian Peninsula. Found once at cap Lardier, in a site of limited size, on the base of a *Quercus ilex* trunk in a shaded area (site 25). This site lies on the western slope of the hill of the semaphore station of Lardier. The dry environment probably made it difficult to establish or maintain in the study area, whereas it is more common on the islands of Hyères (Valance, 2018). Corticolous, especially on old *Quercus ilex* trunks, in forest environments, moderately aerohygrophilous, substratohygrophilous, moderately sciaphilous or photophilous but not heliophilous Upper thermo-Mediterranean and lower meso-Mediterranean zones, not far from the coast. Dry and especially subhumid ombroclimates. CR.

Xanthoparmelia glabrans (Nyl.) O. Blanco, A. Crespo, Elix, D. Hawksw. & Lumbsch - Very rare. In France reported only from Pyrénées-Orientales and Vaucluse. Also found in Europe, in Spain, Macaronesia, Italy and Greece. We found it several times in the area of cap Lardier. All taxa of brown *Xanthoparmelia* have been chromatographed, which allowed the identification of all species and infraspecific taxa, which under ordinary circumstances would have been classified as *Xanthoparmelia pulla* s. l. The surprise is that this taxon is well established and seems frequent in the adlittoral area of the survey area (sites 01, 02, 03, 04, 29, 41, 48), whereas it is rare elsewhere in France. Morphologically difficult to differentiate from

X. pulla, it differs significantly in its chemistry (it contains alectoronic and collatolic acids unique in these brown *Xanthoparmelia*). Saxicolous, calcifuge, heliophilous. From the mesomediterranean to the montane zones. Subhumid and humid ombroclimates. Risk and threat assessment difficult due to lack of data on its distribution.

Xanthoparmelia luteonotata (J. Steiner) O. Blanco, A. Crespo, Elix, D. Hawksw. & Lumbsch - Quite rare, but probably often confused with *Xanthoparmelia pulla* var. *pulla*, from which it differs only in having a light to medium brown lower face and not being entirely black. Only recorded from Corsica, Spain, Italy, Greece, Cyprus and southern Britain. Only one occurrence in the area of cap Lardier (site 27) in the adlittoral zone. Given how widespread the characteristic brown thallus is in the area, it is quite possible that other sites exist. Saxicolous, calcifuge, xerophilous, heliophilous, thermophilous. From the adlittoral to the xerothermic montane zone. Subhumid ombroclimate. Insufficient data for threat assessment.

Xanthoparmelia mexicana auct. ital. [non (Gyeln.) Hale] - Fairly rare at present, but a newly considered taxon in France. Recorded only in the south of France. Also recorded from Italy. In France, it is often not separated from *X. tinctina* which has an entirely black lower face, whereas *X. mexicana* has a light brown lower face. Several specimens were found in the study area (sites 04, 05, 20, 27, 29, 41, 48, 57), in the adlittoral zone and not far from the coast. They are at the same location as the first records in France, though the species has also been found at La Ciotat on quartzite pebble pudding rock (Méric *et al*., 2022). Saxicolous, on horizontal or sloping surfaces and on the tops of rocks and boulders of silicate rocks, calcifuge, heliophilous, lower mesomediterranean and thermomediterranean zones, proxilittoral. Subhumid and humid ombroclimates. Appears to be frequent, but data are insufficient for threat assessment.

Xanthoparmelia plittii (Gyeln.) Hale - Fairly rare at present, but a newly recognised taxon in France where it is recorded only in the south. Also recorded from Italy and Scandinavia. So far it is not being separated from *X. conspersa*, which has an entirely black lower face, whereas *X. plittii* has a light brown lower face and a slightly different chemistry. Two records were made in the cap Lardier area (sites 23 and 57) which are the first records in France. It has since also been found in La Ciotat on quartzite pebble pudding rock (Méric *et al*., 2022). Saxicolous, calcifuge, photophilous but not or only slightly heliophilous. Mesomediterranean and hilly zones, proxilittoral. Data are insufficient for threat assessment.

6.3. Sociological interest

Lichens are by their constitution (thanks to their thallus freely absorbing air and water) considered to be very good ecological indicators that are very sensitive to their surrounding environment and its long-term evolution, as they integrate the effects of abiotic (edaphic, climatic, chemical, topographical) and biotic factors (parasitism, nitrophilia, competition, cooperation). Historically, they have also been used to good effect as indicators of air and sea spray pollution. Lichen associations or communities provide even more information of this kind than the occurrence of an individual lichen taxon. As a relatively large number of groupings and associations, 32 in the entire survey area, have been identified, much information about the environment can be deduced.

Several well-developed littoral associations were found, of both calcifuge saxicolous and corticolous kinds. The former were found on the seashore and the latter in the *maquis* which has been preserved in the small littoral valleys in the west of the survey area. There are also associations which highlight the interesting character of certain stable environments, the supralittoral zone of the eastern side of cap Taillat and the small valleys of Aiguebonne and Brouis being examples.

On the other hand, the sciaphilous corticolous groupings, which are indicators of forest maturity, have clearly been disturbed by the fires and the forestry work carried out for fire protection. This ongoing activity does not favour their recovery. Thus, a large part of the inland territory (thermo- and meso-Mediterranean) is devoid of these groupings and we also found a lack of saxicolous communities except in the northern periphery of the area (east of the Collebasse pass).

6.4. Interest of lichens for the management plan of the area

The study of the lichen flora of the cap Lardier area shows that there are three main factors disturbing elements of the lichenic ecosystems: fire, forestry work and in some places the degree of frequentation of the coastal path. In the interests of conserving these ecosystem areas, a few measures should be taken.

6.4.1. Fire

Fire is one of the most important factors in the impoverishment of the environment or the disappearance of species and lichen communities. This problem is very important on the Mediterranean coast and particularly in the cap Lardier area, which has already suffered a major fire over a large part of its territory in 2017.

The burnt areas are quickly covered by low scrub type vegetation, but the fire remains an essential factor in the impoverishment or disappearance of corticolous, terricolous and even saxicolous lichen

groupings (Fig. 9). The lichen flora has disappeared in many places. Some surveys in these areas show that lichens are extremely sensitive to fire and that only a few thalli remain unaffected afterwards. These show traces of a very slow recolonisation. Two rocky control plots were chosen on the ridges to the west of Collebasse for educational purposes (site 29) where a comparison of two neighbouring rocky features which both rise 60 cm above the surrounds, show one is still covered by its original lichen flora (site 29) perhaps due to the fire jumping over it, whilst the other has been entirely stripped by the fire and has therefore been entirely exposed since 2017. Even today, no small pioneer species, even very young ones, have appeared on the latter. These plots in an open environment have been geolocated for possible future monitoring, but this will require a certain amount of patience, given that even in favourable conditions it takes several decades for the colonization process to again allow the observation of mature communities. This is marked by the establishment of associations of large crustose lichens such as the association of *Caloplaceto necatori - Aspicilietum intermutantis*, which is typical of these environments.

Table XI. Control plots for monitoring lichen recolonization (site 29). Field photo © Bertrand.

