

The sabulicolous fungi from Sicily (southern Italy): additions and critical review

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Abstract — The ecological and distributive data of 165 sabulicolous taxa (29 *Ascomycetes* and 136 *Basidiomycetes*), included in 89 genera and 48 families, collected in Sicily (southern Italy) are here reported. New additions are included, together with a critical review of data reported in literature for the Sicilian territory.

Key words — distribution, ecology, arenicolous fungi

Introduction

In the last 60 years a number of scientific papers on fungi growing on sandy dunes were published by several authors [Andersson (1950), Arnolds (1983), Bon (1970, 1972, 1975, 1984), Courtecuisse (1984, 1986), Eriksson (1964), Høiland (1975, 1977, 1978), Rivas Martinez & Losa Quintana (1969), Calonge & Telleria (1980), Moreno et al. (1994), Rotheroe et al. (1987), Watling & Rotheroe (1989) and Rotheroe (1993)]. A huge number of scientific papers on the same topic were also published from Italy [Contu (1986, 1988, 1989, 1994); Ballero & Contu (1990); Contu & La Rocca (1999); Barluzzi et al. (1996); Marchetti & Franchi (1993); Franchi et al. (2001); Hausknecht & Zuccherelli (1993, 1998); Migliozzi & Camboni (1999, 2000, 2001, 2002); Migliozzi & Resta (2000); Pacioni (1980); Pacioni & Lalli (1981, 1982, 1984a, 1984b, 1985); Para (1996); Pecoraro & Lunghini (2003); Pecoraro et al. (2003); Quadraccia & Lunghini (1990) and Società Veneziana di Micologia (1988-2000, 2000)]. In Sicily, the vascular flora and vegetation of sandy dunes were widely investigated [Brullo et al. (1980, 1988, 2000, 2001, 2002); Brullo & Scelsi (1998); Bartolo et al. (1982); Raimondo et al. (1990); Raimondo & Venturella (1991)]. On the contrary, a minor number of investigation were carried out on fungi [Contu & La Rocca (1999); La Rocca & Bazan (2001); La Rocca (2002); Lantieri (2003a, 2003b, 2004a, 2004b, 2005, 2006); Contu & Signorello (1999); Signorello & Contu (1998, 1999); Venturella et al. (2001); Venturella & Contu (2002)]. New data on fungi of sandy dunes and a critical revision of data reported in literature from Sicily are here pointed out.

Materials and Methods

The investigation were carried out in different localities of Sicily and the collected specimens were characterized, using fresh and dried materials, by morphological and microscopic features, chemical reactions and type of habitat. The dried specimens were identified by a solution of 2-3% KOH and an aqueous solution of 5% NH₃. The microscopic features were observed in an aqueous solution with a DMLB Leica microscope for tissues, Congo Red and Floxine in ammonia solution for hyphae colouring, Cotton Blue (with cool and fire assay) for spores ornamentations and cell walls, Melzer or Lugol for reaction to iodine of spore ornamentations and cell pigments.

The data on recorded taxa are referred to habitat, localities of collection and cartographic reference while the notes are only related to the findings of taxa in sandy environments and not to the general distribution in Sicily. The literature data reported in Contu & Signorello (1999) and Signorello & Contu (1999) were also taken in consideration but no observations and/or critical review were carried out since the cited herbarium samples [*Agaricus bisporatus*, *A. chionodermus*, *A. cupressicola*, *A. devoniensis*, *A. gennadii*, *A. langei*, *A. pseudopratis* var. *pseudopratis*, *A. pseudopratis* var. *niveus*; *Armillaria mellea*; *Conocybe dunensis*; *Crepidotus calolepis*; *Hebeloma ammophilum*, *H. hiemale*, *H. subcaespitosum*; *Hygrocybe conicoides*; *Inocybe arenicola*, *I. dunensis*, *I. halophila*, *I. serotina*; *Lepiota brunneolilacea*, *L. magnispora*; *Lepista sordida*; *Leucoagaricus boudierianus*, *L. menieri*, *L. pilatianus*, *L. salmoneophyllus*, *L. singeri*, *L. volvatus*; *Lyophyllum littoralis*; *Melanoleuca diverticulata*, *M. tristis*; *Rhodocybe malenconii*; *Suillus collinitus*; *Trametes ljubarskyi*; *Tubaria dispersa*] are not kept in the herbaria of Catania (CAT) and Cagliari (CAG). The distributive data were referred to the grid map 1:50.000 of the Official Map of the Italian State (I.G.M.I.), following the methodology proposed by Padovan (1994).

The nomenclature was checked according to Index Fungorum (<http://www.indexfungorum.org/Names/Names.asp>).

The exsiccata are kept in the Herbarium Mediterraneum of Palermo (PAL), the Royal Botanic Gardens of Kew (K), the National Botanic Garden of Belgium (BR) and the personal herbarium of one of the author (A.L.).

List of recorded taxa

1) Taxa recorded in embryo dunes, high dunes, rear dunes and consolidated dunes

Agaricus aridicola Geml, Geiser & Royse 2004 (*Agaricaceae*)

HABITAT: high dunes, close to plants of *Ammophila australis* (Mabille) Porta & Rigo.

LOCALITIES: **Caltanissetta**, Manfria (643241); **Catania**, Riserva Naturale Oasi del Simeto (641414); **Palermo**, Balestrate, Le Macchie (593221), Lascari, Salinelle (596223); **Ragusa**, Riserva Naturale Orientata Foce del Fiume Irminio (650141), Sampieri (651432), Santa Maria del Focallo (651123); **Siracusa**, Riserva Naturale di Vendicari (649323).

NOTES – This species is exclusively collected on coastal areas, burrowed in the substratum, predominantly in the *Medicagini marinae-Ammophiletum australis* Br.-Bl., 1921 corr. and, sometimes, also in consolidated inner dunes characterized by the *Ephedro fragilis-Juniperetum macrocarpae* Bartolo, Brullo & Marcenò, 1982. It predominantly grows among the bushes of *A. australis*. *A. aridicola* is also widespread in North Africa and, rarely, in south America (Sarasini 2005).

Agaricus devoniensis P.D. Orton 1960 (*Agaricaceae*)

HABITAT: consolidated inner dunes with vegetation coverage of *Juniperus macrocarpa* S. & S.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221), Lascari, Salinelle (596223); **Ragusa**, Riserva Naturale Orientata Foce del Fiume Irminio (650141); **Siracusa**, Riserva Naturale di Vendicari (649323).

NOTES – *A. devoniensis*, according to our observations, should be considered as a strictly psammophilous species referred to the *Ephedro fragilis-Juniperetum macrocarpae*. The basidiomata, single or connate, are not easily observable, apart from the pileus, since they are deeply burrowed in the substrata. *A. devoniensis* was previously reported by Contu & Signorello (1999) for the Island of Capo Passero (Siracusa, S.E.-Sicily).

Agaricus menieri Bon 1981 (*Agaricaceae*)

HABITAT: high dunes, on sand, close to plants of *A. australis*.

LOCALITIES: **Catania**, Riserva Naturale Oasi del Simeto (641414); **Palermo**, Balestrate, Le Macchie (593221), Lascari, Salinelle (596223); **Ragusa**, Santa Maria del Focallo (651123).

NOTES – *A. menieri*, according to our investigation, should be considered as a strictly psammophilous species related to the *Medicagini marinae-Ammophiletum australis*.

Arrhenia rickenii (Hora) Watling 1989 (*Tricholomataceae*)

HABITAT: rear dunes, on mosses.

LOCALITIES: Palermo, Balestrate, Le Macchie (**593221**), Lascari, Salinelle (**596223**); Siracusa, Riserva Naturale di Vendicari (**649323**).

NOTES – This is a widespread species in the Mediterranean area growing, on calcareous soils, on mosses, mainly of genus *Barbula* Hedw., in the glades of *Quercus ilex* L. woods and in the Mediterranean maquis. *A. rickenii* was also reported from Algeria and Tunisia, on soil, among mosses (Malençon & Bertault 1970-1975).

Arrhenia spathulata (Fr.) Redhead 1984 (*Tricholomataceae*)

HABITAT: rear dunes and consolidated inner dunes with plants of *J. macrocarpa*; on mosses [*Bryum capillare* Hedw. and *Tortella flavovirens* (Bruch) Broth.].

LOCALITIES: **Catania**, Riserva Naturale Oasi del Simeto (**641414**); **Ragusa**, Riserva Naturale Orientata Foce del Fiume Irminio (**650141**); **Siracusa**, Riserva Naturale di Vendicari (**649323**).

NOTES – This is an infrequent species, growing in coastal dunes on mosses, sometimes among grasses, in the belt of *Centaureo-Ononidietum ramosissimae* Br.-Bl. & Frei in Frei, 1937 and *Ephedro fragilis-Juniperetum macrocarpae*. *A. spathulata* was also reported from Algeria, on mosses (Malençon & Bertault 1970-1975).

Ciboria polygoni-vivipari Eckblad 1969 (*Sclerotiniaceae*)

HABITAT: consolidated inner dunes with plants of *J. macrocarpa*, on mosses, in small groups of isolated basidiomata.

LOCALITIES: **Ragusa**, Santa Maria del Focallo (**651123**).

NOTES – This is a rare species, previously recorded only from the artic-alpine environment (Schumacher & Jenssen 1992). It is easily recognized for the habitat of growth that is constituted by bulbils of mosses.

Conocybe dunensis T. J. Wallace 1960 (*Bolbitiaceae*)

HABITAT: embryo dunes with plants of *Elytrigia juncea* (L.) Nevski and *Eryngium maritimum* L.

LOCALITIES: **Caltanissetta**, Manfria (643241); **Palermo**, Balestrate, Le Macchie (593221), Lascari, Salinelle (596223).

NOTES – This species was reported from Sicily by Contu & Signorello (1999) and La Rocca & Bazan (2001).

Conocybe filaris (Fr.) Kühner 1935 (*Bolbitiaceae*)

HABITAT: consolidated dunes with plants of *J. macrocarpa*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221); **Siracusa**, Riserva Naturale di Vendicari (649323).

NOTES – This species grows on wet substrata, in conifer woods [especially in *Picea abies* (L.) Karsten woods] and, sometimes, broad-leaved woods, on clay soils, in wet and dry environments (Lonati 1994). *C. filaris* is also reported from Tunisia and Algeria, in groups, among grasses, at the borders of forestry tracks (Malençon & Bertault 1970-1975).

Crepidotus variabilis (Pers.) P. Kumm. 1871 (*Inocybaceae*)

HABITAT: consolidated dunes with plants of *J. macrocarpa*, on rot wood of different broad-leaved plants.

LOCALITIES: **Siracusa**, Riserva Naturale di Vendicari (649323).

NOTES – It is a common species growing from sandy coastal to the alpine environments.

Galerina laevis (Pers.) Singer 1961 (*Strophariaceae*)

HABITAT: rear dunes, on mosses.

LOCALITIES: **Caltanissetta**, Manfria (643241); **Catania**, Riserva Naturale Oasi del Simeto (641414); **Palermo**, Balestrate, Le Macchie (593221), Lascari, Salinelle (596223).

NOTES – This species grows on wet rear dunes of sandy coastals in a type of vegetation referred to *Centaureo-Ononidietum ramosissimae*. It is also widespread in the inland, on grasses or mosses from the sea level to the subalpine zone. *G. laevis* is also reported from Algeria, on mosses and grasslands (Malençon & Bertault 1970-1975).

Geopora arenicola (Lév.) Kers 1974 (*Pyronemataceae*)

HABITAT: consolidated inner dunes with plants of *J. macrocarpa*; on mosses (*Bryum caespiticium* Hedw.).

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221), Lascari, Salinelle (596223); **Ragusa**, Riserva Naturale Orientata Foce del Fiume Irminio (650141), Sampieri (651432); **Siracusa**, Riserva Naturale di Vendicari (649323).

