

New records of lichen taxa from Namibia and South Africa

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Abstract: Of the 39 lichen taxa reported here that were collected during numerous excursions to Namibia and the Republic of South Africa, 37 are new to Namibia and 6 are new to the Republic of South Africa; furthermore, 5 of these are new to continental Africa (*Heppia arenacea* M. Schultz, *Peccania arabica* (Müll. Arg.) Henssen, "*Peccania*" *arizonica* Herre, *Phloeopeccania pulvinulina* J. Steiner, *Psorotichia hassei* Fink) and 15 are reported for the first time from southern Africa. Most of the species have a worldwide distribution, especially in arid to semi-arid regions.

Key words: lichens, southern Africa, Namibia, Republic of South Africa.

Introduction

Although lists of species collected in Namibia and South Africa have been published by MASSALONGO (1861), CROMBIE (1876a; 1876b), DOIDGE (1950), ALMBORN (1988), WIRTH et al. (2007) and ZEDDA & RAMBOLD (2004), wide regions of southern Africa are still lichenologically unexplored. A brief overview of lichenological activities in South Africa was recently given by CROUS et al. (2006) concluding that much work needs to be done, especially in microlichens, and a major obstacle being the lack of critical checklist. There are, however, some taxonomic revisions for lichens of southern Africa. A revision of *Cladonia* section *Cocciferae* in South Africa was carried out by STENROOS (1994). Corticolous and lignicolous *Buellia* species were studied by MARBACH (2000), while the family *Physciaceae* was revised by MOBERG (2004). The genus *Catapyrenium* was studied by BREUSS (1993, 1995) and *Catarrhospora*, including two new species from South Africa, was described by BRUSSE (1994). *Caloplaca* species were described and illustrated by KÄRNEFELT (1988a, 1988b) and WIRTH et al. (2005). *Diploschistes* was revised by GUDERLEY & LUMBSCH (1996) and the family *Parmeliaceae* from southern Africa by BRUSSE (1984, 1988, 1989a, 1989b, 1991), ELIX (1997, 1999, 2001), ESSLINGER (1977), and HALE (1987, 1988, 1989, 1990). *Cetraria* and related genera were investigated by KÄRNEFELT (1987). South

African taxa of *Psora* s.lat. were studied by SCHNEIDER (1979), and the genera *Heppia* and *Peltula* by BÜDEL (1987). Members of the Lichinaceae were dealt with by BRUSSE (1987a, b), HENSSEN et al. (1985), MORENO & EGEE (1992a) and more recently by SCHULTZ (2007). A revision of saxicolous species of the genus *Rinodina* was presented by MATZER & MAYRHOFER (1996). SÉRUSIAUX & WESSELS (1984) revised *Santessonina* from the Namib Desert, while KONDRATYUK et al. (2004) revised *Xanthoria* from southern Africa. Several new species from southern Africa were described in the last decades and a good though still incomplete reference to records of lichens from South Africa and Namibia can be found in FEUERER (2008). However, the distribution of cyanobacterial lichens in southern Africa, mainly *Lichinaceae*, still remains poorly known due to difficulties in the identification, especially of sterile specimens. Many ecological and vegetation studies have focussed on the lichen fields of the central and northern Namib (SCHIEFERSTEIN 1989, SCHIEFERSTEIN & LORIS 1992, LALLEY & VILES 2005, WIRTH & HEKLAU 2006, WIRTH et al. 2007) and of the southern Namib in southern Africa (JÜRGENS & NIEBEL-LOHMANN (1995). The Knersvlakte area (Western Cape, RSA) has been investigated floristically and ecologically by ZEDDA & RAMBOLD (submitted). No other floristic works exist from southern, central and northern Namibia, and from the western part of South Africa. Most of the lichens dealt with here were collected in sites which had never been investigated lichenologically.

This study was carried out in the context of the BIOTA Africa project, with the main goal of assessing lichen diversity and its shifts at selected monitoring sites along a climatic and vegetation gradient in southern Africa (SCHMIEDEL & JÜRGENS 2005). In this context, the study of lichen diversity is important in order to detect any impacts of land use and global climate change on local habitats.

Material and methods

The study area: The study area includes Namibia and the western parts of the Northern Cape and Western Cape in the Republic of South Africa. The collecting sites correspond in most cases to investigation sites of the BIOTA Africa project (www.biota-africa.org), so-called “observatories”, and were visited during the field trips listed below. The climate of the area is arid to semi-arid with winter rainfall in western South Africa (Northern and Western Cape provinces) and summer rainfall in Namibia. Fog and dew are frequent events along the Atlantic coast due to the effects of the cold Benguela Current. Mean annual precipitation varies from less than 50 mm in the Namib Desert to about 500 mm in the Savannah Biome further inland. The mean annual air humidity is also higher along the coasts (about 85% in Swakopmund) and low (mostly less than 20%) further inland (WALTER 1986, WERGER 1986). Isotherms run predominantly parallel to the coast and mean annual temperatures vary from 16°C (coast) to 23°C (inland). Climatic differences determine the occurrence of different phytogeographical subdivisions: the Sudano-Zambezian Region in the north-east, characterized by dry forests and savannahs; the Karoo-Namib Region; and the Cape Floristic Region in the south, mainly characterized by fynbos vegetation. Two main units can be distinguished in the Karoo-Namib Region: the Succulent

Karoo Region and the Nama Karoo Region. The Succulent Karoo Region comprises most of the coastal Namib and the former “Western Cape Domain” extending southwards to the mouth of the Olifantsrivier (RSA), and is characterized by the dominance of leaf succulent chamaephytes (WERGER 1986; JÜRGENS 1991). The Nama-Karoo region is floristically more heterogeneous and some areas have lower plant diversity than the Succulent Karoo. According to JÜRGENS (1991), the Succulent Karoo Region is an arid region with high oceanic influence, buffered extreme temperatures and high relative air humidity during late night and early morning, while the Namaland Domain is characterized by more continental air-dry conditions and more extreme temperatures.