Control plot not affected by the fire corresponding to site 29 N 43°11'05.5'' E 06°36'56.5''	**Plot burnt by the 2017 fire** beside site 29 N 43°11'05.5'' E 06°36'57.3''
	

The trees that have been saved are found more or less scattered in the middle of the *maquis*, but unfortunately, they no longer constitute the environment of mature forest that is favourable to sciaphilous or photophilous (but not heliophilous) species. Those trees that have survived the fire are now in an environment which is only suitable for recolonization by pioneer heliophilous species of the first generation.

The risk of fire is present everywhere in the area. Closing the massif to the public on windy days in dry periods helps to reduce the risk. Monitoring efforts must be maintained, as re-colonization by lichen stands takes several decades (longer than that of vascular vegetation) and can be up to as much as a century for certain rocky massifs with large crustose thalli. The return of this lichen biodiversity is dependent on the continued success of the wide range of measures against wildfire.

The evolution of Mediterranean woodlands goes through various preliminary phases during which very heliophilous groupings successively establish themselves when the vegetation is not very dense, then a photophilous but not heliophilous community appears when the canopy becomes thicker, until more sciaphilous lichens adapted to denser and very shaded environments finally take over. At the same time, the increase in humidity and the decrease in thermal differences, as well as the ageing of the bark of the phorophytes, play a very important role in the appearance of a series of aerohygrophilous species and species with slower dynamics than those of the most photophilous groupings. Thus, the large foliose species of lit undergrowth disappear in favour of a group of small, discreet species that are indicative of forest of a certain maturity. This kind of forest results from a forest continuity generally established after several decades without disturbance (small thermal differences, phorophytes with altered bark favourable to a few small substrato-hygrophilous species). In the survey area these groupings were rather difficult to locate and are often incomplete. This is noticeable in the areas around the fire's footprint, where there is often some drying out due to almost constant exposure to dry winds, which disrupts the stability of the original environment. Consequently, the *Wayneetum stoechadianae* is rare and poorly developed in the area. In order to preserve the distinct community, the small valleys facing west between Gigaro and cap Lardier must be protected from fire disasters but also from the bush clearing operations which are used to protect against the fires, as these have the unintended consequence of drying out the environment.

Figure 9. Collebasse summit with rocks completely 'burnt' by the 2017 fire. © Valance.

6.4.2. Forestry work

As a result of the fires, large areas have been cleared of undergrowth on both sides of some tracks within the area (e.g., Tourraque forest road, Brouis forest road), as well as certain outlying areas close to the residential area of Gigaro. Given the high risk of fire, the clearance of these areas is necessary for fire prevention, but the surveys carried out in these places show environments that are very disturbed with consequences for the development of the lichen flora by opening up and drying out the ecosystem. This has been carried out in the area at mid-slope to the north of the park house at mid-slope of Gigaro and at the beginning of the Tourraque forest track for example. Once these clearings have been created, the environment once again becomes favourable to photophilous and even heliophilous species, characteristic of the first phases of the evolution of a forest and showing a break in forest continuity. This work is also prejudicial to the continuity and development of saxicolous sciaphilous species, of which we found little trace.

This is why a management policy integrating the two issues of fire and wild forest conservation should be developed. This will ensure a balance between the conservation of "wild" areas throughout the territory where a priority is given to the slow restoration of mature forest given its high value to biodiversity and the creation and maintenance of a network of fire protection areas. In the case of Mediterranean lichens,

thick woods and forests must be restored to accommodate the 3rd or 4th generation of lichen communities that are characteristic of well-established thermophilous and hygrophilous sciaphilous groupings. This will require much reflection on a comprehensive plan.

Amongst the stations studied, there is a fairly dense *Quercus suber* forest at site 58, which is already rich in lichens with a sciaphilous tendency and is in the process of evolving into a more naturally closed environment, and which it would be very interesting to protect. It is located above the Gigaro forest track at the level of an old path that crosses it and goes up to the old Brouis farm. It is desirable to restrict access to this area rather than clearing it.

6.4.3. Public frequentation

Due to the major efforts made in recent years to open the site to the public, the number of visitors to the site has increased considerably. For the most part these visitors are attracted to the coastal path from Gigaro to l'Escalet, and to a lesser extent the inland trails. This frequentation is essentially on foot or by mountain bike. It is shown by the number of people we met during our autumn-winter surveys and, in some places, evidence of rock polishing by the passage of a large number of people on some sections of the coastal path. These rocks have now lost their coastal saxicolous lichens. The gaps in the lichen colonies caused by the polishing are not yet very large, but given the growing number of visitors and the attraction of the park, it would be wise to increase the existing measures "channelling" the pedestrian flow on the coastal path in the areas connecting the small coves and the beaches so as to restrict the impact of the pedestrian traffic on some rocky outcrops and slabs that are well colonised by the lichens typical of the adlittoral zone. The segment of path from Gigaro to cap Lardier is particularly affected and should be a priority.

Another remarkable sector for the development of supralittoral and adlittoral saxicolous lichen flora is that of the eastern face of cap Taillat as it is exposed to the prevailing easterly winds and to the maritime inputs (hydrohaline and hygrohaline environments). This area, fortunately not affected by fires, is already protected by the closure of its path. It should continue to be completely preserved, as interesting lichenic populations have developed there up to the top of the longitudinal crest of the cape. In particular, a supralittoral zone several metres high has developed there, which is quite rare in the southern French Mediterranean in a siliceous environment, with a remarkable extension of *Flavoplaca marina*.

It is also worth noting the curiosity of several people intrigued by our comings and goings and our "strange" behaviour in front of the trees and rocks! Their questions to us, lead us to believe that it would be of

value for the National Park to develop an environmental interpretation tool about lichens perhaps on the discovery panels about the natural environment or even on interpretation panels near adlittoral rocky outcrops, anemomorphosed adlittoral shrubs and supralittoral outcrops, as these are all rich in lichens. These should succinctly give an outline on the biology of lichens including their nature as symbiotic organisms.

7. Perspectives

It is clear that it is necessary to maintain protection measures against fires, because these disasters leave an impact on the lichen flora that goes far beyond the regeneration of the first phanerogamic layers. However, the recommendations resulting from this study of the lichen flora of the cap Lardier area could be included in the PCNP's environmental management plan in the form of a small "lichen flora" section.

1. The management plan should include measures to maintain some wooded areas which should be allowed to evolve towards the advanced stages of forest maturity so enabling the regeneration of a lichen flora of the thermo-Mediterranean sciaphilous type. These areas would be chosen for their relevance taking into account the other constraints of fauna and flora management and fire protection. In the western part of the area, the priority would be to include all the sector under the forest track from Gigaro to cap Lardier, as far as the rocky coastline, and the area around site 58. These areas would not be subject to brush clearance, but would be enclosed, and the enclosure should be of sufficient surface area to allow the forest's development and carried out by the DFCI system. It would be interesting to study whether such zones could be shared with other groups of living organisms with compatible conservation objectives and measures, with the aim of preserving a lasting overall balance. These areas should have very limited pedestrian and mountain bike traffic and no development of access roads.

2. Draw up a rational plan for restricting or focusing DFCI clearing zones to only relevant and important forest tracks and areas, as there is a risk that if the clearings are too closely spaced, they will have a negative impact on long-term regeneration areas.