NOTES – This is a common species growing from sea level to the artic-alpine environment. The ascomata are deeply burrowed in the substrata and only the margin of the apothecium come out from the substratum. *G. arenicola* was collected in the *Ephedro fragilis-Juniperetum macrocarpae* but it also grows on consolidated inner dunes with *Pinus pinea* L. and *Pinus halepensis* Miller reforestations.

Geopora arenosa (Fuckel) S. Ahmad 1978 (*Pyronemataceae*)

HABITAT: on consolidated inner dunes with *J. macrocarpa*; on *B. caespiticium*.

LOCALITIES: **Siracusa**, Riserva Naturale di Vendicari (649323).

NOTES – The macroscopic features, habitat and habitus are similar to *Geopora arenicola* (Lév.) Kers.

Hebeloma ammophilum Bohus 1978 (*Strophariaceae*)

HABITAT: high dunes, on sand, close to plants of *A. australis*.

LOCALITIES: **Caltanissetta**: Manfria (643241).

Hymenoscyphus calyculus (P. Karst.) Korf ex Kobayasi et al. 1967 (*Helotiaceae*)

HABITAT: in consolidated inner dunes with *J. macrocarpa*; the basidiomata are assembled, and sometimes superimposed, on wood residues of *Pistacia lentiscus* L.

LOCALITIES: **Siracusa**, Riserva Naturale di Vendicari (649323).

NOTES – It is an infrequent species but with a wide distributive area since it also grows from Alps [on wood residues of *Salix* sp. and, sometimes, on other broad-leaved plants (Medardi 2006)], to the Mediterranean area. In Sicily it was collected in the *Ephedro fragilis-Juniperetum macrocarpae*.

Inocybe serotina Peck 1904 (*Inocybaceae*)

HABITAT: high dunes, on sandy, close to plants of *A. australis*.

LOCALITIES: **Caltanissetta**, Manfria (643241).

NOTES – This is a “critical species and neglected taxon, probably should be attributed to *Inocybe serotina* ss. Kuyper (D. & M. Antonini, com. pers.) by Onofri *et al.* (2005).

Lamprospora dictydiola Boud. 1907 (*Pyronemataceae*)

HABITAT: consolidated inner dunes with *J. macrocarpa*, the ascomata are grouped on/or between mosses.

LOCALITIES: **Ragusa**, Riserva Naturale Orientata Foce del Fiume Irmínio (650141).

NOTES – It is a rare species, parasite of mosses, which grows under wet climate conditions on sandy soils, sometimes burnt soils, covered by mosses.

Lepiota brunneolilacea Bon & Boiffard 1972 (*Agaricaceae*)

HABITAT: high dunes, near plants of *A. australis*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221), Lascari, Salinelle (596223).

NOTES – This is a sabulicolous species, widespread in the Mediterranean area; usually growing in the *Medicagini marinae-Ammophiletum australis*, often close to *P. ammophila*. This species was previously reported from Sicily also by Contu & Signorello (1999).

Marasmiellus trabutii (Maire) Singer 1951 (*Marasmiaceae*)

HABITAT: consolidated inner dunes with *J. macrocarpa*, on residues of *Juncus maritimus* Lam. and *Erianthus ravennae* (L.) Beauv.

LOCALITIES: **Siracusa**, Riserva Naturale di Vendicari (649323).

NOTES – This is an alophilous species, collected in the *Ephedro fragilis-Juniperetum macrocarpae*; it is a rare taxon but with a wide distribution area.

Marasmius anomalus Lasch ex Rabenh. 1854 (*Marasmiaceae*)

HABITAT: high dunes, in small groups, on residues of *A. australis*, on plants of *Poaceae*, also on buried debris.

LOCALITIES: **Caltanissetta**, Manfria (643241); **Siracusa**, Riserva Naturale di Vendicari (649323).

NOTES – This species grows in dry areas on herbaceous debris.

Melanoleuca cinereifolia (Bon) Bon 1978 (*Tricholomataceae*)

HABITAT: embryo dunes, on sand, close to plants of *E. juncea* and *E. maritimum*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221), Lascari, Salinelle (596223).

NOTES – This is a frequent species growing on sand dunes mainly in the *Cypero capitati-Agrophyretum juncei* (Kuhnholz-Lordat, 1923) Br.-Bl., 1933. It could be also collected in the higher dunes characterized by the *Medicagini marinae-Ammophiletum australis*.

Montagnea arenaria (DC.) Zeller 1943 (*Agaricaceae*)

HABITAT: on embryo dunes, close to plants of *E. juncea*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221), Lascari, Salinelle (596223); **Siracusa**, Riserva Naturale di Vendicari (649323).

NOTES – This is a xerophilous species, widespread on Mediterranean coastal, growing deeply buried in sand substrata or saprophyte of plant residues in the *Cypero capitati-Agrophyretum juncei*. *M. arenaria* was also collected on high dunes characterized by the *Medicagini marinae-Ammophiletum australis*.

Neottiella hetieri Boud. 1885 (*Pyronemataceae*)

HABITAT: rear dunes, on burnt soils covered by mosses of genus *Funaria* Hedw.

LOCALITIES: **Ragusa**, Sampieri (651432).

NOTES – This is a not common species growing, on burnt soils, on mosses of genus *Funaria*. Along the coasts it grows in winter while, at higher altitudes, the period of fructification correspond to springtime.

Octospora convexula (Pers.) L. R. Batra 1963 (*Pyronemataceae*)

HABITAT: rear dunes and consolidated inner dunes with *J. macrocarpa*, growing grouped on mosses, especially on *B. caespiticium*.

LOCALITIES: **Ragusa**, Sampieri (651432); **Siracusa**, Riserva Naturale di Vendicari (649323).

NOTES – This species is a parasite strictly related to mosses, sometimes at the stage of protonema (Benkert 1987). Along the coasts it grows in winter while, at higher altitudes, the period of fructification is summer and autumn.

Octospora humosa (Fr.) Dennis 1960 (*Pyronemataceae*)

HABITAT: rear dunes, close to mosses.

LOCALITIES: **Ragusa**, Sampieri (651432).

NOTES – This is an infrequent species, along the coasts it grows in winter while, at higher altitudes, the period of fructification is springtime and autumn.

Octospora leucoloma Hedw. 1789 (*Pyronemataceae*)

HABITAT: rear dunes, close to mosses of genus *Bryum* Hedw.

LOCALITIES: **Ragusa**, Sampieri (651432).

NOTES – This is a common species which grows grouped on mosses of genus *Bryum* in wet areas.

Omphalina pyxidata (Bull.) Quél. 1886 (*Tricholomataceae*)

HABITAT: rear dunes, on mosses.

LOCALITIES: **Palermo**, Lascari, Salinelle (596223).

NOTES – It is a common species which grows along the sand coastals but not exclusive of such environments. In fact it also grows near mosses or along the borders of tracks in the montane and alpine areas. It was also recorded from Algeria and Tunisia in a mixed wood of *P. halepensis*, *Acacia* sp., *Abies pinsapo* Boiss. and *Quercus suber* L. (Malençon & Bertault 1970-1975).

Panaeolus cinctulus (Bolton) Britzelm. 1887 (*Agaricales*)

HABITAT: high dunes, near plants of *E. juncea* and *A. australis*.

LOCALITIES: **Caltanissetta**, Manfria (643241); **Palermo**, Balestrate, Le Macchie (593221), Lascari, Salinelle (596223).

NOTES – This is a polychromatic species, hygrophorous, humicolous saprophyte, growing in the *Medicagini marinae-Ammophiletum australis*, joined to stems of *A. australis* or other *Poaceae* or on burrowed debris of *Poaceae*.

Peziza ammophila Durieu & Mont. 1847 (*Pezizaceae*)

HABITAT: embryo dunes with plants of *E. juncea* and *E. maritimum*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221).

NOTES – This species was collected in the stretch of sand and in the embryo dunes where it typically grows. Besides it was also observed on higher dunes characterized by the *Medicagini marinae-Ammophiletum australis* where it shares the habitat with *Peziza pseudoammophila* Bon ex Donadini, morphologically similar as the macroscopic characters are concerned.

Peziza boltonii Quél. 1878 (*Pezizaceae*)

HABITAT: rear dunes, very close to the sea.

LOCALITIES: **Caltanissetta**, Manfria (643241); **Siracusa**, Riserva Naturale di Vendicari (649323).

NOTES – This species is always collected in the rear dunes in the *Centaureo-Ononidietum ramosissimae* or the *Seselio maritimi-Crucianelletum maritimae* Brullo, Minissale & Siracusa, 1998, on sand, rarely on mosses, from autumn to spring. It was also collected on burnt soils (Dougoud 2001).

Peziza pseudoammophila Bon & Donadini 1978 (*Pezizaceae*)

HABITAT: high dunes with *A. australis*.

LOCALITIES: **Caltanissetta**, Manfria (643241); **Palermo**, Balestrate, Le Macchie (593221), Lascari, Salinelle (596223); **Ragusa**, Riserva Naturale Orientata Foce del Fiume Irminio (650141), Santa Maria del Focallo (651123), Sampieri (651432); **Siracusa**, Riserva Naturale di Vendicari (649323).

NOTES – This species is strictly related to the stretch of sand, sometimes it appears on the rear dunes, hypogeous or semi-hypogeous then emerged from the substratum. It is related to the *Medicagini marinae-Ammophiletum australis*, close to plants of *A. australis* or its buried residues.

Pithya cupressi (Batsch) Fuckel 1870 (*Sarcoscyphaceae*)

HABITAT: consolidated inner dunes with *J. macrocarpa*.

LOCALITIES: **Siracusa**, Riserva Naturale di Vendicari (649323); **Ragusa**, Riserva Naturale Orientata Foce del Fiume Irminio (650141).

NOTES – This is a common and widespread species that was found in the *Ephedro fragilis-Juniperetum macrocarpae*. The period of fructification is winter in the presence of rot residues of *Cupressus* sp. and *J. macrocarpa*. Seaver (1928) reported *P. cupressi* from North America on rot residues of *Thuja* and *Sequoia* and the needles of *Juniperus bermudiana* L.

Psathyrella ammophila (Durieu & Lév.) P.D. Orton 1960 (*Psathyrellaceae*)

HABITAT: high dunes with *A. australis*.

LOCALITIES: **Caltanissetta**, Manfria (643241); **Catania**, Riserva Naturale Oasi del Simeto (641414); **Palermo**, Balestrate, Le Macchie (593221), Lascari, Salinelle (596223); **Ragusa**, Riserva Naturale Orientata Foce del Fiume Irminio (650141), Santa Maria del Focallo (651123), Sampieri (651432); **Siracusa**, Riserva Naturale di Vendicari (649323).

NOTES – This is a very common species and exclusive of dune lands characterized by plants of *A. australis* belonging to the *Medicagini marinae-Ammophiletum australis*. It is also very frequent in the embryo dunes characterized by the *Cypero capitati-Agrophyretum juncei*, on sand enriched by organic residues derived from rotting of materials transported by the sea. *P. ammophila* was also reported from North Africa (Malençon & Bertault 1970-1975).

Rhodocybe malenconii Pacioni & Lalli 1985 (*Entolomataceae*)

HABITAT: high dunes, on pure sand with *A. australis*.

LOCALITIES: **Caltanissetta**, Manfria (643241); **Catania**, Riserva Naturale Oasi del Simeto (641414); **Palermo**, Balestrate, Le Macchie (593221), Lascari, Salinelle (596223); **Ragusa**, Sampieri (651432), Santa Maria del Focallo (651123).

NOTES – This species is exclusive of dunes but usually it grows on pure sand in the *Medicagini marinae-Ammophiletum australis*. *R. malenconii* was reported by Contu & Signorello (1999) from the Natural Reserve of Vendicari (Siracusa), on sand in the rear dune.