Collections: The material was collected by Matthias Schultz in October-November 2005 (Namibia) and in March 2006 (Namibia), by Luciana Zedda in April 2001 (RSA), November 2001 (Namibia), November-December 2002 (RSA), March 2005 (RSA) and March 2007 (Namibia), by Jürgen Kreyling and Anne Johann in July 2004 (Namibia), and by Tassilo Feuerer in 2001 (RSA). Geographical coordinates were taken by GPS. The collected specimens are currently studied and housed at the Universities of Bayreuth and Hamburg. After the completion of the BIOTA project (2010), they will be deposited in PRE (Pretoria National Herbarium, RSA), WIND (National Botanical Research Institute, Windhoek, Namibia) and M (Botanische Staatssammlung München). Duplicates of the lichens collected in Namibia by M. Schultz will additionally be deposited in HBG (Herbarium of the University of Hamburg, Biozentrum Klein Flottbek und Botanischer Garten).

Identification: Main floristic works and taxonomic revisions of genera were consulted for identification and in order to check the ecology and distribution of the examined taxa in Africa. Nomenclature follows LIASnames (www.lias.net) and “Index Fungorum” (<http://www.indexfungorum.org/>). The examined herbarium specimens are cited with locality, substrate type, coordinates, altitude (a.s.l.), date of collection, collector and herbarium number.

The new lichen records

Altogether 39 lichen taxa are added to the lichen flora of the study area, of which 37 are new to Namibia and 6 are new to the Republic of South Africa; among these, 5 are also new to continental Africa and 15 are reported for the first time from southern Africa. Most of the species have worldwide distributions, especially in arid to semi-arid regions.

***Collema coccophorum* Tuck.**

This species, previously known from northern Africa (EGEA 1996), Angola and probably Uganda (DEGELIUS 1974), is reported for the first time from Namibia and South Africa. It is widespread worldwide, especially on calciferous soil or soil crusts over rocks, sometimes also on rock itself, and common from sea level to high altitudes. *C. coccophorum* grows mainly on calcareous soil in the study area, rarely on rock, and is very common. It has wide ecological amplitude, and it is found from low altitudes (c. 140 m) in the Succulent Karoo to higher altitudes (c. 1650 m) in the Savannah biome of Namibia.

Specimens examined: Namibia. Hardap Province, Narais, close to the district road D1237, NW of Rehoboth, on calcareous soil crust, 23°07'14.6'' S, 16°54'17.5'' E, 1650 m, 6. III. 2006, M. Schultz 19125 [HBG, M-0039746]. Kommas Province, Rooisand, western end of the Gamsberg-Pass along C26 road, on rock [schist] and sand over schist, 23°17'33.0''S, 16°07'48.5''E, 1350 m, 5. XI. 2005, M. Schultz 19037 [M-0125470]. Otjomondjupa Province, Otjiamongombe West 44 [Erichsfelde], 37 km N of Okahandja, 7 km N of D2180 road, 21°35' S, 16°56' E, 1500 m, 18. III. 2007, L. Zedda 6808 [M-0039854]. **RSA.** Northern Cape, Soebatsfontein, in biological soil crusts, 30°11' S, 17°33' E, 390 m, 15. XI. 2002, leg. L. Zedda 5442 [M-0038399]. Northern Cape Province, Numees, in Richtersveld National Park, close to entrance along the road from Brandkaros to Sendlingsdrif, on soil, 28°18' S, 16°57' E, 360 m, 1. IV. 2001, L. Zedda 5513 [M-0038410]. Western Cape Province, Flaminkvlakte 111 [Goedehoop], c. 50 km N of Vanrhynsdorp, opposite turnoff "Groot-Graafwater" along the N7, in biological soil crust, 31°17' S, 18°36' E, 245 m, 28. XI. 2002, L. Zedda 5872 [M-0039021]. Moedverloren 208, along the road N7, c. 33 km S of Nuwerus, in biological soil crusts, 31°27' S, 18°26' E, 140 m, 24. XI. 2002, L. Zedda 5895 [M-0039092]. Elandsberg, N1 road from Cape Town to Paarl, then along road R44 to Wellington, in biological soil crusts, 33°41'S, 19°03'E, 71 m, 11. III. 2005, L. Zedda 6403 [M-0125385].

***Collema crispum* (L.) Weber ex F.H. Wigg.**

This species is new to Namibia. It has hitherto been reported from South Africa (DOIDGE 1950), northern Africa (EGEA, 1996; SCHULTZ et al. 2004; SEAWARD 1996), and is widespread throughout the world, growing on calciferous soil or rarely on rocks. In Namibia, it is found only in the Savannah biome at high elevations.

Specimens examined: NAMIBIA, Hardap Province, Narais, close to the road D1237, NW of Rehoboth, on calcareous soil crust, 23°07'14.6'' S, 16°54'17.5'' E, 1650 m, 6. & 11.3.2006, leg. M. Schultz 19126 & 19144 (HBG, M).

***Collema tenax* (Sw.) Ach.**

Reported by EGEA (1996) and SEAWARD (1996) from northern Africa and by DEGELIUS (1974) from South Africa and Angola, this species is recorded as new to Namibia. It has a worldwide distribution, mainly on soil or soil over rock, rarely on calcareous or siliceous rock.

Specimens examined: Namibia. Hardap Province, Narais, close to road D1237, NW of Rehoboth, on calcareous soil crust, 23°07'14.6'' S, 16°54'17.5'' E, 1650 m, 6. III. 2006, M. Schultz 19127 [HBG, M]. Khomas Province, S-SW of Windhoek on road C26, on schistose rock, 23°14'28.9''S, 16°33'50.3''E, 1795 m alt., 4. III. 2006, M. Schultz 19116 [HBG, M-0039732]. **RSA.** Northern Cape Province, Soebatsfontein, 30°11' S, 17°33' E, 390 m, on soil, 15. XI. 2002, L. Zedda 5870 [M-0039062].