3. Maintain the protection and regulated access of the eastern face of cap Taillat for its hydrohaline, hygrohaline and aerohaline lichen flora, and possibly also the vascular flora.

4. Reinforcement of the marking of the coastal path between Gigaro and l'Escalet to protect certain sensitive areas from trampling, in order to maintain their lichenic adlittoral flora, by marking out non-accessible areas (mainly the segment between

Gigaro and cap Lardier and the one between the isthmus of Taillat and l'Escalet).

5. Integration of a “lichen” section into the National Park's environmental communication policy, including, for educational purposes, communication about the site's remarkable lichen flora, interpretation panels (perhaps common to other naturalist themes) and the marking of a few "sensitive and remarkable" areas.

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Appendix I - List of the surveys (study sites)

CL 01: 25/10/2021; La Croix Valmer, cap Lardier, southern part of the beach of Gigaro; rocky outcrop facing the sea; adlittoral and adlittoral inf.; eroded granite; West; 2 m alt.; 06.602219°E / 43.181864°N.

CL 02: 25/10/2021; La Croix Valmer, cap Lardier, southern part of the beach of Gigaro; rocky outcrop inclined 45° seaward; adlittoral; eroded granite; SW; 3 m alt.; 06.602372°E / 43.181414°N.

CL 03: 25/10/2021; La Croix Valmer, cap Lardier, rocky coastline before Aiguebonne; rocky outcrops; adlittoral; eroded granite; SW; 2 m alt.; 06.602683°E / 43.180928°N.

CL 04: 25/10/2021; La Croix Valmer, cap Lardier, rocky coastline of Aiguebonne valley; rocky outcrops; lower adlittoral and supralittoral; eroded granite; SW; 1 m alt.; 06.602794°E / 43.180624°N.

CL 05: 25/10/2021; La Croix Valmer, cap Lardier, Aiguebonne littoral; low rocky outcrops; adlittoral in the middle of the maquis; eroded granite; SW; 10 m alt.; 06.603317°E / 43.180431°N.

CL 06: 25/10/2021; La Croix Valmer, cap Lardier, southern part of the beach of Gigaro; scrubland with *Quercus suber*, *Myrtus communis* and *Smilax aspera*; trunk and branches of *Quercus suber;* SW; 10 m alt.; 06.602493°E / 43.181958°N.

CL 07: 25/10/2021; La Croix Valmer, cap Lardier, Aiguebonne littoral; low rocky outcrop above pathway; eroded granite; W; 5 alt.; 06.602998°E / 43.180766°N.

CL 08: 26/10/2021; La Croix Valmer, baie de Briande; rocky shoreline west of the beach; West side of a small cove, +/- shaded; gneiss; South; West; 1 m alt.; 06.631834°E / 43.170924°N.

CL 09: 26/10/2021; La Croix Valmer, baie de Briande, rocky coast West of the beach; large rocky spur, above the water; slab inclined at 45° to the North; gneiss; South; 2 m alt.; 06.629560°E / 43.169606°N.

CL 10: 26/10/2021; La Croix Valmer, baie de Briande, rocky shore west of the beach; steeply sloping wet rocky slab above water; gneiss; South; 3 m alt.; 06.632112°E / 43.171487°N.

CL 11: 26/10/2021; La Croix Valmer, baie de Briande, rocky slope east of the beach, beginning of the isthmus; adlittoral; rocky outcrops; basic silicate green rock; South; East; 2 m alt.; 06.640060°E / 43.172090°N.

CL 12: 26/10/2021; Ramatuelle, cap Taillat, rocky ridge at the top of the peninsula; rocky ridge and rocky outcrops; gneiss; NW and N; 22 m alt.; 06.644859°E / 43.169868°N.

CL 13: 26/10/2021; Ramatuelle, cap Taillat, isthmus of the peninsula; rocky outcrops falling into the sea; gneiss; South; 1 m. alt.; 06.640494°E / 43.172312°N.

CL 14: 26/10/2021; La Croix Valmer, baie de Briande, beach access path; earthy slope on the edge of the beach; access path; soil +/- siliceous; East; 5 m alt.; 06.631889°E / 43.173130°N.

CL 15: 26/10/2021; La Croix Valmer, baie de Briande, rocks to the East of the beach; rocky outcrops on the seafront; basic siliceous green rock; South; 1m alt.; 06.637156°E / 43.172515°N.

CL 16: 26/10/2021; La Croix Valmer, baie de Briande, rocky coastline west of the beach; shaded rock on the edge of the coastal path; gneiss; South; 10 m alt.; 06.630229°E / 43.170808°N.

CL 17: 26/10/2021; La Croix Valmer, baie de Briande, rocky coast west of the beach; low rocky outcrops; gneiss; South; 10 m alt.; 06.629779°E / 43.169728°N.

CL 18: 26/10/2021; La Croix Valmer, baie de Briande, access path to the beach; wooded cover at the edge of the path; *Quercus suber, Pistachia lentiscus, Quercus ilex;* East; 5 m alt.; 06.631816°E / 43.173156°N.

CL 19: 27/10/2021; La Croix Valmer, cap Lardier, cove West of cape isthmus; large rocks above water; supralittoral; granite compact; West; 3 m alt.; 06.620655°E / 43.159527°N.

CL 20: 27/10/2021; La Croix Valmer, cap Lardier, summit of the cape peninsula; gneiss; South; 40 m alt.; 06.621370°E / 43.158976°N.

CL 21: 27/10/2021; La Croix Valmer, cap Lardier, intersection between the cape path and the track, west of the semaphore; Mediterranean *Quercus ilex* and *Q. suber* forest at

the edge of the fire of 2017, but not affected; *Quercus suber* trunk; West; 100 m alt.; 06.612676°E / 43.168973°N.

CL 22: 27/10/2021; La Croix Valmer, cap Lardier, Brouis valley, along the runway, south side; scrubland with *Quercus suber*, *Q. suber* and *Pinus pinea*; *Q. ilex* trunk; West; 15 m alt.; 06.611022°E / 43.173170°N.

CL 23: 27/10/2021; La Croix Valmer, cap Lardier, Brouis valley, along the runway; southern slope roadside, slope 45° earthy; micaschist; NW; 20 m alt.; 06.611101°E / 43.172965°N.

CL 24: 27/10/2021; La Croix Valmer, cap Lardier, top of the rocky isthmus, north side of the peninsula; escarpment and rocky cliff; granite; North; 20 m alt.; 06.621512°E / 43.159416°N.

CL 25: 27/10/2021; La Croix Valmer, cap Lardier, intersection of cape path and track, west of semaphore; Mediterranean *Quercus ilex* and *Q. suber* forest at the edge of the fire of 2017, but not affected; *Q. ilex* trunk; W; 100 m alt.; 06.612597°E / 43.168907°N.

CL 26: 27/10/2021; La Croix Valmer, cap Lardier, Brouis valley, along the runway, south side; scrubland with *Quercus suber*, *Q. ilex* and *Pinus pinea*; *Q. suber* trunk; West; 22 m alt.; 06.611343°E / 43.173056°N.