Swardaea planchonis (Dunal ex Boud.) Korf & W.Y. Zhuang 1991 (*Pyronemataceae*)

HABITAT: consolidated inner dunes with *J. macrocarpa*; on mosses (*T. flavovirens*).

LOCALITIES: **Ragusa**, Riserva Naturale Orientata Foce del Fiume Irminio (650141); **Siracusa**, Riserva Naturale di Vendicari (649323).

NOTES – This is a very frequent species growing on sandy soils of coastal dunes characterized by the *Ephedro fragilis-Juniperetum macrocarpae*.

Xerula mediterranea (Pacioni & Lalli) Quadr. & Lunghini 1990 (*Physalacriaceae*)

HABITAT: on pure sand, in consolidated inner dunes with *J. macrocarpa*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221), Lascari, Salinelle (596223); **Ragusa**, Riserva Naturale Orientata Foce del Fiume Irminio (650141); **Siracusa**, Riserva Naturale di Vendicari (649323).

NOTES – The most common species in the group of fungi growing along the coast or the arenicolous areas. *X. mediterranea* is widely distributed along the coasts and it was collected in the *Ephedro fragilis-Juniperetum macrocarpae*.

2) Taxa recorded on reforested consolidated dunes

Agaricus bisporatus Contu 1993 (*Agaricaceae*)

HABITAT: in consolidated inner dunes with reforestation of *Acacia* sp. and *Eucalyptus* sp.

LOCALITIES: **Caltanissetta**, Manfria (643241).

Agaricus chionodermus Pilát 1951 (*Agaricaceae*)

HABITAT: in consolidated inner dunes with reforestation of *Eucalyptus camaldulensis* Dehnh. and *P. pinea*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221).

NOTES – It is a rare species, usually collected in *P. abies* woods, on limestone (Cappelli, 1984). *A. chionodermus* was reported by Contu & Signorello (1999) from the locality “Boschetto della Plaja” (Catania), in reforestation of *E. camaldulensis* and *P. pinea*, on sandy soil.

Agaricus cupressicola Bon & Grilli 1987 (*Agaricaceae*)

HABITAT: in consolidated inner dunes with reforestation of *Acacia* sp.

LOCALITIES: **Caltanissetta**, Manfria (**643241**).

Agaricus gennadii (Chatin & Boud.) P. D. Orton 1960 (*Agaricaceae*)

HABITAT: in consolidated inner dunes with reforestation of *Acacia* sp. and *Eucalyptus* sp.

LOCALITIES: **Caltanissetta**, Manfria (**643241**).

NOTES – This species was reported from Morocco close to plants of *Eucalyptus* sp. (Malençon & Bertault 1970-1975).

Agaricus langei (F.H. Møller & Jul. Schäff.) Maire 1952 (*Agaricaceae*)

HABITAT: in consolidated inner dunes with reforestation of *Acacia* sp. and *Eucalyptus* sp.

LOCALITIES: **Caltanissetta**, Manfria (**643241**).

Agaricus lanipes (F.H. Møller & Jul. Schäff.) Singer 1949 (*Agaricaceae*)

HABITAT: in consolidated inner dunes with reforestation of *E. camaldulensis*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (**593221**).

NOTES – This is an infrequent species usually collected in broad-leaved woods, mainly in *Q. ilex* woods.

Agaricus pseudopratensis (Bohus) Wasser 1976 var. *pseudopratensis* (*Agaricaceae*)

HABITAT: in consolidated inner dunes with reforestation of *Acacia saligna* Auct.

LOCALITIES: **Caltanissetta**, Manfria (**643241**).

Armillaria mellea (Vahl) P. Kumm. 1871 (*Physalacriaceae*)

HABITAT: in consolidated inner dunes with reforestation of *Eucalyptus* sp.

LOCALITIES: data on localities are not reported in the cited literature.

NOTES – This is a very common species growing on woods of different broad-leaved plants from the sea level to the alpine zones.

Astraeus hygrometricus (Pers.) Morgan 1889 (*Diplocystidiaceae*)

HABITAT: the basidiomata are single or connate, in consolidated inner dunes with reforestations of *A. saligna*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221), Lascari, Salinelle (596223); **Ragusa**, Santa Maria del Focallo (651123), Sampieri (651432); **Siracusa**, Riserva Naturale di Vendicari (649323).

NOTES – This is a common species not typically related to a peculiar environment. It grows in conifer and broad-leaved woods around 1000 m of altitudes (Sarasini 2005), in the sandy or shrubby waterfronts, in parks and gardens, on bare soils, on wet soils, on stony soils, sometimes on muddy soils.

Battarrea phalloides (Dicks.) Pers. 1801 (*Agaricaceae*)

HABITAT: in consolidated inner dunes with reforestations of *E. camaldulensis* and *A. saligna*.

LOCALITIES: **Caltanissetta**, Manfria (643241); **Catania**, Riserva Naturale Oasi del Simeto (641414); **Palermo**, Balestrate, Le Macchie (593221), Lascari, Salinelle (596223).

NOTES – This species grows in the rear dunes with reforestations of *E. camaldulensis* or mixed with conifers, and also in sandy or arid soils, in greenhouses, in anthropized land and ruderal areas.

Chroogomphus rutilus (Schaeff.) O.K. Mill. 1964 (*Gomphidiaceae*)

HABITAT: in consolidated inner dunes with reforestations of *P. pinea*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221).

NOTES – This is a mycorrhizal species of pines, widespread in coastal pine woods but also in the alpine zone.

Clathrus ruber P. Micheli ex Pers. 1801 (*Phallaceae*)

HABITAT: among grasses, at the border of untilled land, in consolidated inner dunes with reforestations of *P. pinea*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221), Lascari, Salinelle (596223).

NOTES – This species was originally diffused only under warm climate but later it was also collected under different climatic conditions. It usually grows in wet and shadowy meadows, in clear woods, also in sand coasts, in soils rich of humus and rot plant debris.

Clavulina rugosa (Bull.) J. Schröt. 1888 (*Clavulinaceae*)

HABITAT: in winter, in consolidated inner dunes with reforestation of *P. pinea*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221).

NOTES – It is a widespread species that grows on bare soils, on mosses, in conifer and broad-leaved woods, sometimes also in pre-alpine and alpine zones.

Clitocybe amarescens Harmaja 1969 (*Tricholomataceae*)

HABITAT: in consolidated inner dunes at the borders of reforestations of *E. camaldulensis* and *P. pinea*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221).

NOTES – This species was wrongly reported as new from Sicily by La Rocca & Bazan (2001). The first record should be attributed to Signorello (1995) which collected *C. amarescens* in *Q. ilex* woods of Etna volcano.

Clitocybe fragrans (With.) P. Kumm. 1871 (*Tricholomataceae*)

HABITAT: in consolidated inner dunes with reforestations of *P. pinea*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221).

NOTES – This is a common species which grows in conifer and broad-leaved woods from hills to mountains. It was collected also from Algeria and related to *Eucalyptus* sp., *Pinus* sp. and *Quercus* sp., and from Tunisia in relation with olive-trees and *Cistus* sp., (Malençon & Bertault 1970-1975).

Clitocybe leucodiatreta Bon 1980 (*Tricholomataceae*)

HABITAT: in consolidated inner dunes with reforestations of *A. saligna*.

LOCALITIES: **Caltanissetta**, Manfria (643241); **Palermo**, Balestrate, Le Macchie (593221); **Ragusa**, Santa Maria del Focallo (651123), Sampieri (651432); **Siracusa**, Riserva Naturale di Vendicari (649323).

NOTES – It is a common species growing on sand waterfront but not strictly psammophilous since it was reported also on hilly graminicolous habitat (Consiglio 1999) and nitro-mineral halophilous habitat (Bon 1997).

Clitocybe rivulosa (Pers.) P. Kumm. 1871 (*Tricholomataceae*)

HABITAT: in consolidated inner dunes with reforestations of *A. saligna*.

LOCALITIES: **Catania**, Riserva Naturale Oasi del Simeto (641414); **Ragusa**, Riserva Naturale Orientata Foce del Fiume Irminio (650141), Santa Maria del Focallo (651123), Sampieri (651432); **Siracusa**, Riserva Naturale di Vendicari (649323).

NOTES – It is a common species growing on soil in grasslands near woods, parks and gardens. It was recorded also from Algeria in small groups, in the glades, in pastures, at the border of the roads, from plain to mountain (Malençon & Bertault 1970-1975).

Clitocybe umbilicata (Schaeff.) P. Kumm. 1871 (*Tricholomataceae*)

HABITAT: in consolidated inner dunes with reforestations of *P. pinea*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221).

NOTES – This is a widespread species growing from sand seafronts to mountains, in conifer or mixed woods. It was reported also from Algeria related to *Pinus* sp. (Malençon & Bertault 1970-1975).

Conocybe aporos Kits van Wav. 1970 (*Bolbitiaceae*)

HABITAT: on mosses, in consolidated inner dunes with reforestations of *P. pinea*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221), Lascari, Salinelle (596223).

NOTES – This is a common species growing in wet areas and urban parks.

Corioloopsis gallica (Fr.) Ryvarden 1973 (*Polyporaceae*)

HABITAT: in consolidated inner dunes with reforestations of *A. saligna* and *E. camaldulensis*.

LOCALITIES: **Palermo**, Lascari, Salinelle (**596223**).

NOTES – It is a saprobe or weak parasite growing on many broad-leaved plants (white rot), rarely on conifers. It was reported, as frequent species, in southern Europe and North America, while is infrequent in North Europe (Bernicchia 1990).

Cortinarius bisporiger Contu 1992 (*Cortinariaceae*)

HABITAT: in consolidated inner dunes with reforestations of *E. camaldulensis*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (**593221**).

NOTES – It is a rare species of the Mediterranean environment which grows in small groups in the reforestations of *E. camaldulensis*.

Crepidotus calolepis (Fr.) P. Karst. 1879 (*Inocybaceae*)

HABITAT: in consolidated inner dunes, on stumps and trunks of *A. saligna* and *E. camaldulensis*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (**593221**), Lascari, Salinelle (**596223**).

NOTES – It is an infrequent species, living on rot branches of broad-leaved plants. Contu & Signorello (1999) reported *C. calolepis* on woods of *Eucalyptus* sp., in the locality “Boschetto della Plaja” (Catania), in the rear dune with reforestation of *P. pinea* and *E. camaldulensis*.

Crinipellis scabella (Alb. & Schwein.) Murrill 1915 (*Marasmiaceae*)

HABITAT: in consolidated inner dunes with reforestations of *A. saligna* and *E. camaldulensis*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (**593221**), Lascari, Salinelle (**596223**).

NOTES – On rot plant residues, including roots and herbaceous stems, portion of bark, also growing in dry meadows. It was also recorded from Algeria near

plants of *Ampelodesmos tenax* (Vahl) Link., *Dactylis glomerata* L. and other *Poaceae* and in Tunisia close to plants of *Stipa tenacissima* L. (Malençon & Bertault 1970-1975).

Crucibulum crucibuliforme (Scop.) V. S. White 1902 (*Agaricaceae*)

HABITAT: in consolidated inner dunes with reforestations of *A. saligna* and *E. camaldulensis*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (**593221**).

NOTES – This species is widely distributed and it grows on rot or burnt woody residues, sometimes paper residues or dung.

Cyathus olla (Batsch) Pers. 1801 (*Agaricaceae*)

HABITAT: in consolidated inner dunes with reforestation of *A. saligna* and *E. camaldulensis*, on different plant residues.

LOCALITIES: **Caltanissetta**, Manfria (**643241**); **Palermo**, Balestrate, Le Macchie (**593221**), Lascari, Salinelle (**596223**).