***Diploschistes actinostomus* (Pers.) Zahlbr.**

This is a widespread species, previously reported from South Africa (GUDERLEY & LUMBSCH 1996), which is found in calcareous areas. New to Namibia.

Specimen examined: Namibia: Khomas Province, W of Rehobot, E of D1237, farm Duruchaus, chamaephytic shrubland close to the Oanob Rivier S of BIOTA-observatory, on small hill with scattered limestone boulders, fully exposed, 23°08'34.6''S, 16°54'56.8''E, c. 1600 m, 13. III. 2006, M. Schultz 19185 [HBG, M].

***Diploschistes euganeus* (A. Massal.) J. Steiner**

Like the preceding one, this species is widespread, especially on siliceous rock in open situations of arid and semiarid regions. It has previously been reported from South Africa (GUDERLEY & LUMBSCH 1996). New to Namibia.

Specimens examined: Namibia: Khomas Province, NW of Rehobot, farm Fyndrai W of D1237, thorn scrub with mostly *Acacia*, rocky outcrops, on steep, shaded schistose rock face, 23°10'44.0''S, 16°52'54.0''E, 1600 m, 12. III. 2006, M. Schultz 19164 [HBG, M].

***Flavopunctelia flaventior* (Stirton) Hale**

This species has been reported from tropical East Africa by SWINSCOW & KROG (1988) and from South Africa by BRUSSE (1988). The new records from eastern central Namibia suggest a wider distribution of this species in the savannah biomes of southern Africa.

Specimens examined: Namibia: Omaheke Province, Sandveld Research Farm, NE of Drimiopsis, *Acacia-Terminalia*-savannah, on E-exposed, somewhat shaded, midtrunk of *Acacia erioloba*, 22°02'39.8''S, 19°08'09.5''E, 1525 m, 2. III. 2006, M. Schultz 19103 [HBG, M-0039709]. Otjozondjupa Province, Otjiamongombe West 44 (Erichsfelde), 37 km N of Okahandja, 7 km N of D2180 road, on *Acacia* trees, 21°35' S, 16°56' E, 1500 m, 30. X. 2001, L. Zedda 5699 [M-0039387].

***Gloeoheppia turgida* (Ach.) Gyeln.**

This species has been reported earlier from Algeria (EGEA 1989), Morocco (EGEA 1989, 1996), Tunisia (EGEA 1989), the Canary Islands (EGEA 1989, SCHULTZ & VAN DEN BOOM 2007, SWINSCOW 1982) and Cape Verde Islands (BÜDEL & MIES 1993), and more recently from Aldabra (SCHULTZ & APTROOT 2008). *G. turgida* is very common in desert and semi-desert areas in the Middle East region. This is the first record for southern Africa.

Specimen examined: Namibia. Khomas Province, W of Kuiseb Canyon, Rooisand Farm, just below summit of small mountain, SE of farm buildings and BIOTA observatory, in W-exposed, sandfilled clefts of schistose rock, 23°17'33.0''S, 16°07'48.5''E, 1350 m, 5. XI. 2005, M. Schultz 19038 [HBG, M-0125471].

***Heppia adglutinata* (Kremp.) A. Massal.**

This species has been reported from southern Africa by BÜDEL et al. (2002), but lacks detailed locality data. It is reported by HENSSEN (1994) for Europe, Macaronesia and North America. Here, locality data are provided for some recent collections from South Africa and Namibia.

Specimens examined: Namibia. Erongo Province, c. 80 km S of Karibi on C32, on soil, 22°40'23.7''S, 15°51'53.0''E, 1170 m, 13. XI. 2005, M. Schultz 19079 [HBG, M-0125679]. Khomas Province, NW of Rehobot, just E of road D1237, S end of farm Narais, on calcareous soil crust, 1650 m, 11. III. 2006, M. Schultz 19142b [M] & 19147 [HBG, M]. Khomas Province, NW of Rehobot, just E of road D1237, N end of farm Duruchaus, on calcareous soil crust, 1650 m, 11. III. 2006, M. Schultz 19156b [HBG, M]. **RSA.** Western Cape Province, Flaminkvlakte 111 (Goedehoop), c. 50 km N of Vanrhynsdorp, opposite turnoff "Groot-Graafwater" along the road N7, to the east, in biological soil crusts, 31°17'S, 18°36'E, 245 m, 28. XI. 2002, L. Zedda 5926 [M-0039012].

***Heppia arenacea* M. Schultz**

This species was described from Yemen and Socotra by SCHULTZ (2005) and recently reported from the Canary Islands (SCHULTZ & VAN DEN BOOM 2007). The new record from Namibia suggests a wide though scattered occurrence in arid to semi-arid regions across Africa. In Yemen and Socotra, it grows in soil crust communities over limestone and basaltic rocks in desert habitats at a wide range of elevations (200–2100 m), but in Namibia it occurs on calcareous soil. New to southern and continental Africa.

Specimens examined: Namibia. Hardap Province, Narais, close to road D1237, NW of Rehobot, on calcareous soil crust, 23°07'14.6'' S, 16°54'17.5'' E, 1650 m, 6. & 11. III. 2006, M. Schultz 19130 & 10150 [HBG, M-0039749, M-0039750]. Khomas Province, NW of Rehobot, just E of road D1237, N end of farm Duruchaus, on calcareous soil crust, 1650 m, 11. III. 2006, M. Schultz 19151 [HBG, M].