CL 27: 28/10/2021; La Croix Valmer, cap Lardier, small summit west of col de Collebasse; large rocky outcrops on the ridge; gneiss; SE; 192 m alt.; 06.616055°E / 43.192943°N.

CL 28: 28/10/2021; La Croix Valmer, cap Lardier, les Gaches, edge of runway *Pinus*, *Quercus ilex*, *Q. suber* forest;*Q. suber* trunk; West; 169 m alt.; 06.614370°E / 43.189887°N.

CL 29: 28/10/2021; La Croix Valmer, cap Lardier, edge of runway west of Collebasse; rocky outcrops above ground (60 cm); gneiss; South; 149 m alt.; 06.615812°E / 43.184604°N.

CL 30: 28/10/2021; La Croix Valmer, cap Lardier, small valley on the edge of the Brouis track; dark *Quercus ilex* and *Q. suber* forest; trunks; West; 76 m alt.; 06.610251°E / 43.176595°N.

CL 31: 28/10/2021; La Croix Valmer, cap Lardier, Jovat valley, on the edge of the lookout trail;*Quercus ilex* wood at the bottom of the valley; *Quercus ilex* trunks; SW; 41 m alt.; 06.608106°E / 43.177546°N.

CL 32: 28/10/2021; La Croix Valmer, cap Lardier, rocky coastline south of Brouis beach; sloping rocky wall facing the sea, on the edge of a cove, supralittoral; amphibolite; West; 0.5 m alt.; 06.608216°E / 43.170650°N.

CL 33: 28/10/2021; La Croix Valmer, cap Lardier, small summit west of Collebasse pass; open scrubland on edge of track, scattered trees; *Quercus pubescens, Q. ilex, Phillyrea* sp.; South; 194 m alt.; 06.614902°E / 43.192763°N.

CL 34: 28/10/2021; La Croix Valmer, cap Lardier, rocky coastline south of Brouis beach; coastal rocks, adlittoral; gneiss; NW; 5 m alt.; 06.608250°E / 43.171300°N.

CL 35: 29/10/2021; La Croix Valmer, cap Lardier, vallon d'Aiguebonne; dense shrubby scrub (mainly *Erica arborea*); *Erica arborea;* West; 23 m alt.; 06.605389°E / 43.180702°N.

CL 36: 29/10/2021; La Croix Valmer, cap Lardier, vallon d'Aiguebonne; lichenized soil in the middle of semi-open scrubland; siliceous soil; West; 26 m alt.; 06.605667°E / 43.180674°N.

CL 37: 29/10/2021; La Croix Valmer, cap Lardier, vallon d'Aiguebonne; dense wooded scrub (cork oak and umbrella pine); cork oak trunk; West; 24 m alt.; 06.605513°E / 43.180709°N.

CL 38: 29/10/2021; La Croix Valmer cap Lardier, vallon d'Aiguebonne; dense wooded scrub (*Quercus suber* and *Pinus pinea*); *Quercus suber* trunk; West; 23 m alt.; 06.604881°E / 43.180402°N.

CL 39: 29/10/2021; La Croix Valmer, cap Lardier, vallon d'Aiguebonne; low slope at the edge of a path on the south side of the valley Earthy; gneiss; North; 38 m alt.; 06.605322°E / 43.179864°N.

CL 40: 29/10/2021; La Croix Valmer, cap Lardier, vallon d'Aiguebonne, valley bottom path; rocky outcrop at ground level; gneiss; West; 19 m alt.; 06.604498°E / 43.181037°N.

CL 41: 29/10/2021; La Croix Valmer, cap Lardier, rocky hillside "des pins parasols"; rocky spur sloping towards the sea, adlittoral; gneiss; West; 5 m alt.; 06.602577°E / 43.179571°N.

CL 42: 29/10/2021; La Croix Valmer, beach of Gigaro, wooded area behind the beach; in a wood of big *Eucalyptus*; trunk of *Eucalyptus* sp.; West; 5 m alt.; 06.602008°E / 43.183129°N.

CL 43: 31/01/2022; La Croix Valmer, cap Lardier, vallon de Brouis; high scrubland with *Erica arborea* and *Quercus ilex*, shaded; *Q. ilex* trunks; West; 10 m alt.; 06.609971°E / 43.173163°N.

CL 44: 31/01/2022; La Croix Valmer, cap Lardier, vallon de Brouis; high scrub with *Quercus ilex* and *Erica arborea* remnants, shaded; *Q. ilex* trunk; West; 6 m alt.; 06.608906°E / 43.172851°N.

CL 45: 31/01/2022; La Croix Valmer, cap Lardier, vallon de Brouis, beach of Brouis; maquis of anamorphosed *Quercus ilex* on the edge of the beach, adlittoral; trunk and branches of *Q. ilex*; West; 4 m alt.; 06.608830°E / 43.172504°N.

CL 46: 31/01/2022; La Croix Valmer, cap Lardier, vallon de Brouis, Laurent property; old clear olive orchard; old olive tree trunk; North; 20 m alt.; 06.612042°E / 43.173163°N.

CL 47: 31/01/2022; La Croix Valmer, cap Lardier, vallon de Brouis, Laurent property; wet ditch inside the maquis, sciaphilous; edge of talus, earthy; siliceous soil; North; 20 m alt.; 06.611809°E / 43.173072°N.

CL 48: 01/02/2022; La Croix Valmer, baie de Briande, calanque des Canibous; large rock (2 m high), adlittoral; on the edge of the granite coastline; South; North; 2 m alt.; 06.623991°E / 43.165989°N.

CL 49: 01/02/2022; La Croix Valmer, baie de Briande, calanque des Canibous; rocky edge subject to sea spray, supra-littoral; granite; South; 1 m alt.; 06.623991°E / 43.165989°N.

CL 50: 01/02/2022; La Croix Valmer, baie de Briande, calanque des Canibous; rocky outcrops subject to sea spray, but adlittoral limit; gneiss; South; 3 m alt.; 06.623528°E / 43.165503°N.

CL 51: 01/02/2022; La Croix Valmer, baie de Briande, calanque des Canibous; rocky face inclined at 60° on the coast, adlittoral; gneiss; South; 3 m alt.; 06.624759°E / 43.165828°N.

CL 52: 01/02/2022; La Croix Valmer, baie de Briande, calanque des Canibous; rocky face inclined at 60° at the edge of the coast, supralittoral exposed to sea spray; gneiss; South; 1 m alt.; 06.624759°E / 43.165828°N.

CL 53: 01/02/2022; La Croix Valmer, mas de Gigaro; pine forest and coppiced wood on south side of Collebasse; edge of track, slope inclined 45° wet and earthy rocky; saxiterricolous and schist/gneiss; West; 55 m alt.; 06.605597°E / 43.183556°N.

CL 54: 01/02/2022; La Croix Valmer, baie de Briande, calanque des Canibous; rocky outcrop at the bottom of the stream; granite; South; 5 m alt.; 06.623535°E / 43.165785°N.

CL 55: 02/02/2022; La Croix Valmer, cap Lardier, Jovat valley, bottom of valley just above the beach; low shrubby scrub, open to the sea, subject to marine air; branches of *Erica arborea, Pistacia lentiscus, Pinus pinea;* West; 12 m alt.; 06.604884°E / 43.175407°N.