NOTES – It is a species typically distributed in temperate regions. It grows in parks and woods on different rot residues, sometimes also on dead residues of living plants.

Daldinia concentrica (Bolton) Ces. & De Not. 1863 (*Xylariaceae*)

HABITAT: in consolidated inner dunes with reforestations of *A. saligna* and *E. camaldulensis*.

LOCALITIES: **Caltanissetta**, Manfria (**643241**); **Catania**, Riserva Naturale Oasi del Simeto (**641414**); **Palermo**, Balestrate, Le Macchie (**593221**), Lascari, Salinelle (**596223**); **Ragusa**, Santa Maria del Focallo (**651123**), Sampieri (**651432**).

NOTES – It is a species-complex that should be verified on the basis of molecular studies (Stadler et al. 2004).

Descomyces albus (Berk.) Bougher & Castellano 1993 (*Cortinariaceae*)

HABITAT: in consolidated inner dunes with reforestations of *A. saligna* and *E. camaldulensis*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (**593221**); **Ragusa**, Santa Maria del Focallo (**651123**, **651131**), Sampieri (**651423**, **651432**).

NOTES – It is a species of Australian origin growing on sand soils, from seafront to 800 m a.l.m., symbiont of *E. camaldulensis*. It was sometimes recorded on *A. saligna* (La Rocca & Bazan 2003).

Geastrum fimbriatum Fr. 1829 (*Geastraceae*)

HABITAT: in consolidated inner dunes with reforestations of *A. saligna*.

LOCALITIES: **Catania**, Riserva Naturale Oasi del Simeto (**641414**); **Ragusa**, Sampieri (**651432**).

NOTES – This is a common species, widespread in woods and parks with presence of plants of conifer or *Fagus* sp., on dry and stony soils, mainly on limestone, rich of organic residues. It is distributed from the sea level to ca. 1500 m. It is also frequent in North America (Sarasini 2005).

Geastrum schmidelii Vittad. 1842 (*Geastraceae*)

HABITAT: in consolidated inner dunes with reforestation of *E. camaldulensis*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (**593221**).

NOTES – This is an infrequent species growing in arid or semi-arid areas of sparse broad-leaved or conifer woods, from hill in the inland to dune on the sea level, sometimes in steppe areas, on sand or stony soils. It is rare on the mountain.

Geastrum triplex Jungh. 1840 (*Geastraceae*)

HABITAT: in consolidated inner dunes with reforestation of *P. pinea*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (**593221**).

NOTES – The type of growth is connate sometimes in numerous basidiomata. This species is widely distributed from the sea level to the mountains in every type of woods, in wet and shadowy coastal pine woods, on sandy soils or humic soils, sometimes in parks and gardens. This species is also widespread in North America (Sarasini 2005).

Gloeophyllum sepiarium (Wulfen) P. Karst. 1882 (*Gloeophyllaceae*)

HABITAT: in consolidated inner dunes with reforestation of *P. pinea*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221).

NOTES – This is a common species, widespread in the temperate zones of north hemisphere, which was collected on rot conifer wood, sometimes also on timbers and palisades. *G. sepiarium* was reported by Bernicchia (1990) on rot wood of different species of *Pinus*, rarely on broad-leaved plants.

Gymnopilus junonius (Fr.) P. D. Orton 1960 (*Strophariaceae*)

HABITAT: in consolidated inner dunes with reforestation of *P. pinea*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221)

NOTES – This is a common species which grows connate on stumps or at the base of trunks, especially on broad-leaved plants, rarely on conifers. *G. junonius* was reported by Malençon & Bertault (1970-1975) from Tunisia on *Q. suber* and from Algeria on *Eucalyptus* sp., *Imperata* sp., *Q. suber* and *Typha* sp.

Gymnopus ocior (Pers.) Antonín & Noordel. 1997 (*Marasmiaceae*)

HABITAT: in consolidated inner dunes with reforestations of *P. pinea*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221).

NOTES – This is a common species growing in broad-leaved or conifer woods from the sea level to mountain. It was also recorded from North Africa (Courtecuisse 1994).

Hebeloma laterinum (Batsch) Vesterh. 2005 (*Strophariaceae*)

HABITAT: in consolidated inner dunes, in mixed reforestations with prevalence of *P. pinea*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221)

NOTES – This is a common species growing in broad-leaved and conifers woods, from the subalpine to the hilly zones, on sandy soils or sandy-clayey soils. *H. senescens* was reported by Malençon & Bertault (1970-1975) from Algeria.

Hebeloma subcaespitosum Bon 1978 (*Strophariaceae*)

HABITAT: in consolidated inner dunes with reforestations of *A. saligna*.

LOCALITIES: **Siracusa**, Riserva Naturale di Vendicari (**649323**).

NOTES – This is a “critical species and a not well investigated taxon, reported as synonym of *H. collariatum* Bruchet ss. str. (Arnold et al. 1999; D. & M. Antonini, com. pers.), by Onofri *et al.* (2005).

Helvella lacunosa Afzel. 1783 (*Helvellaceae*)

HABITAT: on mosses, in consolidated inner dunes, in mixed reforestations with prevalence of *P. pinea*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (**593221**).

NOTES: This is a very common species growing in the glades of broad-leaved woods, from the sea level to the mountains and also reported on burnt soils (Medardi 2006).

Helvella leucomelaena (Pers.) Nannf. 1941 (*Helvellaceae*)

HABITAT: in consolidated inner dunes with reforestations of *P. pinea*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (**593221**); **Ragusa**, Sampieri (**651432**).

NOTES – This is a common species, usually growing connate on humic soils evolved on sand, always near plants of conifers.

Hemymycena lactea (Pers.) Singer 1938 (*Mycenaceae*)

HABITAT: in consolidated inner dunes with reforestations of *P. pinea*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (**593221**).

NOTES – This species is widely distributed in broad-leaved and conifer woods, on leaves, needles or rot fragments of bark. It was also reported by Malençon & Bertault (1970-1975) from Algeria close to plants of *Pinus* and in Tunisia near plants of *P. halepensis*.

Hohenbuehelia atrocoerulea (Fr.) Singer 1951 (*Pleurotaceae*)

HABITAT: in consolidated inner dunes with reforestations of *P. pinea*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (**593221**).

NOTES – This is a common species growing on rot wood of broad-leaved plants, rarely on conifers. It was also recorded by Malençon & Bertault (1970-1975) from Algeria on *Phytolacca dioica* L.

Humaria hemisphaerica (F.H. Wigg.) Fuckel 1870 (*Pyronemataceae*)

HABITAT: on mosses, in consolidated inner dunes with reforestations of *P. pinea*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (**593221**).

NOTES – This is a widespread common species, growing in wet habitat, inside or at the borders of woods, often near waterways, sometimes on rot or burnt woody residues.

Hydnangium carneum Wallr. 1839 (*Hydnangiaceae*)

HABITAT: in consolidated inner dunes with reforestations of *A. saligna* and *E. camaldulensis*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (**593221**); **Ragusa**, Santa Maria del Focallo (**651123**, **651131**), Sampieri (**651423**, **651432**).

NOTES – This species is strictly related to *Eucalyptus*. It was found on sandy soils in the rear dunes characterized by reforestation of *E. camaldulensis* sometimes mixed with *A. saligna*. *H. carneum* was also reported from Spain by Montecchi & Sarasini (2000).

Hygrocybe conicoides (P.D. Orton) P.D. Orton & Watling 1969 (*Hygrophoraceae*)

HABITAT: in consolidated inner dunes with reforestations of *P. halepensis* and *P. pinea*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (**593221**), Lascari, Salinelle (**596223**); **Siracusa**, Riserva Naturale di Vendicari (**649323**).

NOTES – This species was previously reported by La Rocca & Bazan (2001) and Contu & Signorello (1999).

Hysterangium inflatum Rodway 1918 (*Hysterangiaceae*)

HABITAT: in consolidated inner dunes with reforestations of *A. saligna* and *E. camaldulensis*.

LOCALITIES: **Caltanissetta**, Manfria (**643241**); **Palermo**, Balestrate, Le Macchie (**593221**), Lascari, Salinelle (**596223**).

NOTES – This is a semi-hypogeous species, typically related to sand watersides, introduced in Europe with *Eucalyptus* plantations. It was also reported by Montecchi & Sarasini (2000) from Provenza (southern France).

Inocybe arenicola (R. Heim) Bon 1983 (*Inocybaceae*)

HABITAT: in consolidated inner dunes close to reforestations of *P. pinea*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221), Lascari, Salinelle (596223); **Siracusa**: Riserva Naturale di Vendicari (649323).

NOTES – This species is strictly sabulicolous and widespread in all the Mediterranean Basin. It also grows, single or connated, on mosses close to plants of *J. macrocarpa*, in the *Ephedro fragilis-Juniperetum macrocarpae*, or frequently near plants of *Pinus pinaster* Aiton. *I. arenicola* was reported for the territory of Manfria (province of Caltanissetta) by Contu & Signorello (1999).

Inocybe dulcamara (Alb. & Schwein.) P. Kumm. 1871 (*Inocybaceae*)

HABITAT: on mosses, grouped, in consolidated inner dunes close to reforestation of *P. pinea*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221); **Siracusa**, Riserva Naturale di Vendicari (649323).

NOTES – This is a frequent species, growing on dunes close to plants of *P. pinea* and close to plants of *J. macrocarpa* in the *Ephedro fragilis-Juniperetum macrocarpae*; in the inland and on burnt soils. *I. dulcamara* was reported by Malençon & Bertault (1970-1975) from Tunisia and Algeria close to plants of *Fraxinus* sp., *P. halepensis*, *Populus* sp. and *Ulmus* sp.

Inocybe dunensis P.D. Orton 1960 (*Inocybaceae*)

HABITAT: single or in small groups, in inner consolidated dunes close to plants of *P. pinea*.

LOCALITIES: **Siracusa**, Riserva Naturale di Vendicari (649323).

NOTES – This species is strictly sabulicolous and grows in the rear dune on pure sand or among mosses, close to plants of *P. pinea*, but also close to plants of *J. macrocarpa*, in the *Ephedro fragilis-Juniperetum macrocarpae*. This is the second report from the Natural Reserve of Vendicari. The previous record was pointed out by Contu & Signorello (1999).

Inocybe geophylla (Pers.) P. Kumm. var. *lilacina* Gillet 1876 (*Inocybaceae*)

HABITAT: in consolidated inner dunes close to reforestations of *P. pinea*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221).

NOTES – It is a common species growing from plain to mountain belt, in broad-leaved and conifer woods, on calcareous soils.

Inocybe halophila R. Heim 1931 (*Inocybaceae*)

HABITAT: in consolidated inner dunes with reforestations of *P. pinea*.

LOCALITIES: **Siracusa**, Riserva Naturale di Vendicari (649323).

NOTES – This is a “critical species and, according to Kuyper, is a synonym of *I. pruinosa* R. Heim (D. & M. Antonini, com. pers.), by Onofri et al. (2005).

Inocybe heimii Bon 1984 (*Inocybaceae*)

HABITAT: in consolidated inner dunes, on pure sand or among mosses, close to plants of *P. pinea* and *P. pinaster*.

LOCALITIES: **Palermo**, Lascari, Salinelle (596223); **Siracusa**, Riserva Naturale di Vendicari (649323).

NOTES – This species is typically sabulicolous, widespread during the year in consolidated inner dunes close to plants of *P. pinea* and *P. pinaster*. It grows gregarious and numerous, in small groups composed by 6-8 joined basidiomata. This species was found in the *Ephedro fragilis-Juniperetum macrocarpae*, close to plants of *J. macrocarpa*.

Inocybe rufuloides Bon 1984 (*Inocybaceae*)

HABITAT: in consolidated inner dunes with reforestation of *P. pinea*.