***Heppia despreauxii* (Mont.) Tuck.**

This species has been reported earlier from Zimbabwe (BECKER 2002). It appears to be widespread in northern Africa and the Canary Islands (HENSSSEN 1994); it is also known from Socotra (SCHULTZ 2005) and Australia (BÜDEL et al. 2002). It is characterized by its yellowish-olive, pale dotted squamules that may appear greyish due to the presence of a thick epinecral layer covering the thick upper cortex. A lower cortex is lacking or is very thin and restricted to the margins of younger squamules. Greyish forms of the otherwise dark olive species *H. adglutinata* chiefly differ in the presence of a distinct lower cortex and the absence of a thick upper cortex. Occasionally, *H. despreauxii* grows adjacent *H. adglutinata*. New to Namibia.

Specimens examined: Namibia. Kommas Province, W of Kuiseb Canyon, W of Rooisand Farm on C26, desert-grassland transition, fully exposed roadside between scattered grasses, on soil, 23°20'53.6'' S, 15°57'04.3'' E, 1050 m, 2. XI. 2005, M. Schultz 19012 [M-0125420]. Kommas Province, Rooisand, western end of the Gamsberg-Pass along the road C26, on rock (schist) and sand over schist, 23°17'33.0''S, 16°07'48.5''E, 1350 m, 5. XI. 2005, M. Schultz 19036 [HBG, M-0125468]. Khomas Province, NW of Rehobot, just E of road D1237, S end of farm Narais, on exposed calcareous soil crust, 1650 m, 11. III. 2006, M. Schultz 19143, 19145 & 19149 [HBG, M]. Otjondjupa Province, Otjiamongombe West 44 (Erichsfelde), 37 km N of Okahandja, 7 km north of D2180 road, 21°35' S, 16°56' E, 1500 m, 18. III. 2007, L. Zedda 6703 [M-0125407].

***Heppia lutosa* (Ach.) Nyl.**

This is a widespread species, especially in arid regions throughout the world, mostly growing on calcareous soil. It has been previously reported from Lesotho and South Africa (Cape Province) by BÜDEL (1987) and from northern Africa by EGEEA (1989). New to Namibia.

Specimen examined: Namibia. Otjozondjupa Province, Otjiamongombe West 44 (Erichsfelde), 37 km N of Okahandja, 7 km N of road D2180, on calcareous soil, 21°35' S, 16°56' E, 1500 m, 18. III. 2007, L. Zedda 6803 [M-0039849].

***Hyperphyscia adglutinata* (Flörke) H. Mayrhofer & Poelt**

This is a widely distributed, common species, which grows mainly on tree trunks, branches and twigs and on rocks in open or partly shaded habitats. It is very frequent in South Africa (MOBERG 2004), but has not been reported from Namibia.

Specimens examined: Namibia. Omaheke Province, Sandveld Research Farm, NE of Drimiopsis, Acacia-Terminalia-savannah, on E-exposed, somewhat shaded, mid-trunk of *Acacia erioloba*, 22°02'39.8''S, 19°08'09.5''E, 1525 m, 2. III. 2006, M. Schultz 19102 [HBG, M-0039707]. NAMIBIA, Otjozondjupa Province, Otjiamongombe West 44 (Erichsfelde), 37 km N of Okahandja, 7 km N of road D2180, on *Acacia*, 21°35' S, 16°56' E, 1500 m, 3. III. 2001, L. Zedda 5700 [M-0039388].

***Hyperphyscia granulata* (Poelt) Moberg**

This species has been reported from tropical East Africa, Madagascar, Zambia and Zimbabwe (APTROOT 1990, BECKER 2002, SWINSCOW & KROG 1988), and is common in South Africa (MOBERG 2004). New to Namibia, where it is corticolous on *Acacia* trees.

Specimen examined: Namibia. Omaheke Province, Sandveld Research Farm, NE of Drimiopsis, *Acacia-Terminalia*-savannah, on shaded base of small *Acacia mellifera*, 22°02'57.1''S, 19°08'02.6''E, 1530 m, 3. III. 2006, M. Schultz 19111 [HBG, M-0039723].

***Lichinella stipatula* Nyl.**

This species is new to South Africa and Namibia. It was recorded by SCHULTZ & VAN DEN BOOM (2007) from the Canary Islands, and by MORENO & EGEEA (1990, 1992b) and EGEEA (1996) from Morocco, where it is frequent on acid substrata of the Atlas Mountains. This is certainly one of the commonest and widespread species of the family *Lichinaceae* in southern Africa, where it dominates biological soil crusts under arid to semi-arid conditions.

Specimens examined: Namibia. Komass Province, W of Kuiseb Canyon, W of Rooisand Farm along road C26, desert-grassland transition, fully exposed roadside between scattered grasses, on soil, 23°20'36.3'' S, 15°55'57.0'' E, 1050 m, 3. XI. 2005, M. Schultz 19013 [HBG, M-0125421]. Rooisand, western end of the Gamsberg-Pass along road C26, on W-exposed rock faces (schist), 23°17'34.9''S, 16°07'43.5''E, 1350

m, 5. XI. 2005, M. Schultz 19039c [HBG, M-0125475]. Claratal, SW of Windhoek, after the junction of roads C26 and D1982 towards Gamsberg Pass, on schist, 22°47'14.7'' S, 16°46'58.1'' E, 1850 m, 7. XI. 2005, M. Schultz 19052 [HBG, M-0125500]. Hardap Province, Narais, close to road D1237, NW of Rehoboth, on calcareous soil crust, 1650 m, 6. & 11. III. 2006, M. Schultz 19128, 19142 [HBG, M]. Khomas Province, NW of Rehoboth, just E of road D1237, N end of farm Duruchaus, on limestone pebbles on the ground, 23°08'04.0''S, 16°54'26.4''E, 1650 m, 6. III. 2006, M. Schultz 19137 [HBG, M]. NW of Rehoboth, east of road D1237, farm Duruchaus, close to Oanob rivier, S of BIOTA-observatory, on top of small hill with scattered limestone boulders, 23°08'34.6''S, 16°54'56.8''E, c. 1600 m, 13. III. 2006, M. Schultz 19180 [HBG, M]. Otjozondjupa Province, Otjiamongombe West 44 (Erichsfelde), 37 km N of Okahandja, 7 km N of road D2180, 21°35' S, 16°56' E, 1500 m, 21. III. 2007, L. Zedda 6828 (M-0039874). **RSA.** Northern Cape, Soebatsfontein, in biological soil crusts, 30°11' S, 17°33' E, 390 m, 15. XI. 2002, L. Zedda 5914 [M-0039963]. Western Cape Province, Flaminkvlakte 111 (Goedehoop), c. 50 km N of Vanrhynsdorp, opposite turnoff "Groot-Graafwater" along the N7, in biological soil crust, 31°17' S, 18°36' E, 245 m, 28. XI. 2002, L. Zedda 5942 [M-0039037].