CL 56: 02/02/2022; La Croix Valmer, cap Lardier, Jovat valley, beach; coastal rocks, supralittoral exposed to sea spray; gneiss; West; 0.5 m alt.; 06.604593°E / 43.175374°N.

CL 57: 02/02/2022; La Croix Valmer, cap Lardier, Jovat valley, bottom of the valley just above the beach; rocky outcrops at ground level, adlittoral; gneiss; West; 5 m alt.; 06.604777°E / 43.175326°N.

CL 58: 02/02/2022; La Croix Valmer, cap Lardier, Les Brouis; dense *Quercus suber* forest, not affected by fire; trunk of *Q. suber;* West; 54 m alt.; 06.608447°E / 43.175287°N.

CL 59: 02/02/2022; La Croix Valmer, cap Lardier, les Brouis, Laurent property; dark undergrowth of *Quercus ilex* and *Q. suber* at the bottom of the valley; trunk of *Q. ilex;* North; 48 m alt.; 06.612847°E / 43.171448°N.

CL 60: 03/02/2022; Ramatuelle, cap Taillat, rocky east side; rocks of the sea-beaten coast, exposed to sea spray and sea inputs, supralittoral; gneiss/micaschists; East; 1 m alt.; 06.642908°E /43.171862°N.

CL 61: 03/02/2022; Ramatuelle, rocky coast south of Canadel point; rocky spur above a small cove, adlittoral; eroded granite; SE; 8 m alt.; 06.640542°E / 43.177860°N.

CL 62: 03/02/2022; Ramatuelle, rocky coast south of Canadel point; rocky outcrop exposed to sea spray and sea entries, supralittoral; eroded granite; SE; 4 m alt.; 06.640738°E / 43.177806°N.

CL 63: 03/02/2022; Ramatuelle, upper part of the Tourraque valley, col de Collebasse track; recently cleared oak cork wood; trunk of *Quercus suber;* SE; 136 m alt.; 06.623986°E / 43.191048°N.

CL 64: 03/02/2022; Ramatuelle, cap Taillat, rocky East side; rocky escarpments and outcrops at mid-slope; gneiss; East; 20 m alt.; 06.643177°E / 43.171721°N.

CL 65: 11/02/2022; La Croix Valmer, cap Lardier, anse de Jovat, opposite the Crocodile Island; small spur descending to the sea opposite the island, adlittoral; large whitish vein in the granite; West; 2 m alt.; 06.603693°E / 43.176917°N.

CL 66: 04/02/2022; La Croix Valmer, vallon du ruisseau de la Ricarde; edge of road in dark undergrowth; large trunk of old *Quercus ilex;* West; 10 m alt.; 06.560883°E / 43.192917°N.

CL 67: 04/02/2022; La Croix Valmer, vallon du ruisseau de la Ricarde; roadside in dark undergrowth; big trunk of old *Quercus ilex;* West; 10 m alt.; 06.561178°E / 43.193028°N.

Appendix II - Complete list of lichens, lichenicolous fungi and non-lichenized–non-lichenicolous fungi. Study sites where they were recorded. **CF83** means confirmed in the Var department, as it is only mentioned there once in the *Catalogue des lichens de France* (3rd edition); **N83**: newly reported in Var department; **NF**: newly reported in France.

Lichens

01 *Acarospora microcarpa* (Nyl.) Wedd.; 07, 65
02 *Acarospora privigna* (Ach.) A. Schneid.; 27, 40
03 *Acarospora subfuscescens* (Nyl.) H. Magn.; 02, 16, 23, 48, 65
04 *Acarospora subrufula* (Nyl.) H. Olivier; 07, 41, 49, 61, 65; **CF83**
05 *Acarospora umbilicata* Bagl.; 23, 27, 29
06 *Alyxoria culmigena* (Lib.) Ertz; 46
07 *Alyxoria subelevata* (Nyl.) Ertz & Tehler; 61
08 *Amandinea maritima* Giralt, van den Boom & Elix; 45, 55; N**83**
09 *Amandinea pelidna* (Ach.) Fryday & L. Arcadia; 01, 04, 12, 27, 57; **N83**
10 *Amandinea punctata* (Hoffm.) Coppins & Scheid.; 45, 58
11 *Anaptychia runcinata* (With.) J.R. Laundon; 01, 05, 12, 61
12 *Aquacidia trachona* (Ach.) Aptroot; 44
13 *Arthonia atra* (Pers.) A. Schneid.; 45
14 *Aspicilia cupreoglauca* B. de Lesd.; 05, 29
15 *Aspicilia intermutans* morpho. *intermutans* (Nyl.) Arnold; 02, 04, 11, 16, 20, 24, 27, 29,34, 48, 57
16 *Aspicilia intermutans* morpho. *ammotropha* (Nyl.) Arnold; 29
17 *Aspicilia viridescens* (A. Massal.) Hue; 02, 03, 04, 10, 11, 16, 17, 20, 34, 41, 48, 54, 57, 61, 65
18 *Athallia holocarpa* (Hoffm.) Arup, Frödén & Søchting; 65; **N83**
19 *Athallia necator* (Poelt & Clauzade) Vondrák, Halıcı, Güllü & Demirel; 16, 29
20 *Athallia pyracea* (Ach.) Arup, Frödén & Søchting; 26
21 *Bacidia rubella* (Hoffm.) A. Massal.; 46
22 *Bactrospora patellarioides* (Nyl.) Almq. var. *convexa* (B. de Lesd.) Egea & Torrente; 18, 21, 22, 25, 26, 30, 31, 42, 44, 45, 55, 58, 59, 63
23 *Biatoridium monasteriense* J. Lahm ex Körb.; 58
24 *Blastenia crenularia* (With.) Arup, Søchting & Frödén; 23, 24
25 *Blastenia crenularia* var. *contigua* (A. Massal.) Cl. Roux; 61, 64
26 *Blastenia festivella* (Nyl.) Vondrák; 02, 24, 27, 48, 54, 57, 64
27 *Blastenia xerothermica* Vondrák, Arup & I.V. Frolov subsp. *xerothermica*; 33, 38, 46
28 *Buellia abstracta* (Nyl.) H. Olivier; 01, 13, 29, 40; **CF83**
29 *Buellia caloplacivora* Llimona & Egea chémo. II; 02; **N83**
30 *Buellia disciformis* (Fr.) Mudd; 26
31 *Buellia leptoclinoides* (Nyl.) J. Steiner; 03, 12, 24, 61
32 *Buellia saxorum* A. Massal.; 05, 27, 57
33 *Buellia sequax* s.l. sensu Giralt *et al*. 2010; 09, 24, 56, 64; **N83**
34 *Buellia spuria* (Schaer.) Anzi; 27, 29
35 *Buellia stellulata* (Tayl.) Mudd; 27, 29, 54
36 *Buellia subdisciformis* (Leight.) Vain. ; 01, 02, 20, 48, 54, 57, 61, 64, 65
37 *Buellia subdisciformis* chémo. *sejuncta* (Leight.) Vain.; 01, 05, 29
38 *Buellia tesserata* Körb.; 12, 17, 20, 41, 57,61, 64
39 *Caloplaca aegatica* Giralt, Nimis & Poelt; 33, 45
40 *Caloplaca cecericola* B. de Lesd.; 27; **N83**
41 *Caloplaca conglomerata* (Bagl.) Jatta; 29
42 *Caloplaca ligustica* B. de Lesd.; 07
43 *Caloplaca obscurella* (J. Lahm.) Th. Fr.; 26
44 *Candelaria concolor* (Dicks.) Stein; 06
45 *Candelariella oleaginescens* Rondon; 32, 61, 64, 65
46 *Candelariella vitellina* (Hoffm.) Müll. Arg.; 05, 16, 20, 23, 27, 29, 33, 41, 64
47 *Catillaria chalybeia* (Borrer) A. Massal.; 01, 02, 03, 04, 09, 16, 23, 32, 40, 41, 49, 50, 51, 57, 61