LOCALITIES: **Siracusa**, Riserva Naturale di Vendicari (649323).

NOTES – It is a very common species growing on sand seafronts of different Italian regions such as Veneto, Tuscany, Emilia-Romagna, Sardinia, Calabria and Apulia (Onofri et al. 2005). The period of fructification is mainly autumnal but the basidiomata could be observed also during winter (if mild) and spring (with humid climate and scarce wind).

Laccaria fraterna (Cooke & Masee) Pegler 1965 (*Hydnangiaceae*)

HABITAT: in consolidated inner dunes with reforestation of *E. camaldulensis*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221).

NOTES – This is a common species in the Mediterranean area where it grows in arid and sandy soils with presence of *Eucalyptus* sp., *Acacia* sp., *Pinus* sp. and *Cupressus* sp. *L. fraterna* was also recorded from Morocco on sandy soil near plants of *Acacia mearnsii* De Wild., *E. camaldulensis*, *Eucalyptus globulus* Labill., *Eucalyptus gomphocephala* DC., *P. pinaster* and *Q. suber* (Malençon & Bertault 1970-1975).

Laccaria laccata (Scop.) Cooke 1884 (*Hydnangiaceae*)

HABITAT: in consolidated inner dunes with reforestations of *P. pinea*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221), Lascari, Torre Tonda.

NOTES – This is an infrequent species growing in broad-leaved and conifer woods, among mosses and *Sphagnum*, from the sea level to the alpine zone.

Lactarius hepaticus Plowr. 1905 (*Russulaceae*)

HABITAT: in consolidated inner dunes with reforestations of *P. pinea*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221).

NOTES – This is an infrequent species growing in conifer woods, on clayey-calcareous soils, from the sea level to the alpine zone.

Lactarius sanguifluus (Paulet) Fr. var. *violaceus* (Barla) Basso 1999 (*Russulaceae*)

HABITAT: in consolidated inner dunes with reforestations of *P. pinea*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221).

NOTES – This species grows on sand seafronts as symbiont of *P. halepensis* and *P. pinaster*.

Lamprospora crouanii (Cooke) Seaver 1914 (*Pyronemataceae*)

HABITAT: on mosses, in consolidated inner dunes with reforestations of *P. pinea*.

LOCALITIES: **Ragusa**, Sampieri (651432).

NOTES – This is an infrequent species growing on wet sandy or clay soils. In the alpine zone it grows from summer to autumn (Medardi, 2006), while in the Mediterranean area it grows also in winter.

Lecanidion atratum (Hedw.) Endl. 1830 (*Patellariaceae*)

HABITAT: in consolidated inner dunes with reforestations of *A. saligna* and *E. camaldulensis*.

LOCALITIES: **Siracusa**, Riserva Naturale di Vendicari (649323).

NOTES – This is a common species with a wide area of distribution. It grows, all year long, on rot woods from the sandy waterfronts to the pre-alpine and the alpine zone.

Lentinellus micheneri (Berk. & M. A. Curtis) Pegler 1983 (*Auriscalpiaceae*)

HABITAT: in consolidated inner dunes with reforestations of *P. pinea*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221).

NOTES – This species grows grouped on buried small woody residues, in *Pinus* woods (mainly *P. halepensis* on the seafront), *Cistus* maquis and in mixed woods. *L. omphalodes* was reported by Malençon & Bertault (1970-1975) from Algeria and Tunisia on *Cedrus* sp., *Cytisus villosus* Pourret, *Erica arborea* L., *P. halepensis*, *Q. suber* and *Rubus* sp.

Lepiota castanea Quéél. 1881 (*Agaricaceae*)

HABITAT: in consolidated inner dunes with reforestations of *P. pinea*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221).

NOTES – This is a very common species which usually grows in broad-leaved and conifer woods, also in the alpine and subalpine zone. Some records are also reported from Morocco in *Pinus* sp. woods (Malençon & Bertault, 1970-1975).

Lepiota cristata (Bolton) P. Kumm. 1871 (*Agaricaceae*)

HABITAT: in consolidated inner dunes with reforestations of *P. pinea*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221).

NOTES – This is a common and widespread species growing in conifer and broad-leaved woods, in gardens, along trails, in shady places, also grassy. Some records are also reported from Algeria on *Cedrus* sp. and *Pinus* sp. woods (Malençon & Bertault, 1970-1975).

Lepiota magnispora Murrill 1912 (*Agaricaceae*)

HABITAT: in consolidated inner dunes with reforestations of *A. saligna* and *E. camaldulensis*.

LOCALITIES: **Caltanissetta**, Manfria (643241).

NOTES – This species was reported by Contu & Signorello (1999) from Sicily and subsequently never confirmed.

Lepiota pseudolilacea Hujsman 1947 (*Agaricaceae*)

HABITAT: in consolidated inner dunes with reforestations of *P. pinea*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221).

NOTES – This species grows on sandy soils, in the seafronts, in pine woods and *Q. ilex* woods.

Lepiota subincarnata J. E. Lange 1940 (*Agaricaceae*)

HABITAT: in consolidated inner dunes with reforestations of *A. saligna*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221).

NOTES – This species is typically reported from wet places and broad-leaved and conifer woods. Malençon & Bertault (1970-1975) reported *L. subincarnata* from North Africa in woods with *P. halepensis*, *P. pinea*, *Q. ilex*, *Quercus faginea* Lam., *Quercus pyrenaica* Willd. and *Q. suber*.

Lepista sordida (Schumach.) Singer 1951 (*Tricholomataceae*)

HABITAT: in consolidated inner dunes with reforestations of *A. saligna*.

LOCALITIES: **Caltanissetta**, Manfria (643241); **Catania**, Riserva Naturale Oasi del Simeto (641414); **Palermo**, Balestrate, Le Macchie (593221); **Ragusa**, Sampieri (651432), Santa Maria del Focallo (651123); **Siracusa**, Riserva Naturale di Vendicari (649323).

NOTES – This species, according to our field investigation, is very common in the late autumn-winter on sandy coastal and in reforestations of *A. saligna*. It also grows in summer and autumn in the alpine and subalpine zones. Some records are also reported from Algeria and Tunisia in *Q. ilex* woods (Malençon & Bertault, 1970-1975). This species was reported by Contu & Signorello (1999) from Sicily in *Eucalyptus* woods.

Leucoagaricus boudierianus Bon 1993 (*Agaricaceae*)

HABITAT: in consolidated inner dunes with reforestations of *A. saligna*.

LOCALITIES: **Caltanissetta**, Manfria (**643241**).

Leucoagaricus littoralis (Menier) Bon & Boiffard 1976 (*Agaricaceae*)

HABITAT: in consolidated inner dunes with reforestations of *A. saligna*.

LOCALITIES: **Caltanissetta**, Manfria (**643241**); **Catania**, Riserva Naturale Oasi del Simeto (**641414**); **Palermo**, Balestrate, Le Macchie (**593221**), Lascari, Salinelle (**596223**); **Ragusa**, Sampieri (**651432**).

NOTES – This species grows on sandy soils located close to the seafront and the inland too, close to broad-leaved plants.

Leucoagaricus menieri (Sacc.) Singer 1968 (*Agaricaceae*)

HABITAT: in consolidated inner dunes with reforestations of *A. saligna*.

LOCALITIES: **Ragusa**, Sampieri (**651432**).

NOTES – It is a typical species of sandy seafronts which grows close to plants of *Juniperus* sp. or *Pinus* sp. This species was also reported by Contu & Signorello (1999) from the locality of Manfria (province of Caltanissetta).

Leucoagaricus pilatianus (Demoulin) Bon & Boiffard 1976 (*Agaricaceae*)

HABITAT: in consolidated inner dunes with reforestations of *A. saligna*.

LOCALITIES: **Caltanissetta**, Manfria (**643241**).

NOTES – This species grows on sandy soils, in parks and public gardens, sometimes on debris of constructions.

Leucoagaricus salmoneophyllus Bon & Guinb. 1993 (*Agaricaceae*)

HABITAT: in consolidated inner dunes with reforestations of *A. saligna*.

LOCALITIES: **Caltanissetta**, Manfria (643241).

NOTES – This species grows in the rear dunes. The same authors considered *L. salmoneophyllus* as an ecological form of *L. pilatianus*.

Leucoagaricus wichanskyi (Pilát) Bon & Boiffard 1974 (*Agaricaceae*)

HABITAT: in consolidated inner dunes with reforestations of *A. saligna*.

LOCALITIES: **Catania**, Riserva Naturale Oasi del Simeto (641414).

NOTES – It is an infrequent species growing on wet soils, in broad-leaved woods or maquis. It was previously reported from Latium, Lombardy and Veneto (Onofri et al. 2005).

Limacella illinita (Fr.) Maire 1933 (*Amanitaceae*)

HABITAT: in consolidated inner dunes with reforestations of *A. saligna* and *E. camaldulensis*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221).

NOTES – It is a not common species growing in small groups or single in broad-leaved woods or scattered conifer woods, also close to plants of *Larix*. It was also reported from Algeria close to plants of *Q. ilex* and *Cedrus* sp. (Malençon & Bertault 1970-1975).

Limacella subfurnacea Contu 1990 (*Amanitaceae*)

HABITAT: in consolidated inner dunes with reforestations of *A. saligna*, *E. camaldulensis* and *P. pinea*.

LOCALITIES: **Caltanissetta**, Manfria (643241); **Catania**: Riserva Naturale Oasi del Simeto (641414); **Palermo**, Balestrate, Le Macchie (593221); **Ragusa**, Santa Maria del Focallo (651123), Sampieri (651432); **Siracusa**, Riserva Naturale di Vendicari (649323).

NOTES – This species is typically distributed in the southern areas of Italy but it was also reported from Sardinia, Apulia, Emilia Romagna and Latium (Migliozzi & Camboni 2002; Onofri et al. 2005). It predominantly grows in reforestations of *A. saligna* sometimes along the tracks.

Lyophyllum buxeum (Maire) Singer 1943 (*Lyophyllaceae*)

HABITAT: in consolidated inner dunes with reforestations of *A. saligna* and *E. camaldulensis*.

LOCALITIES: **Agrigento**, Eraclea Minoa (Cattolica Eraclea); **Caltanissetta**, Manfria (643241); **Palermo**, Balestrate, Le Macchie (593221); **Ragusa**, Santa Maria del Focallo (651123); Sampieri (651432).

NOTES – It is a not widespread species but fairly common in Sicily. It grows on sandy soils in the rear dunes, deeply buried. It is easily recognized also for the typical habitat usually close to plants of *Eucalyptus* sp. and, sometimes, close to plants of *A. saligna*. It was also reported from Algeria on sandy soils close to plants of *A. saligna* (Malençon & Bertault 1970-1975).

Lyophyllum littoralis (Ballero & Contu) Contu 1998 (*Lyophyllaceae*)

HABITAT: in consolidated inner dunes with reforestations of *A. saligna*, on mosses.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221), Lascari, Salinelle (596223).

NOTES – It is a common species on the Mediterranean coasts, on sandy soils, sometimes on woody residues, in reforestations of *A. saligna* and *Eucalyptus* sp., in acid and calcareous soils. Contu & Signorello (1999) reported *L. littoralis* from the locality “Boschetto della Plaja” (Catania) in reforested areas with *E. camaldulensis* and *P. pinea* on sandy soil, and in Manfria (Caltanissetta), in the rear dune with reforestation of *A. saligna*.

Macrolepiota fuliginosa (Barla) Bon 1977 (*Agaricaceae*)

HABITAT: in consolidated inner dunes with reforestations of *A. saligna* and *E. camaldulensis*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221).

NOTES – This species is widespread in the Mediterranean area on meadows and broad-leaved woods. It was sporadically collected also in the pre-alpine and alpine zones.