***Parmotrema austrosinense* (Zahlbr.) Hale**

This is a widespread species in tropical and temperate regions (SWINSCOW & KROG 1988), which has been already reported from South Africa (ALMBORN 1988). It is new to Namibia, where it grows on bark of *Acacia* spp.

Specimen examined: Namibia. Omaheke Province, Sandveld Research Farm, NE of Drimiopsis, *Acacia-Terminalia*-savannah, on E-exposed, somewhat shaded, midtrunk of *Acacia erioloba*, 22°02'39.8''S, 19°08'09.5''E, 1525 m, 2. III. 2006, M. Schultz 19107 [HBG, M-0039715].

***Peccania arabica* (Müll. Arg.) Henssen**

This species has been described from the Sinai Peninsula and was recently reported from the Canary Islands (SCHULTZ & VAN DEN BOOM 2007); it is also present in Yemen, Oman and UAE, as well is in semi-arid regions of southern Spain (unpubl. results). It is new to southern and continental Africa.

Specimens examined: RSA. Northern Cape Province, Numees, in Richtersveld National Park, close to entrance along the road from Brandkaros to Sendlingsdrif, on soil, 28°18' S, 16°57' E, 360 m, 1. IV. 2001, L. Zedda 5513 [M-0038410]. Northern Cape, Soebatsfontein, in biological soil crusts, 30°11' S, 17°33' E, 390 m, 15. XI. 2002, L. Zedda 5958 [M-0039055]. Western Cape Province, Flaminkvlakte 111 (Goedehoop), c. 50 km N of Vanrhynsdorp, opposite turn-off "Groot-Graafwater" along the road N7, in biological soil crust, 31°17' S, 18°36' E, 245 m, 28. XI. 2002, L. Zedda 5926 [M-0039012].

***“Peccania” arizonica* Herre**

This species was described from desert areas in North America, but appears to have a much wider distribution. Because of the different thallus and fruit-body characteristics "*Peccania” arizonica* should be excluded from this genus once the correct generic affiliation has been clarified. *Psorotichia hassei* Fink (see below)

is rather similar in its minutely coralloid growth form, but the hymenium is I+ blue, whereas there is no hymenial reaction with iodine in "*Peccania*" *arizonica*. New to southern and continental Africa.

Specimens examined: **Namibia.** Khomas Province, Rooisand W of Kuiseb Canyon, summit of small mountain SE of farm buildings and BIOTA observatory, on horizontal to slightly inclined schistose rock faces, exposed, 1350 m, 23°17'33.0''S, 16°07'48.5''E, 5. XI. 2005, M. Schultz 19035 [HBG, M-0125466]. **RSA.** Northern Cape Province, Richtersveld National Park, BIOTA-observatory 500 m N from Park entrance, along the road to Kuboes, c. 700 m, 31. III. 2001, T. Feuerer 63376 [HBG].

***Peccania subnigra* (de Lesd.) Wetmore**

This species is new to South Africa and Namibia. Hitherto it was known only from North America (TRETACH & SCHULTZ 2008; WETMORE 1985). The specimens from southern Africa morphologically match the SW North American material very well, though preliminarily molecular studies by the first author suggest that the African material is not closely related to typical specimens from North America and possibly constitute a separate genotype.

Specimens examined: **Namibia.** Kommas Province, W of Kuiseb Canyon, W of Rooisand Farm along road C26, desert-grassland transition, fully exposed roadside between scattered grasses, on soil, 23°20'53.6'' S, 15°57'04.3'' E, 1050 m, 2. XI. 2005, M. Schultz 19011a [HBG, M-0039701]. Khomas Province, NW of Rehobot, just E of road D1237, S end of farm Narais, on calcareous soil crust, 1650 m, 11. III. 2006, M. Schultz 19141 [HBG, M]. Otjozondjupa Province, Toggekry 250 (Omatako-Ranch), W of junction of road B1 and D2404, along D2414, on soil, 21°30' S, 16°43' E, 1500 m, 21. VII. 2004, J. Kreyling & A. Johann [M-0039567]. **RSA.** Northern Cape Province, Numees, in Richtersveld National Park, close to entrance along the road from Brandkaros to Sendlingsdrif, on soil, 28°18' S, 16°57' E, 360 m, 1. IV. 2001, L. Zedda 5496, 5498 [M-0038383, M-0038381]. Northern Cape, Soebatsfontein, on soil in biological soil crusts, 30°11' S, 17°33' E, 390 m, 15. XI. 2002, L. Zedda 5962 [M-0039059].

***Peccania tiruncula* (Nyl.) Henssen**

This is a small squamulose to irregularly dwarf-fruticose species. It is usually separated from other species of the genus by the small, subglobose to globose ascospores which do not exceed 10 µm in length. However, preliminary molecular studies by the first author suggest that the circumscription of *P. tiruncula* is in need revision. It is known from Algeria and Morocco (MORENO & EGEE 1992c), Saudi Arabia (BOKHARY et al. 1993), Oman (BROWN et al. 2002) and the United States (TRETACH & SCHULTZ 2008). It is new to southern Africa.