48 *Catillaria nigroclavata* (Nyl.) Schuler; 28, 33
49 *Chrysothrix candelaris* (L.) J.R. Laundon; 28, 35, 38, 46
50 *Cladonia cervicornis* (Ach.) Flot.; 23, 36, 39, 53
51 *Cladonia chlorophaea* (Flörke ex Sommerf.) Spreng.; 40
52 *Cladonia ciliata* Stirt. f. *flavicans* (Flörke) Ahti & DePriest; 36, 39
53 *Cladonia foliacea* (Huds.) Willd. subsp. *foliacea*; 36, 39, 53
54 *Cladonia furcata* (Huds.) Schrad. morpho. corymbosa (Huds.) Schrad.; 36
55 *Cladonia furcata* morpho. *furcata*; 36, 53
56 *Cladonia glauca* Flörke; 39
57 *Cladonia humilis* (With.) J.R. Laundon; 14, 53
58 *Cladonia peziziformis* (With.) J.R. Laundon; 53
59 *Cladonia pyxidata* (L.) Hoffm.; 39, 53
60 *Cladonia ramulosa* (With.) J.R. Laundon; 39
61 *Cladonia rangiformis* Hoffm. morpho. pungens; 14, 23, 36, 39, 40, 53
62 *Coenogonium pineti* (Schrad. ex Ach.) Lücking & Lumbsch; 25, 43
63 *Coenogonium tavaresianum* (Vězda) Lücking, Aptroot & Sipmann; 25
64 *Collema furfuraceum* (Arnold) Du Rietz; 58
65 *Dendrographa decolorans* (Turner & Borrer ex Sm.) Ertz & Tehler; 21, 22, 25, 30, 31, 43, 44, 45, 46, 58, 59, 63
66 *Diploicia canescens* (Dicks.) A. Massal.; 22, 26, 46
67 *Diploicia subcanescens* (Werner) Hafellner & Poelt; 01, 02, 07, 12, 20, 24, 32, 34, 41, 48, 50, 51, 60, 61, 64, 65
68 *Diploschistes actinostoma* (Pers. ex Ach.) Zahlbr.; 04, 29, 41, 57
69 *Diploschistes euganeus* (A. Massal.) J. Steiner; 07, 40, 57, 65; **N83**
70 *Diploschistes scruposus* (Schreb.) Norman; 23, 53
71 *Diplotomma chlorophaeum* (Hepp ex Leight) Szatala; 09, 32, 41
72 *Diplotomma glaucoatrum* (Nyl.) Cl. Roux; 04, 11, 15, 16, 24, 60, 62, 64, 65
73 *Dirina fallax* De Not.; 20, 64
74 *Endohyalina kalbii* (Giralt & Matzer) Giralt, van den Boom & Elix; 28; **N83**
75 *Evernia prunastri* (L.) Ach.; 25, 35, 37, 38, 55, 58, 63
76 *Flavoparmelia caperata* (L.) Hale; 05, 06, 18, 22, 25, 28, 30, 33, 35, 38, 39, 45, 46, 55, 58, 63
77 *Flavoparmelia soredians* (Nyl.) Hale; 21, 22, 26, 28, 33, 35, 37, 38, 55, 58, 63
78 *Flavoplaca arcisproxima* (Vondrák, Říha, Arup & Søchting) Arup, Søchting & Frödén; 13
79 *Flavoplaca flavocitrina* (Nyl.) Arup, Frödén & Søchting; 02, 64
80 *Flavoplaca marina* (Wedd.) Arup, Frödén & Søchting; 10, 11, 13, 19, 24, 50, 56, 60, 61, 62, 64
81 *Flavoplaca ora* (Poelt & Nimis) Arup, Søchting & Frödén; 08, 41, 52, 62
82 *Gyalecta liguriensis* (Vězda) Vězda; 66
83 *Gyalecta schisticola* Werner; 61; **N83**
84 *Heteroplacidium phaeocarpoides* (Nyl.) Breuss; 02; **N83**
85 *Hydropunctaria symbalana* (Nyl.) Cl. Roux; 04, 56, 60
86 *Hyperphyscia adglutinata* (Flörke) H. Mayrhofer & Poelt; 18, 21, 25, 26, 28, 31, 33, 37, 38, 43, 58, 63
87 *Hypogymnia physodes* (L.) Nyl.; 35
88 *Kuettlingeria fuscoatroides* (J. Steiner) I.V. Frolov, Vondrák & Arup; 48, 57
89 *Lecania atrynoides* M. Knowles; 01, 02, 03, 04, 09, 10, 11, 13, 24, 32, 41, 49, 50, 51, 52, 56, 60, 62, 64, 65
90 *Lecania cyrtella* (Ach.) Th. Fr.; 45
91 *Lecania cyrtellina* (Nyl.) Sandst.; 55
92 *Lecania koerberiana* J. Lahm; 21, 37, 45, 58
93 *Lecanora* aff. *chlarotera* sensu Giralt 1996; 42, 44, 46
94 *Lecanora campestris* subsp. *campestris* (Schaer.) Hue; 23
95 *Lecanora conizella* Nyl.; 31, 35
96 *Lecanora gangaleoides* Nyl.; 05, 17, 23, 27, 51, 57
97 *Lecanora hybocarpa* (Tuck.) Brodo ; 18, 21, 22, 25, 26, 30, 31, 33, 37, 44, 45, 46, 55, 58, 63