Marasmius corbariensis (Roum.) Sacc. & Trotter 1911 (*Marasmiaceae*)

HABITAT: in consolidated inner dunes with reforestations of *A. saligna*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221), Lascari, località, Salinelle (596223).

NOTES – It is an infrequent species growing on rot leaves of broad-leaved plants, (*Olea* sp., *Myrtus communis* L. and *Q. ilex*).

Melanoleuca diverticulata G. Moreno & Bon 1980 (*Tricholomataceae*)

HABITAT: in consolidated inner dunes with reforestations of *A. saligna* and *E. camaldulensis*.

LOCALITIES: **Caltanissetta**, Manfria (643241)

Melanoleuca tristis M. M. Moser 1991 (*Tricholomataceae*)

HABITAT: in consolidated inner dunes with reforestations of *A. saligna* and *E. camaldulensis*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221).

NOTES – It is an infrequent species, growing on calcareous soils, in grassy broad-leaved and conifer woods. It was also recorded in meadows, pastures and mixed woods also in the subalpine zone (Bon 1991). Contu & Signorello (1999) reported *M. tristis* from Manfria (Caltanissetta), on dunes on sandy soils.

Mutinus caninus (Huds.) Fr. 1849 (*Phallaceae*)

HABITAT: in consolidated inner dunes with reforestations of *P. pinea*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221).

NOTES – This species grows on hilly and mountainous zones up to ca. 1000 m (Sarasini 2005) in wet broad-leaved woods, on soils rich in humus, in wet and shady places. Sometimes it also grows in parks.

Mycena pura (Pers.) P. Kumm. 1871 (*Mycenaceae*)

HABITAT: in consolidated inner dunes with reforestations of *P. pinea*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221).

NOTES – It is a common species growing in broad-leaved and conifer woods, from sandy seafronts to alpine zones. There are some reports from Morocco

close to plants of *Cedrus* sp., *Q. ilex*, *Q. mirbeckii* Durieu and *Q. suber*, (Malençon & Bertault 1970-1975).

Mycena seynesii Quéf. 1877 (*Mycenaceae*)

HABITAT: in consolidated inner dunes with reforestations of *P. pinea*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (**593221**).

NOTES – This is a common species from pine woods located at the sea level but often growing in many other habitats. It was also reported from Algeria on rot cones of *P. halepensis*, (Malençon & Bertault 1970-1975).

Omphalina galericolor (Romagn.) M.M. Moser var. *galericolor* 1975 (*Tricholomataceae*)

HABITAT: in consolidated inner dunes with reforestations of *A. saligna* and *E. camaldulensis*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (**593221**), Lascari, località Salinelle (**596223**).

NOTES – This species grows, during autumn and winter, on mosses of sandy waterfronts.

Parasola megasperma (P.D. Orton) Redhead, Vilgalys & Hopple 2001 (*Psathyrellaceae*)

HABITAT: in consolidated inner dunes with reforestations of *A. saligna* and *E. camaldulensis*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (**593221**).

NOTES – It is a rare species growing, single or in small groups, on soil rich in humus sometimes also on dung. It was reported from Italy and Spain by Doveri (2004).

Peziza domiciliana Cooke 1877 (*Pezizaceae*)

HABITAT: in consolidated inner dunes with reforestations of *P. pinea*.

LOCALITIES: **Siracusa**, Riserva Naturale di Vendicari (**649323**).

NOTES – It is a gregarious species which usually grows on wet soils, sandy or clayey, but also on ripple mold or on dumps, sometimes in cellars or wet cavities.

Peziza sepiatra Cooke 1875 (*Pezizaceae*)

HABITAT: in consolidated inner dunes, on sand or mosses (*B. caespiticium*), with reforestations of *A. saligna*.

LOCALITIES: **Siracusa**, Riserva Naturale di Vendicari (649323).

NOTES – In small groups on soil sometimes on burnt soil during winter. In literature there are also some records on rot tissues. *P. sepiatra* is also reported from alpine zones during summertime (Medardi 2006).

Peziza varia (Hedw.) Fr. 1822 (*Pezizaceae*)

HABITAT: in small groups in consolidated inner dunes with reforestations of *A. saligna*.

LOCALITIES: **Caltanissetta**, Manfria (643241); **Ragusa**, Riserva Naturale Orientata foce del fiume Irminio (650141), Sampieri (651432).

NOTES – This is a common species from sandy seafronts where it grows also during winter, while, at higher altitudes, it appears during summer or autumn. It mainly grows on rot residues of broad-leaved trees, sometimes on burnt residues.

Pisolithus arhizus (Scop.) Rauschert 1959 (*Sclerodermataceae*)

HABITAT: epigeous or semihypogeous, gregarious, sometimes connate, in consolidated inner dunes with reforestations of *A. saligna* and *E. camaldulensis*.

LOCALITIES: **Caltanissetta**, Manfria (643241); **Catania**, Riserva Naturale Oasi del Simeto (641414); **Palermo**, Balestrate, Le Macchie (593221), Lascari, Salinelle (596223); **Ragusa**, Riserva Naturale Orientata Foce del Fiume Irminio (650141), Sampieri (651432), Santa Maria del Focallo (651123); **Siracusa**, Riserva Naturale di Vendicari (649323).

NOTES – This is a termophilous species, growing on arid and sandy soils from plains to hill, mainly in *Eucalyptus* woods, sometimes close to plants of *A. saligna* or in costal pine woods, in uncultivated meadows or at the border of roads.

Plectania rhytidia (Berk.) Nannf. & Korf 1957 (*Sarcosomataceae*)

HABITAT: in consolidated inner dunes with reforestations of *E. camaldulensis*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (**593221**).

NOTES – In Europe this species is strictly related to reforestations of *E. camaldulensis*. It was firstly recorded in New Zeland and reported also from Madagascar (Donadini 1985).

Pluteus romelli (Britzelm.) Sacc. 1895 (*Pluteaceae*)

HABITAT: in consolidated inner dunes with reforestations of *A. saligna* and *E. camaldulensis*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (**593221**).

NOTES – This is a very common species growing in wet places on woody residues of broad-leaved plants, sometimes it appears as terricolous in burnt wood.

Psathyrella conopilus (Fr.) A. Pearson & Dennis 1949 (*Psathyrellaceae*)

HABITAT: in consolidated inner dunes with reforestations of *A. saligna* and *E. camaldulensis*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (**593221**).

NOTES – This is a common species growing in sandy seafronts where it appears in the higher dunes characterized by *Medicagini marinae*-*Ammophiletum australis*, often close to plants of *A. australis*. It was also recorded in broad-leaved woods or along the streets, on humus or near woody debris.

Psathyrella melanthina (Fr.) Kits van Wav. 1985 (*Psathyrellaceae*)

HABITAT: in consolidated inner dunes with reforestations of *A. saligna*.

LOCALITIES: **Caltanissetta**, Manfria (**643241**); **Palermo**, Balestrate, Le Macchie (**593221**), Lascari, Salinelle (**596223**).

NOTES – This is a lignicolous species growing on stumps of *Salix*, *Betula* and *Fraxinus*. It was also reported on *Opuntia* and *Agave*. It is a rare or infrequent species, widespread from sandy littorals to mountains. *P.*

melanthina was also recorded from Algeria, on *Agave Americana* L., *Agave sisalana* Perrine, *Fraxinus oxycarpa* Bieb., *Opuntia ficus-indica* (L.) Miller and *Phoenix dactylifera* L. (Malençon & Bertault 1970-1975).

Pustularia patavina (Cooke & Sacc.) Boud. 1907 (*Pyronemataceae*)

HABITAT: in consolidated inner dunes with reforestations of *P. pinea*, on wet sand or mosses [*Syntrichia ruraliformis* (Besch.) Cardot].

LOCALITIES: **Palermo**, Balestrate, Le Macchie (**593221**), Lascari, Salinelle (**596223**); **Siracusa**, Riserva Naturale di Vendicari (**649323**).

NOTES – This is a species which grows in the rear dunes of littoral (sometimes it grows in winter), on sand or mosses, sometimes also on burnt soil. It is common also in the alpine zone, in every type of wood, during the summer.

Ramaria stricta (Pers.) Quél. 1888 (*Gomphaceae*)

HABITAT: in consolidated inner dunes with reforestations of *P. pinea*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (**593221**).

NOTES – This is a common species growing on stumps or rot debris of conifers and broad-leaved plants, especially on *Fagus sylvatica* L. It was also collected in the prealpine and alpine zones.

Reddellomyces donkii (Malençon) Trappe, Castellano & Malajczuk 1992 (*Tuberaceae*)

HABITAT: in consolidated inner dunes with reforestation of *A. saligna* and *E. camaldulensis*.

LOCALITIES: **Caltanissetta**, Manfria (**643241**); **Palermo**, Balestrate, Le Macchie (**593221**), Lascari, Salinelle (**596223**); **Ragusa**, Santa Maria del Focallo (**651123**), Sampieri (**651432**).

NOTES – This is an hypogeous or semi-hypogeous species growing on sand seafronts which was previously collected in Sardinia, Latium and Tuscany close to plants of *Eucalyptus*. In Sardinia it was also observed close to plants of *A. saligna* (Montecchi & Sarasini 2000).

Rhizopogon roseolus (Corda) Th. Fr. 1909 (*Rhizopogonaceae*)

HABITAT: in consolidated inner dunes with reforestations of *P. pinea*.

LOCALITIES: **Agrigento**, Eraclea Minoa; **Palermo**, Balestrate, Le Macchie (593221).

NOTES – This is a semi-hypogeous species, widespread from sandy littorals to prealpine zones reaching 800 m of altitudes. It is strictly related to *Pinus* species. It was also recorded in littoral pine woods of Sweden (Montecchi & Sarasini 2000).

Rhodocybe gemina (Fr.) Kuyper & Noordel. 1987 (*Entolomataceae*)

HABITAT: in consolidated inner dunes with reforestations of *P. pinea*.

LOCALITIES: **Siracusa**, Riserva Naturale di Vendicari (649323).

NOTES – This is a common species growing from sandy littorals to prealpine zones in broad-leaved and conifer woods.

Russula torulosa Bres. 1929 (*Russulaceae*)

HABITAT: in consolidated inner dunes with reforestations of *P. pinea*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221).

NOTES – It is a very common species growing from the mediterranean to the alpine environment, on siliceous, sandy or calcareous soils.

Schizophyllum commune Fr. 1815 (*Schizophyllaceae*)

HABITAT: in consolidated inner dunes with reforestations of *P. halepensis* and *A. saligna*.

LOCALITIES: **Agrigento**, Eraclea Minoa (Cattolica Eraclea); **Caltanissetta**, Manfria (643241); **Catania**, Riserva Naturale Oasi del Simeto (641414); **Palermo**, Balestrate, Le Macchie (593221), Lascari, Salinelle (596223); **Ragusa**, Sampieri (651432), Santa Maria del Focallo (651123).

NOTES – This is a cosmopolitan lignicolous species, widely distributed all year long on all types of rot woods. It grows on consolidated dunes especially in reforestations of *A. saligna*.

Scleroderma flavidum Ellis & Everh. 1885 (*Sclerodermataceae*)

HABITAT: in consolidated inner dunes with reforestations of *A. saligna* and *E. camaldulensis*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (**593221**).

NOTES – This species grows on arid, acid and sandy soils, on reforested dunes, at the border of tracks, in parks and anthropized areas. It is usually collected in *Eucalyptus*, *Pinus* and *Quercus* woods. It is widespread in warm regions of boreal hemisphere (Sarasini 2005).

Scleroderma meridionale Demoulin & Malençon 1971 (*Sclerodermataceae*)

HABITAT: in consolidated inner dunes with reforestations of *A. saligna*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (**593221**), Lascari, Salinelle (**596223**).