Specimens examined: **Namibia.** Khomas Province, Kupferberg Pass, high land savannah, on exposed, roadside schistose boulders, 2000 m alt., 2. XI. 2005, M. Schultz 19001 [HBG, M-0039692]. Otjozondjupa Province, Otjiamongombe West 44 (Erichsfelde), 37 km N of Okahandja, 7 km N of road D2180, 21°35' S, 16°56' E, 1500 m., 21. III. 2007, L. Zedda 6811 [M-0039857].

***Peltula boletiformis* (Hue) Henssen & Büdel**

This species is known from Central and South Africa (BÜDEL 1987), including Zimbabwe (SEINE et al. 1998, BECKER 2002), where it grows on granites, especially on inselbergs. New to Namibia.

Specimens examined: Namibia. Khomas Province, just W of junction of roads D1265 and C26, high land savannah, flat rocky outcrop with rock pools and seepage channels, on exposed schistose rock faces, 23°18'26.3''S, 16°30'39.3''E, 1700 m, 2. XI. 2005, M. Schultz 19003 [HBG, M-0039694]. Erongo Province, Ameib Ranch S of Erongo Mts., rock pools in front of "Elephants Head" and "Wagner Scene", on exposed granite rock faces, 21°46'56.2''S, 15°39'36.3''E, 1117 m, 13. XI. 2005, M. Schultz 19081 [HBG, M-0125681].

***Peltula coriacea* Büdel**

This seems to be a rare species described from Transvaal in South Africa (BÜDEL 1987) and later reported from Hong Kong (APTROOT & SEAWARD 1999). New to Namibia and to the Northern Cape province of RSA.

Specimens examined: Namibia. Khomas Province, NW of Rehobot, farm Fyndrai W of road D1237, east of rivier, thorn scrub with mostly *Acacia karoo*, rocky slope, on steep rock faces of exposed schistose and quartzitic boulders, 23°10'48.7''S, 16°53'14.0''E, 1600 m, 12. III. 2006, M. Schultz 19168 [HBG, M]. **RSA.** Northern Cape Province, Numees, in Richtersveld National Park, close to entrance along the road from Brandkaros to Sendlingsdrif, on soil, 28°18' S, 16°57' E, 360 m, 1. IV. 2001, L. Zedda 5327 [M-0038382].

***Peltula corticola* Büdel & R. Sant.**

This is one of the two corticolous species of the genus. It grows on smooth barked trees in dry regions and has rarely been collected (Kenya, South Yemen and Socotra), although it is an apparently widely distributed species (BÜDEL 1987). New to southern Africa.

Specimens examined: Namibia. Khomas Province, NW of Rehobot, E of road D1237, farm Duruchaus, at the base of old *Acacia erioloba* tree close to Oanob River, S of the BIOTA observatory, semi-shaded, 23°08'30.2''S, 16°54'59.1''E, c. 1600 m, 13. III. 2006, M. Schultz 19189 [HBG, M].

***Peltula farinosa* Büdel**

This conspicuously, large, grayish, pruinose species is known from South Africa, SW North America and Pakistan (BÜDEL & LANGE 1994, BÜDEL & NASH 2002) and was recently reported from the Canary Islands (SCHULTZ & VAN DEN BOOM 2007). It is new to Namibia.

Specimen examined: Namibia: Khomas Province, close to railway bridge along road B6, a few km E of Windhoek, on steep and shaded mica-schist boulders moist from seeping water, 22°34'55.4''S, 17°08'26.1''E, 1550 m, 3. III. 2006, M. Schultz 19115 [HBG, M-0039729].

***Peltula impressa* (Vain.) Swinscow & Krog**

This is a fairly widespread species in Africa, especially in eastern and southern Africa, where it is particularly common on inselbergs (BÜDEL 1987; SEINE et al. 1998). It is new to Namibia.

Specimen examined: Namibia. Erongo Province, Ameib Ranch S of Erongo Mts., shallow rock pools in front of “Elephants Head” and “Wagner Scene”, exposed granite, 21°46'56.2''S, 15°39'36.3''E, 1117 m, 13. XI. 2005, M. Schultz 19083 [M-0125683].

***Peltula marginata* Büdel**

This is an African species, reported from South Africa (Transvaal) (BÜDEL 1987), Zimbabwe (BECKER 2002) and Somalia (ALSTRUP & APTROOT 1994). New to Namibia, occurring on granite, especially on inselbergs.

Specimen examined: Namibia. Erongo Province, Ameib Ranch S of Erongo Mts., c. 200 m W of “Elephants Head”, along 30° inclined seepage channel, partly shaded granite rock face, 21°46'56.2''S, 15°39'31.3''E, c. 1200 m, 13. XI. 2005, M. Schultz 19086 [HBG, M-0125690].

***Peltula obscurans* (Nyl.) Gyeln. s. lat.**

This is one of the commonest and widespread species of the genus with a worldwide distribution. It has been reported from northern, eastern and southern Africa where it is found on thin accumulations of soil particles in rock clefts etc. on both siliceous and calcareous rock; it is also found in biological soil crust communities, as well as on small calcareous pebbles. *P. obscurans* exhibits variation in morphology. Many of the specimens recently collected in southern Africa could be identified to one of three varieties (var. *obscurans*, var. *deserticola* (Zahlbr.) Wetmore, and var. *hassei* (Zahlbr.) Wetmore) as distinguished by BÜDEL & NASH (2002). However, the taxonomic status of the varieties needs to be evaluated using molecular analyses. *P. obscurans* var. *hassei* has been reported from the Canary Islands, Cape Verde Islands, Cote d'Ivoire, South Africa (Transvaal, Cape Province) (BÜDEL 1987) and Zimbabwe (SEINE et al. 1998), where it grows on neutral to acid cliffs or on detritus among rocks. In Namibia, this variety is found on schistose rock and calcareous pebbles. *P. obscurans* var. *obscurans* has hitherto been reported from northern Africa (EGEA 1996) and East Africa (SWINSCOW & KROG 1979), but not from southern Africa. New to Namibia.