98 *Lecanora lividocinerea* Bagl.; 43, 46, 55, 59
99 *Lecanora praepostera* Nyl.; 02, 04, 05, 12, 24, 27, 48, 54, 61
100 *Lecanora rubrofusca* morpho. rubrofusca B. de Lesd.; 03, 61
101 *Lecanora rubrofusca* var. *monstruosa* B. de Lesd.; 05; **NF**
102 *Lecanora rupicola* (L.) Zahlbr. subsp. *rupicola* morpho. rupicola (L.) Zahlbr.; 05
103 *Lecanora rupicola* subsp. *sulphurata* (Nyl.) Leuckert & Poelt; 27, 29
104 *Lecanora strobilina* (Spreng.) Kieff.; 28, 33, 35, 55
105 *Lecanora sulphurea* (Hoffm.) Ach.; 01, 02, 03, 04, 10, 17, 24, 34, 41, 48, 51, 57,64
106 *Lecidea erythrophaea* Flörke ex Sommerf.; 55; **N83**
107 *Lecidea fuscoatra* (L.) Ach.; 57
108 *Lecidea grisella* Flörke; 53
109 *Lecidea sarcogynoides* Körb.; 40, 57; **N83**
110 *Lecidella asema* (Nyl.) Knoph & Hertel var. *asema*; 48
111 *Lecidella asema* var. *elaeochromoides* (Nyl.) Nimis & Tretiach; 01, 02, 04, 05, 10, 16, 17, 20, 24, 27, 29, 34, 41, 51, 57, 61, 64, 65
112 *Lecidella carpathica* Körb.; 03, 23, 27
113 *Lecidella elaeochroma* (Ach.) M. Choisy; 33, 45, 63
114 *Lecidella elaeochroma* chemo. flavicans (Ach.) M. Choisy; 22, 55
115 *Lecidella scabra* (Taylor) Hertel & Leuckert; 02; **CF83**
116 *Lepra albescens* (Huds.) Hafellner; 25
117 *Lepra amara* (Ach.) Hafellner var. *amara*; 26, 63
118 *Lepra amara* var. *flotowiana* (Flörke) Nimis; 05, 35, 38
119 *Lepra mammosa* (Harm.) Hafellner; 05
120 *Lepraria finkii* (B. de Lesd.) R.C. Harris; 43, 45, 47, 55
121 *Lepraria incana* (L.) Ach.; 47
122 *Lepraria jackii* Tønsberg; 14; **N83**
123 *Leprocaulon quisquiliare* (Leers) M. Choisy; 14, 23, 53
124 *Lichenothelia convexa* Henssen; 08
125 *Martinjahnsia resendei* (Poelt & Tav.) S.K. Kondr.; 11, 19, 20, 49, 61
126 *Melanelixia subaurifera* (Nyl.) O. Blanco, A. Crespo, Divakar, Essl., D. Hawksw & Lumbsch; 25; 35, 37, 55
127 *Micarea byssacea* (Th. Fr.) Czarnota, Guzow-Krzem. & Coppins; 14; **N83**
128 *Myriolecis* aff. *oyensis* (M. Bertrand & Cl. Roux) M. Bertrand & Cl. Roux; 16
129 *Myriolecis dispersa* (Pers.) Śliwa, Zhao Xin & Lumbsch; 20
130 *Myriolecis liguriensis* (B. de Lesd.) Cl. Roux; 05, 32, 51
131 *Myriolecis oyensis* (M. Bertrand & Cl. Roux) M. Bertrand & Cl. Roux; 01, 02, 03, 09, 41, 48, 49, 50, 56, 60, 64
132 *Myriolecis persimilis* (Th. Fr.) Sliwa, Zhao Xin & Lumbsch; 33
133 *Nephroma laevigatum* Ach.; 47
134 *Normandina pulchella* (Borrer) Nyl.; 58
135 *Ochrolechia parella* (L.) A. Massal.; 01, 02, 05, 07, 12, 16, 20, 27, 29, 41, 51, 57, 61
136 *Opegrapha celtidicola* (Jatta) Jatta; 58
137 *Opegrapha conferta* Anzi; 64; **N83**
138 *Opegrapha niveoatra* (Borrer) J.R. Laundon; 42, 46, 58
139 *Opegrapha vermicellifera* (Kunze) J.R. Laundon; 44
140 *Opegrapha vulgata* (Ach.) Ach.; 22, 25, 43, 44, 45, 59
141 *Parmelia saxatilis* s.l. (L.) Ach.; 46
142 *Parmelia sulcata* Taylor; 21, 25, 33, 38, 39, 46, 55, 58, 63
143 *Parmelina tiliacea* (Hoffm.) Hale; 01, 04, 25, 26, 33, 34, 37, 38, 46, 48, 57, 58, 63
144 *Parmotrema hypoleucinum* (J. Steiner) Hale; 28, 33, 35, 38, 55, 63
145 *Parmotrema perlatum* (Huds.) M. Choisy; 06, 21, 22, 26, 28, 30, 33, 35, 37, 38, 45, 55, 58, 63
146 *Parmotrema reticulatum* (Taylor) M. Choisy; 26, 33
147 *Peltula euploca* (Ach.) Poelt; 20
148 *Pertusaria digrediens* Nyl.; 27
149 *Pertusaria flavida* (D.C.) J.R. Laundon; 26, 45
150 *Pertusaria heterochroa* (Müll. Arg.) Erichsen; 21, 25, 33, 45, 46, 59
151 *Pertusaria leioplaca* DC.; 43, 55, 63

152 *Pertusaria pluripuncta* Nyl.; 01, 02, 03, 17, 20, 24, 41, 48, 50, 51, 54, 57, 61, 64, 65
153 *Pertusaria rupicola* (Sommerf.) Harm.; 01, 03, 04, 05, 10, 12, 17, 27, 41
154 *Pertusaria werneriana* Boqueras; 43, 44; **N83**
155 *Phaeophyscia hirsuta* (Mereschk.) Essl.; 58
156 *Phaeophyscia orbicularis* (Neck.) Moberg; 28, 31, 63
157 *Physcia adscendens* H. Olivier; 04, 06, 18, 21, 24, 25, 26, 28, 31, 33, 37, 38, 42, 43, 45, 46, 55, 58, 59, 61, 63
158 *Physcia dubia* morpho. dubia (Hoffm.) Lettau; 03, 06, 41
159 *Physcia tenella* (Scop.) DC.; 30, 48, 58
160 *Physcia tribacia* (Ach.) Nyl.; 27
161 *Physconia enteroxantha* (Nyl.) Poelt; 58
162 *Physconia petraea* (Poelt) Vězda & Poelt; 12; **N83**
163 *Porina aenea* (Wallr.) Zahlbr.; 21, 25, 30, 42
164 *Porina leptalea* (Durieu & Mont.) A.L. Sm.; 45
165 *Porina leptospora* (Nyl.) A.L. Sm.; 43; **N83**
166 *Porpidia cinereoatra* subsp. *cinereoatra* (Ach.) Hertel & Knoph; 36
167 *Porpidia crustulata* (Ach.) Hertel & Knoph; 14, 23, 36, 39, 53
168 *Porpidia macrocarpa* (DC.) Hertel & A.J. Schwab; 01
169 *Protoparmelia montagnei* (Fr.) Poelt & Nimis; 10, 20, 24, 27, 34, 41, 48, 51, 57
170 *Protoparmelia montagnei* (Fr.) Poelt & Nimis chemo. aquilina; 02, 04, 05
171 *Protoparmelia olivascens* (Nyl.) Llimona; 01, 12, 17, 41, 57, 61, 64, 65
172 *Punctelia borreri* (Sm.) Krog; 33
173 *Punctelia subrudecta* (Nyl.) Krog; 06, 21, 25, 37, 38, 46, 55, 58, 63
174 *Pyrenopsis* sp.; 53
175 *Pyrrhospora quernea* (Dicks.) Körb.; 21, 22, 25, 26, 28, 35, 37, 38, 45, 46, 55, 58, 63
176 *Ramalina breviuscula* Nyl.; 02, 05, 12, 20, 24, 34, 41, 48, 51, 57, 61, 64
177 *Ramalina canariensis* J. Steiner; 26, 28, 38, 45, 46, 58
178 *Ramalina farinacea* (L.) Ach.; 21, 26, 33, 35, 38, 45, 55, 58, 63
179 *Ramalina pusilla* Le Prévost; 45
180 *Ramalina requienii* (De Not.) Jatta; 05, 12, 34, 61
181 *Rhizocarpon geographicum* s.l. (L.) DC.; 05, 27
182 *Rhizocarpon reductum* Th. Fr.; 39
183 *Rhizocarpon richardii* (Lamy ex Nyl.) subsp. *constrictum* (Malme) Cl. Roux; 27; 29; 57
184 *Rinodina alba* Metzler ex Arnold; 04, 20, 27, 41, 48
185 *Rinodina atrocinerea* (Hook.) Körb; 54, 57
186 *Rinodina beccariana* Bagl. var. *beccariana*; 03, 04, 12, 20, 24, 41, 48, 50, 51, 57, 61, 65
187 *Rinodina confragosa* (Ach.) Körb.; 10, 27
188 *Rinodina gennarii* Bagl.; 24
189 *Rinodina oleae* Bagl.; 58
190 *Rinodina roboris* (Dufour ex Nyl.) Arnold var. *roboris*; 33
191 *Rinodina santorinensis* J. Steiner var. *olivieri* (Sampaio) H. Mayrhofer & Sattler; 01; **NF**
192 *Rinodina santorinensis* var. *santorinensis*; 01
193 *Roccella phycopsis* (Ach.) Ach.; 12, 20, 24, 51, 57, 61, 64
194 *Rostania occultata* (Bagl.) Otálora, P.M. Jorg. & Wedin; 58
195 *Sanguineodiscus aractinus* (Fr.) I.V. Frolov & Vondrák; 09, 11, 41, 49, 56, 61, 62, 64, 65
196 *Sarcogyne clavus* (DC.) Kremp.; 57
197 *Scoliciosporum umbrinum* (Ach.) Arnold; 27
198 *Scytinium teretiusculum* (Wallr.) Otálora, P.M. Jorg. & Wedin; 58
199 *Solenopsora holophaea* (Mont.) Samp.; 01
200 *Solenopsora vulturiensis* A. Massal.; 01, 05, 10, 23, 47, 52, 61, 64, 65
201 *Strigula* cf. *ziziphi* (A. Massal.) Cl. Roux et Sérus.; 22, 25, 58
202 *Tephromela atra* (Huds.) Hafellner var. *atra*; 01, 03, 04, 10, 17, 24, 32, 41, 48, 51, 57, 61, 64, 65