NOTES – This species grows in warm regions on sandy soils, in the glades, on reforested dunes, or hilly zones, in *Cedrus* or *Pinus* woods, rarely in broad-leaved woods. It is also widespread on European atlantic coasts (Sarasini 2005).

Scleroderma verrucosum (Bull. : Pers.) Pers. 1801 (*Sclerodermataceae*)

HABITAT: in consolidated inner dunes with reforestations of *E. camaldulensis*.

LOCALITIES: **Siracusa**, Riserva Naturale di Vendicari (**649323**).

NOTES – The habitat is extremely variable and represented by parks, gardens, anthropized areas, on reforested dunes, in sandy soils not shady, from plain to hill, near broad-leaved plants.

Setchelliogaster tenuipes (Setch.) Pouzar 1958 (*Agaricales*)

HABITAT: in consolidated inner dunes with reforestations of *A. saligna* and *E. camaldulensis*.

LOCALITIES: **Caltanissetta**, Manfria (**643241**); **Palermo**, Balestrate, Le Macchie (**593221**), Lascari, Salinelle (**596223**); **Siracusa**, Riserva Naturale di Vendicari (**649323**).

NOTES – This is a semi-hypogeous species, rarely epigeous, It was introduced in Italy with *Eucalyptus* reforestations and grows from the sea-level to 800

m. It was also reported as symbiont of *A. saligna* (La Rocca & Bazan 2003; Sarasini 2005).

Sphaerobolus stellatus Tode 1790 (*Gaeastraceae*)

HABITAT: in consolidated inner dunes with reforestations of *P. pinea*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (**593221**).

NOTES – This is a widespread, cosmopolitan and saprobe species (Sarasini 2005), growing on rot woody debris and sometimes on bovine and equine dung.

Stereum hirsutum (Willd.) Pers. 1800 (*Stereaceae*)

HABITAT: in consolidated inner dunes with reforestations of *A. saligna* and *P. pinea*.

LOCALITIES: **Catania**, Riserva Naturale Oasi del Simeto (**641414**); **Palermo**, Balestrate, Le Macchie (**593221**), Lascari, Salinelle (**596223**); **Ragusa**, Sampieri (**651432**).

NOTES – This is a widespread common species, growing all year long on rot woods of different broad-leaved plants of the genera *Alnus*, *Corylus*, *Fagus* and *Quercus*.

Stereum ochraceoflavum (Schwein.) Sacc. 1888 (*Stereaceae*)

HABITAT: in consolidated inner dunes with reforestations of *A. saligna*.

LOCALITIES: **Caltanissetta**, Manfria (**643241**).

NOTES – This is a widespread species with few reports since it is confused with *S. hirsutum*. It grows on small branches and rot woods of broad-leaved plants, mainly on *Quercus*. It was also recorded from America (Breitenbach & Kränzlin 1986).

Suillus bellinii (Inzenga) Watling 1967 (*Suillaceae*)

HABITAT: in consolidated inner dunes with reforestations of *P. pinea*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (**593221**).

NOTES – This is a very common species growing on sandy seafronts as symbiont of *P. halepensis*, *P. pinea* and *P. pinaster*. It also grows in the alpine zone.

Suillus collinitus (Fr.) Kuntze 1898 (*Suillaceae*)

HABITAT: in consolidated inner dunes with reforestations of *P. pinea*.

LOCALITIES: **Catania**, Riserva Naturale Oasi del Simeto (641414); **Palermo**, Balestrate, Le Macchie (593221); **Siracusa**, Riserva Naturale di Vendicari (649323).

NOTES – This is a symbiont of two-needle pines growing from seafront to alpine zone on sandy-siliceous soils. *S. collinitus* was reported by Contu & Signorello (1999) in Boschetto della Plaja (Catania) and Natural Reserve of (Siracusa), in *Pinus* woods, on sandy soil. This report also includes the findings of *S. collinitus* (Fr.) Kuntze var. *velatipes* Contu, Lavorato & Simonini.

Tapinella panuoides (Batsch) E.-J. Gilbert 1931 (*Tapinellaceae*)

HABITAT: in consolidated inner dunes on stumps of *P. pinea*.

LOCALITIES: **Agrigento**, Eraclea Minoa (Cattolica Eraclea); **Catania**, Riserva Naturale Oasi del Simeto (641414); **Palermo**, Balestrate, Le Macchie (593221); **Ragusa**, Sampieri (651432).

NOTES – This is a common species growing on rot trunks of pine and other conifers.

Trichaptum fuscoviolaceum (Ehrenb.) Ryvarden 1972 (*Polyporaceae*)

HABITAT: in consolidated inner dunes, on stumps and trunks of *P. pinea*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221).

NOTES – This species is semipileate or resupinate depending on the inclination of substratum. It grows on rot wood of *Pinus*, rarely on other conifers, also if worked, sporadically on broad-leaved plants (*Betula*); white rot. It grows in Europe in temperate zones of northern hemisphere (Bernicchia 1990), North America and Asia (Breitenbach & Kränzlin 1986).

Tricholoma argyraceum (Bull.) Gillet 1874 (*Tricholomataceae*)

HABITAT: in consolidated inner dunes in reforestation of *P. pinea*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (**593221**).

NOTES – This is a widespread species frequently observed in fir and pine woods but also growing in mixed broad-leaved woods, parks and herbaceous glades. It was also recorded in Algeria close to plants of *P. halepensis* and *Populus alba* L., (Malençon & Bertault 1970-1975).

Tricholoma fracticum (Britzelm.) Kreisel 1984 (*Tricholomataceae*)

HABITAT: in consolidated inner dunes in reforestation of *P. pinea*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (**593221**).

NOTES – This is a termophilous species or growing in the mountains, in conifer woods especially *Pinus sylvestris* L., rarely in mixed conifer woods, on calcareous soil. It was also recorded in North Africa (Riva 1988).

Tricholoma myomyces (Pers.) J. E. Lange 1933 (*Tricholomataceae*)

HABITAT: in consolidated inner dunes in reforestation of *P. pinea*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (**593221**).

NOTES – This is a common species, growing from seafronts to subalpine zones, on calcareous soil, in conifer woods, *Picea* and *Pinus*, rarely in broad-leaved woods. It also grows in Algeria close to plants of *Cedrus* sp., *P. halepensis* and *Q. suber* and in Tunisia close to plants of *P. halepensis* (Malençon & Bertault 1970-1975).

Tubaria furfuracea (Pers.) Gillet 1876 (*Inocybaceae*)

HABITAT: in consolidated inner dunes in reforestation of *E. camaldulensis*.

LOCALITIES: **Caltanissetta**, Manfria (**643241**); **Catania**, Riserva Naturale Oasi del Simeto (**641414**); **Palermo**, Balestrate, Le Macchie (**593221**).

NOTES – This is a common species growing in groups composed by many sporophores, on frustules or other woody rot material, also buried.

Tulostoma brumale Pers. 1794 (*Agaricaceae*)

HABITAT: in consolidated inner dunes, on pure sands or near mosses, in reforestations of *A. saligna*.

LOCALITIES: **Caltanissetta**, Manfria (643241); **Catania**, Riserva Naturale Oasi del Simeto (641414); **Palermo**, Balestrate, Le Macchie (593221), Lascari, Salinelle (596223).

NOTES – This species grows on sandy and bushy soils, in uncultivated meadows, along the tracks on the hills, always in wet places, also near mosses. It was also recorded in boreal temperate zones (Sarasini 2005).

Volvariella gloiocephala (DC.) Boekhout & Enderle 1986 (*Pluteaceae*)

HABITAT: in consolidated inner dunes with reforestations of *A. saligna*.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221); **Ragusa**, Riserva Naturale Orientata Foce del fiume Irminio (650141), Sampieri (651432); **Siracusa**, Riserva Naturale di Vendicari (649323).

NOTES – This is a common species growing on sandy seafronts collected in reforestation of *A. saligna* also in the *Medicagini marinae-Ammophiletum australis*, in the *Centaureo-Ononidietum ramosissimae* and the *Ephedro fragilis-Juniperetum macrocarpae*, to the alpine zone, in meadows, cultivated lands and at the border of woods.

3) Sabulicolous fungi reported in literature with habitat of uncertain assignment

Agaricus pseudopratensis (Bohus) Wasser var. *niveus* Bohus 1980 (*Agaricaceae*)

HABITAT: dunes, on sandy soil.

LOCALITIES: **Siracusa**, Isola di Capo Passero (652311).

Anthracobia melaloma (Alb. & Schwein.) Arnould 1893 (*Pyronemataceae*)

HABITAT: on burnt woody residues.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (593221).

NOTES – This is a widely distributed species, very common from the alpine zones to the sea level.

Coprinellus angulatus (Peck) Redhead, Vilgalys & Moncalvo 2001 (*Psathyrellaceae*)

HABITAT: consolidated dunes, close to burnt woody residues.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (**593221**).

NOTES – This is a not very common species, not strictly sabulicolous.

Inonotus tamaricis (Pat.) Maire 1938 (*Hymenochaetaceae*)

HABITAT: on trunks of *Tamarix gallica* L.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (**593221**); Cefalù, Lascari, Salinelle (**596223**), Capo Gallo, Hotel La Torre (Mondello).

NOTES – This is a termophilous species, very common in the mediterranean area. The identification of the host plant should be verified.

Leucoagaricus singeri (Bon ex Contu & Signor.) Consiglio & Contu 2004 (*Agaricaceae*)

HABITAT: dunes, on sandy soil.

LOCALITIES: **Siracusa**, Isola di Capo Passero (**652311**).

Leucoagaricus volvatus Bon & A. Caball. 1995 (*Agaricaceae*)

HABITAT: rear dunes, on sand.

LOCALITIES: **Siracusa**, Isola di Capo Passero (**652311**).

Panaeolus guttulatus Bres. 1881 (*Agaricales*)

HABITAT: on burnt woody debris.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (**593221**).

NOTES – This is a common species growing on coal residues among mosses of genus *Funaria*.

Parasola plicatilis (Curtis) Redhead, Vilgalys & Hopple 2001 (*Psathyrellaceae*)

HABITAT: in the glades at the border of reforested areas.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (**593221**), Lascari, Salinelle (**596223**).

NOTES – This species could be observed in grassy areas, along tracks and in pastures. It was also reported from Tunisia and Algeria from sea level to the

mountains, on buried woody residues among grasses, blackberry bushes or in the woods (Malençon & Bertault 1970-1975).

Peziza violacea Pers. 1801 (*Pezizaceae*)

HABITAT: on burnt woody debris.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (**593221**).

NOTES – This is a widespread species growing on burnt soils or on coal residues. It is sometimes erroneously considered as terricolous since it also grows on buried woody residues. It was also reported from the alpine zones (Medardi, 2006).

Plicaria endocarpoides (Berk.) Rifai 1968 (*Pezizaceae*)

HABITAT: on burnt woody residues.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (**593221**).

NOTES – This is a species typically growing on burnt soils the year after the cross of fire.

Thelephora caryophyllea (Schaeff.) Pers. 1801 (*Thelephoraceae*)

HABITAT: on sand, among scattered mosses.

LOCALITIES: **Palermo**, Balestrate, Le Macchie (**593221**), Lascari, Salinelle (**596223**).

NOTES – This is a very common species growing in conifer or mixed woods, on sandy soils or among grasses, sometimes in *Betula* woods.

Trametes ljubarskyi Pilát 1937 (*Polyporaceae*)

HABITAT: rear dunes, on residues of *Ononis natrix* L. ssp. *ramosissima* (Desf.) Batt. et Trab.

LOCALITIES: **Siracusa**, Isola di Capo Passero (**652311**), Riserva Naturale di Vendicari (**649323**).

Tulostoma melanocyclum Bres. 1904 (*Agaricaceae*)

HABITAT: in mobile dunes, on mosses.