Specimens examined: cf. *Peltula obscurans* var. *deserticola* (Zahlbr.) Wetmore: **Namibia.** Otjozondjupa Province, Otjiamongombe West 44 (Erichsfelde), 37 km N of Okahandja, 7 km N of road D2180, 21°35' S, 16°56' E, 1500 m, 21. III. 2007, L. Zedda 6811 [M-0039857]. Hardap Province, Narais, close to road D1237, NW of Rehoboth, on exposed limestone pebbles on the ground, 23°07'40.1''S, 16°53'56.8''E, 1650 m, 6. III. 2006, M. Schultz 19132 [HBG, M].

cf. *Peltula obscurans* var. *hassei* (Zahlbr.) Wetmore: **Namibia.** Kommas Province, Rooisand, western end of the Gamsberg-Pass along road C26, on rocks (schists), 23°17'40.4'' S, 16°06'53.0'' E, 1150 m, 3. XI. 2005, M. Schultz 19018 [HBG, M-0125683].

0125432]. Khomas Province, farm Claratal, SW of Windhoek, highland savanna, on inclined, partly shaded schistose boulders at the ground, 22°47'14.7''S, 16°46'58.1''E, 1850 m, 7. XI. 2005, M. Schultz 19050 [HBG, M-0125495]. Hardap Province, Narais, close to road D1237, NW of Rehoboth, on limestone pebbles on exposed ground, 23°07'40.1''S, 16°53'56.8''E, 1650 m, 6. III. 2006, M. Schultz 19133 [HBG, M].

cf. *Peltula obscurans* (Nyl.) Gyeln. var. *obscurans*: **Namibia**. Komas Province, Rooisand, western end of the Gamsberg-Pass along road C26, on rocks (schists), 23°17' S, 16°06' E, 1200 m, 3. XI. 2005, M. Schultz [M-0125464]. Komas Province, Claratal, SW of Windhoek, after the junction of road C26 and D1982 towards Gamsberg Pass, on schist, 22°47' S, 16°46' E, 1850 m, 7. XI. 2005, M. Schultz [M-0125504].

***Peltula omphaliza* (Nyl.) Wetmore**

This species has a worldwide distribution. In Africa, it is already known from the Canary Islands (BREUSS 1988), Cape Verde Islands (BÜDEL & MIES 1993) and northern Africa (EGEA 1989). It grows on both acidic and calcareous rocks in deserts and other open, arid habitats (BÜDEL & NASH 2002). New to southern Africa.

Specimens examined: **Namibia**. Komas Province, Rooisand, western end of the Gamsberg-Pass along road C26, on calcareous rock crust, 23°17'39.3'' S, 16°06'42.9'' E, 1200 m, 4. XI. 2005, M. Schultz 19029 [HBG, M-0125458]. Hardap Province, Narais, close to road D1237, NW of Rehoboth, roadside with exposed lime pebbles and small boulders, 23°07'45.5''S, 16°53'47.1''E, 1650 m, 11. III. 2006, M. Schultz 19161 [HBG, M].

***Peltula patellata* (Bagl.) Swinscow & Krog**

This species, described from East Africa by SWINSCOW & KROG (1979), has a worldwide distribution. In Africa, it has hitherto been reported from northern Africa (EGEA 1989), the Canary Islands (SCHULTZ & VAN DEN BOOM 2007) and Zimbabwe (SEINE et al. 1998, BECKER 2002). It is new to Namibia and South Africa.

Specimens examined: **Namibia**. Komas Province, Rooisand, western end of the Gamsberg-Pass along road C26, on rocks (schists), 23°17'43.2'' S, 16°06'41.1'' E, 1200 m, 3. XI. 2005, M. Schultz 19027 [M-0125454]. Otjozondjupa Province, Otjiamongombe West 44 (Erichsfelde), 37 km N of Okahandja, 7 km N of road D2180, on calcareous soil, 21°35' S, 16°56' E, 1500 m, 21. III. 2007, L. Zedda 6701 [M-0125405]. **RSA**. Northern Cape, Soebatsfontein, in biological soil crusts, 30°11' S, 17°33' E, 390 m, 5. IV. 2001, L. Zedda 5436 [M-0038398].

***Peltula radicata* Nyl.**

This species has been reported from northern Africa (EGEA 1989, SEAWARD 1996), Cape Verde Islands, North America, Mexico (BÜDEL 2001), southern Yemen (SCHULTZ 1998), Tajikistan (KUDRATOV & MAYRHOFER 2002) and Australia (BÜDEL 2001). It is new to southern Africa. It grows mainly on sandy soils.

Specimens examined: Namibia. Kommas Province, W of Kuiseb Canyon, W of Rooisand Farm, along road C26, desert-grassland transition, fully exposed roadside between scattered grasses, on soil, 23°20'36.3'' S, 15°55'57.0'' E, 1050 m, 2. XI. 2005, M. Schultz 19014 [HBG, M-0125426]. Hardap Province, Narais, close to road D1237, NW of Rehoboth, on calcareous soil crust with limestone pebbles, 23°07'14.6''S, 16°54'17.5''E, 1650 m, 11. III. 2006, M. Schultz 19146 [HBG, M]. Otjozondjupa Province, Otjiamongombe West 44 (Erichsfelde), 37 km N of Okahandja, 7 km N of road D2180, on calcareous soil, 21°35' S, 16°56' E, 1500 m, 18. III. 2007, L. Zedda 6808 [M-0039854].

***Peltula tortuosa* (Nees) Wetmore**

This is a widespread species, occurring in North America, Venezuela and Africa (BÜDEL 1987; BÜDEL & NASH 2002). It grows mainly on granitic rocks under open conditions. New to Namibia.