203 *Thelopsis corticola* (Coppins & James) Sanderson & Ertz; 67
204 *Trapelia coarctata* (Sm.) M. Choisy; 27, 40, 53
205 *Trapelia glebulosa* (Sm.) J.R. Laundon; 05; **N83**
206 *Trapeliopsis flexuosa* (Fr.) Coppins & P. James; 06
207 *Usnea esperantiana* P. Clerc; 35, 38
208 *Usnea rubicunda* Stirt.; 35
209 *Usnochroma carphinea* (Fr.) Søchting, Arup & Frödén; 29
210 *Variospora thallincola* (Wedd.) Arup, Frödén et Søchting; 02, 03, 09, 11, 32, 50, 52, 56, 60
211 *Verrucaria fusconigrescens* Nyl.; 03, 24, 57; **N83**
212 *Waynea stoechadiana* (Abbassi Maaf & Cl. Roux) P. Clerc & Cl. Roux; 25
213 *Xanthoparmelia cumberlandia* (Gyeln.) Hale; 29; **N83**
214 *Xanthoparmelia delisei* (Duby) O. Blanco, A. Crespo, Elix, D. Hawksw. & Lumbsch; 57
215 *Xanthoparmelia glabrans* (Nyl.) O. Blanco, A. Crespo, Elix, D. Hawksw. & Lumbsch; 01, 02, 03, 04, 29, 41, 48; **N83**
216 *Xanthoparmelia luteonotata* (J. Steiner) O. Blanco, A. Crespo, Elix, D. Hawksw. & Lumbsch ; 27; **N83**
217 *Xanthoparmelia mexicana* auct. ital. [non (Gyeln.) Hale]; 04, 05, 20, 27, 29, 41, 48, 57; **NF**
218 *Xanthoparmelia plittii* (Gyeln.) Hale; 23, 57; **NF**
219 *Xanthoparmelia pulla* (Ach.) O. Blanco, A. Crespo, Elix, D. Hawksw. et Lumbsch chémo. pulla; 05; **N83**
220 *Xanthoparmelia pulla* (Ach.) O. Blanco, A. Crespo, Elix, D. Hawksw. & Lumbsch chémo. perrugata; 01, 23, 27, 53, 65; **N83**
221 *Xanthoparmelia pulla* s.l.; 16, 20, 34
222 *Xanthoparmelia stenophylla* (Ach.) Ahti & D. Hawksw.; 23
223 *Xanthoparmelia verruculifera* (Nyl.) O. Blanco, A. Crespo, Elix, D. Hawksw. & Lumbsch; 05, 53
224 *Xanthoria calcicola* Oxner; 01, 02, 04, 05, 07, 09, 11, 12, 16, 17, 19, 20, 23, 24, 27, 29, 34, 41, 48, 49, 51, 57, 61, 64, 65
225 *Xanthoria parietina* (L.) Th. Fr.; 06, 11, 12, 18, 26, 28, 33, 37, 38, 55, 58, 63

The following two taxa, mentioned by Ménard (2009) were not found during our surveys.
226 *Lecanora polytropa* (Ehrh. ex Hoffm.) Rabenh.
227 *Rhizocarpon polycarpum* (Hepp) Th. Fr.

Lichenicolous fungi
As lichenicolous fungi have been less surveyed than lichens, the list below includes mainly taxa mentioned by Ménard 1997 and 2009.
01 *Chaenothecopsis hospitans* (Th. Fr.) Tibell [on *P. rupicola*]; Ménard, 1997
02 *Endoccoccus rugulosus* s.l. Nyl. [on *R. alba*]; Ménard, 1997
03 *Lichenostigma cosmopolites* Hafellner et Calat. [on *X. plittii*] *;* 57
04 *Muellerella pygmaea* (Körb.) D.Hawksw. [on *L. praepostera, L. atrynoides*]; Ménard, 1997
05 *Stigmidium ramalinae* (Müll.Arg.) Etayo et Dierderich [on *R. breviuscula*]; Ménard, 1997
06 *Polycoccum* cf. *arnoldii;* Ménard, 1997
07 *Polycoccum microsticticum* (Leight.) Arnold [on various lichens]; Ménard, 1997
08 *Sphinctrina leucopoda* Nyl. [on *Pertusaria* sp.]; 46

non-lichenized–non-lichenicolous fungi
01 *Hysterium angustatum* Pers.; 42
02 *Hysterobrevium smilacis* (Schwein.) E. Boehm & C.L. Schoch; 42
03 *Patellaria atrata* (Hedw.) Fr.; 42
04 *Polyblastiopsis subericola* B. de Lesd.; 21; **CF83**