LOCALITIES: **Palermo**, Lascari, Salinelle (**596223**).

NOTES – This is a rare species growing on clay-sandy soil, on waterfronts or uncultivated meadows. It was also recorded in central Europe and North America (Sarasini 2005).

Xerula xeruloides (Bon) Dörfelt 1980 (*Physalariaceae*)

HABITAT: rear dune, on roots *O. natrix* ssp. *ramosissima*.

LOCALITIES: **Siracusa**, Isola di Capo Passero (**652311**).

NOTES – The herbarium sample was not analyzed in our revision since is not kept in CAG as wrongly reported by Contu & Signorello (1999) in their publication.

4) Excluded taxa

The following species are excluded since the locality Boschetto della Plaja (Catania) is characterized by anthropized areas isolated from the sandy environment.

Hebeloma hiemale Bres. 1892 (*Strophariaceae*)

HABITAT: pine woods.

LOCALITIES: **Catania**, Boschetto della Plaja.

Tubaria dispersa (L.) Singer 1961 (*Inocybaceae*)

HABITAT: pine woods.

LOCALITIES: **Catania**, Boschetto della Plaja.

Conclusions

The littorals and sandy dunes areas of Sicily has been strongly modified by anthropic pressure, by fragmentation into lots with the setting up of touristic villages and residences and by reforestations. Nevertheless the coastal belts still host some interesting plants and fungi species. The reported number of macromycetes is 35 taxa (14 *Ascomycetes* and 21 *Basidiomycetes*) collected on embryo dunes, high dunes, rear dunes and consolidated dunes and 114 taxa (12 *Ascomycetes* and 102 *Basidiomycetes*) from reforested consolidated dunes. Besides fungi with uncertain habitats correspond to 14 taxa (3 *Ascomycetes* and 11 *Basidiomycetes*), Two *Basidiomycetes* were excluded

from the sabulicolous environment since they grows in a strongly anthropized area. On the whole 165 taxa (29 *Ascomycetes* and 136 *Basidiomycetes*), belonging to 160 species and 5 varieties were reported.

As shown in Fig. 1, saprobes are the main ecological category (119 taxa), followed by mycorrhizal species (33 taxa) and parasites (13 taxa). Referring to the substrate (Fig. 2), the number of terricolous species is 111, followed by lignicolous fungi (24 taxa), fungi on debris (20 taxa) and fungi on mosses (10 taxa). The embryo dunes, characterized by *E. juncea*, sometimes associated to different psammophytes such as *Sporobolus pungens* (Schreber) Kunth, *E. maritimum*, *Cyperus kalli* (Forsskal) Murb., *Cutandia maritima* (L.) Richter, *Echinophora spinosa* L., *Pancreatium maritimum* L. ecc., are the areas mainly subjected to wind and saltiness action; and it hosts only few fungi species such as *C. dunensis*, *M. cinereifolia*, *M. arenaria* and *P. cinctulus*.

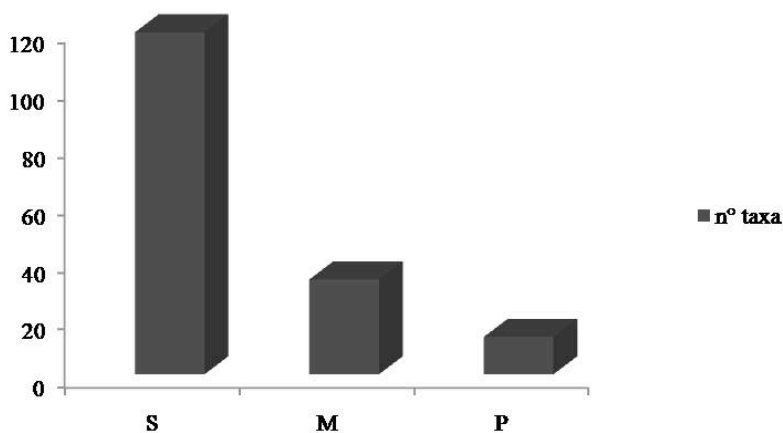


FIGURE 1. Number of fungi per ecological categories. S = saprobes, M = mycorrhizal, P = parasites.

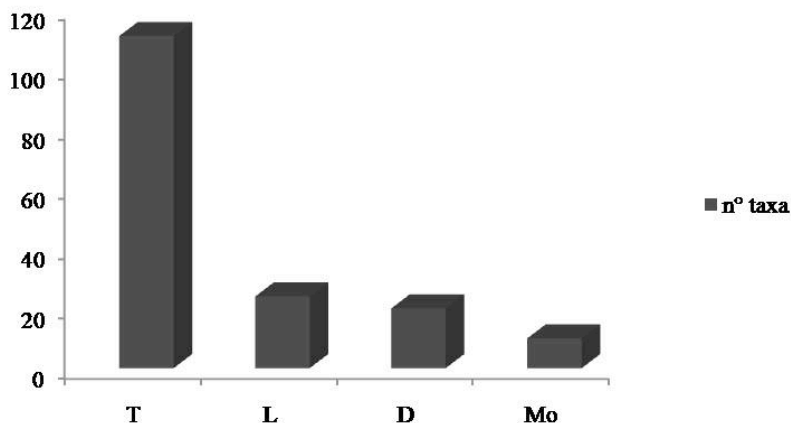


FIGURE 2. Number of fungi per type of substrate. **T** = terricolous, **L** = lignicolous, **D** = fungi on debris, **M** = fungi on mosses.

On higher dunes, the vegetation was substituted by *Medicagini marinae*-*Ammophiletum australis*, characterized by big tufts of *A. australis*. In this type of dunes we register the main growth of a common saprophytic species, *P. ammophila*, able to extend its presence on the substratum all year long with the exception of summertime.

As regards psammophilous species, *P. ammophila* is one of first to appear from the end of November with a progressive increase of fructification in the following months. Close to *A. australis* it could be observed *A. aridicola*, *A. menieri*, *H. ammophilum*, *I. serotina*, *L. brunneolilacea*, *M. anomalus*, *P. cinctulus*, *P. ammophila*, *P. pseudoammophila* and *R. malenconii*. *A. aridicola*, *P. ammophila*, *P. cinctulus*, *P. ammophila*, *P. pseudoammophila* and *R. malenconii* are considered strictly arenicolous species with a wide spectrum of diffusion. These species were collected also in Spain (Calonge & Telleria 1980), France (Courtecuisse 1984, 1986) and United Kingdom (Rotheroe 1993). In the level stretch of rear dunes the vegetation is characterized by small bushes of *O. natrix* ssp. *ramosissima*, apart from some other psammophytes such as *Lotus cytisoides* L., *Centaurea sphaerocephala* L., *Seseli tortuosum* var. *maritimum*, *Euphorbia terracina* L. and *Scabiosa maritima* L. This plant community, referred to the *Centaureo-Ononidietum ramosissimae*, thanks to its high degree of coverage, play a very important role in the consolidation of sand surfaces and facilitate the beginning of pedogenesis.

The crops, reforestations and urbanizations strongly reduced the area occupied in past times by this plant association which is now confined to

very scattered relictual strips. In the *Centaureo-Ononidietum ramosissimae* only few species such as *A. spathulata*, *G. laevis* and *P. boltonii* were observed.

In the consolidated dunes a very interesting psammophilous maquis is observed. The plant association, mainly represented by *J. macrocarpa*, is located on coastal dunes belonging to the *Ephedro fragilis-Juniperetum macrocarpae*, and characterized by *J. macrocarpa*, *Ephedra fragilis* Desf., *P. lentiscus*, *Phyllirea angustifolia* L., *Clematis cirrhosa* L., etc. Owing to the action of swell the *Ephedro fragilis-Juniperetum macrocarpae* occupies a belt very close to the sea shore. A huge number of fungi such as *A. spathulata*, *A. devoniensis*, *C. filaris*, *G. arenicola*, *G. arenosa*, *H. conscriptus*, *M. trabutii*, *P. cupressi*, *S. planchonii* and *X. mediterranea* grows close to the shrubs. In the investigated coastal area the reforestations are included also in the consolidated dunes and generate a windbreak barrier against the action of saltiness.

The coastal natural vegetation was replaced with different plants such as *A. saligna*, *P. pinea*, *P. halepensis*, *P. pinaster* and *E. camaldulensis*, with unsatisfying results for the environment since such species are aliens for the landscape and unable to define a natural plant succession. In such areas fungi show the greatest abundance and the mycocoenoses is enriched by species belonging to genera *Agaricus* L., *Inocybe* (Fr.) Fr., *Leucoagaricus* Locq. ex Singer and *Lyophyllum* P. Karst.

Besides rare or infrequent taxa was observed in the same areas such as *A. chionodermus*, *A. gennadii*, *A. langei*, *A. lanipes*, *B. phalloides*, *P. megasperma*, *C. bisporiger*, *C. calolepis*, *D. albus*, *G. schmidelii*, *I. arenicola*, *I. dulcamara*, *I. dunensis*, *I. heimii*, *I. rufuloides*, *L. hepaticus*, *L. crouanii*, *L. menieri*, *L. pilatianus*, *L. salmoneophyllus*, *L. wichanskyi*, *L. illinita*, *L. subfurnacea*, *L. buxum*, *L. littoralis*, *M. corbariensis*, *M. tristis*, *O. galericolor* var. *galericolor* and *P. melanthina*.

The presence of *L. buxum*, a rare species with distribution limited to the Mediterranean area, is noteworthy. The distribution in Italy of such taxon is limited to Sicily (Contu & Signorello 1999; Signorello & Contu 1998; Contu & La Rocca 1999; La Rocca & Bazan 2001; Lantieri 2003b) and Sardinia (Contu & La Rocca 1999).

Some other taxa, which could not be included in any vegetational belts, are rare or not reported before such as *L. singeri*, *T. ljubarskyi* and *X. xeruloides*.

The presence of hypogeous or semihypogeous fungi such as *D. albus*, *H. carneum*, *H. inflatum*, *R. donkii*, *P. arhizus* and *S. tenuipes*, is not strictly linked to *E. camaldulensis* but also to *A. saligna*.

Apart from *Arrhenia rickenii* (*Basidiomycetes*), the species growing on mosses belongs to *Ascomycetes*. This group is represented by six parasites and four saprophytes; some other are rare such as *C. polygona-vivipari*, *L.*

dictydiola and *O. convexula*, some other are infrequent such as *L. crouanii*, *O. humosa* and *O. leucoloma*. The presence of *P. patavina*, a very uncommon species, reported from Italy in Tuscany (Franchi et. al. 2001) and Sicily [La Rocca & Bazan (2001); Lantieri (2004b)], which usually grows in the same period of *A. spathulata* is here pointed out.

A huge number of lignicolous species were collected on stumps: *A. mellea*, *C. gallica*, *C. variabilis*, *C. calolepis*, *D. concentrica*, *G. sepiarium*, *G. junonius*, *H. atrocoerulea*, *H. conscriptus*, *I. tamaricis*, *L. micheneri*, *P. romellii*, *P. melanthina*, *L. atratum*, *S. commune*, *S. stellatus*, *S. hirsutum*, *S. ochraceoflavum*, *T. panuoides* and *T. fuscoviolaceum*; on rot roots (*X. xeruloides*), on other plant residues (*P. rhytidia* and *T. ljubarskyi*).

The substratum is usually represented by materials deposited on the beach during the storms or derived from the forestry activity inside the natural reserves.

A limited number of fungi grows on burnt areas and some of them are strictly anthracophilous such as *A. melaloma*, *P. guttulatus*, *P. violacea* and *P. endocarpoides*.

Acknowledgements

The authors wish to thank Dr Dario Lunghini (Italy) and Dr Gabriel Moreno (Spain) for critically reviewing the manuscript.

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