Specimen examined: Namibia: Erongo Province, Ameib Ranch, S of Erongo Mts., c. 200 m W of "Elephants Head", along 30° inclined seepage channel, partly shaded granite rock face, 21°46'56.2''S, 15°39'31.3''E, c. 1200 m, 13. XI. 2005, M. Schultz 19085 [HBG, M-0125688].

***Peltula umbilicata* (Vain.) Swinscow & Krog**

This species has been reported from tropical East Africa, the Ivory Coast and South Africa (BÜDEL 1987). It grows on exposed granite and sandstone cliffs. New to Namibia.

Specimen examined: Namibia. Erongo Province, Ameib Ranch, S of Erongo Mts., c. 200 m W of "Elephants Head", along 30° inclined seepage channel, partly shaded granite rock face, 21°46'56.2''S, 15°39'31.3''E, c. 1200 m, 13. XI. 2005, M. Schultz 19084 [HBG, M-0125686].

***Phloeopeccania pulvinulina* J. Steiner**

This species was described from southern Yemen; it has been recently reported from the Arabian Peninsula (Oman) and Socotra (BROWN et al. 2002, SCHULTZ & MIES 2003), as well as from the Canary Islands (SCHULTZ & VAN DEN BOOM 2007). This new record is very interesting, since no cyanolichens have been previously reported from the Namib Desert. New to southern and continental Africa, though certainly widespread and common on rock in coastal, dry regions.

Specimen examined: Namibia. Erongo Province, Wlotzkasbaken lichen field, road to Hentjiesbaai, c. 7 km from Swakopmund (C34), on soil and on calcareous crust, 22°18' S, 14°28' E. 70 m, 24. X. 2001, L. Zedda 5773, 5784 [M-0038908; M-0038908].

***Physciella chloantha* (Ach.) Essl.**

This species is widely distributed in North America, Europe and Asia. It has been tentatively reported from the Canary Islands (VAN DEN BOOM & ETAYO 2006). At the Namibian site it is associated with *Caloplaca* spp. and an unidentified, effigurate species of the *Physciaceae*. New to southern Africa.

Specimen examined: Namibia: Erongo Province, Gobabeb Station, rocky area beyond the Kuiseb River bed with scattered old *Acacia erioloba* trees, partly shaded, 23°33'44.3''S, 15°02'25.3''E, 400 m, 10. XI. 2005, M. Schultz 19060 [HBG, M-0125641].

***Placidium squamulosum* (Ach.) Breuss**

This species is widespread in all continents (except Antarctica), and has its ecological optimum in arid to semi-arid regions (BREUSS 1994). It has been collected in North Africa (BREUSS 1994) and in the Republic of South Africa (BREUSS 1993), but has not yet been reported from Namibia, where it grows on calcareous soil together with cyanolichens, outside the Namib Desert.

Specimens examined: Namibia. Hardap Province, Narais, close to road D1237, NW of Rehoboth, on calcareous soil crust, 23°07'14.6'' S, 16°54'17.5'' E, 1650 m alt., 6. III. 2006, M. Schultz 19131 [HBG, M-0039968]. Otjozondjupa Province, Otjiamongombe West 44 (Erichsfelde), 37 km N of Okahandja, 7 km N of road D2180, on calcareous soil, 21°35' S, 16°56' E, 1500 m, 21. III. 2007, L. Zedda 6826 [M-0039872].

***Psorotichia hassei* Fink**

The species has previously been reported from Socotra (SCHULTZ & MIES 2003) and the Canary Islands (SCHULTZ & VAN DEN BOOM 2007). It is usually found on crumbling mica-schist, and more rarely on calcareous pebbles. In Namibia, it seems to be rather common. New to southern and continental Africa.

Specimens examined: Namibia. Kommas Province, Rooisand, western end of the Gamsberg-Pass along road C26, on rock (schist), 23°17'40.4''S, 16°06'53.0''E, 1350 m, 3. XI. 2005, M. Schultz 19017 [HBG, M-0125430]. Claratal, SW of Windhoek, after the junction of road C26 and D1982 towards Gamsberg Pass, on flat boulders (schist) close to the ground, 22°46'44.4''S, 16°46'31.0''E, 1850 m, 7. XI. 2005, M. Schultz 19047 [HBG, M-0125489], *ibid.*, 22°47'14.7''S, 16°46'58.1''E, M. Schultz 19053 [HBG, M-0125502]. NW of Rehobot, just E of road D1237, N end of farm Duruchaus, limestone pebbles on exposed ground, 23°08'04.0''S, 16°54'26.4''E, 1650 m, 6. III. 2006, Schultz 19136 [HBG, M]. Khomas Province, NW of Rehobot, farm Fyndrai, W of road D1237, thorn scrub with mostly *Acacia karoo*, on exposed small schistose rocky outcrops on soil, 23°10'44.0''S, 16°52'54.0''E, 1600 m, 12. III. 2006, M. Schultz 19163 [HBG, M].

***Pyxine cocoes* (Sw.) Nyl.**

This is a very widespread pantropical species and rather common in South Africa (MOBERG 2004). New to Namibia, where it is frequent on *Acacia* trees.

Specimens examined: Namibia. Omaheke Province, Sandveld Research Farm, NE of Drimiopsis, *Acacia-Terminalia*-savannah, on E-exposed, somewhat shaded, midtrunk of *Acacia erioloba*, 22°02'39.8''S, 19°08'09.5''E, 1525 m, 2. III. 2006, M. Schultz 19101 [HBG, M-0039704] and on shaded base of small *Acacia mellifera*, 22°02'57.1''S, 19°08'02.6'' E, 1530 m, 3. III. 2006, M. Schultz 19113 [HBG, M-0039726]. Otjozondjupa Province, Otjiamongombe West 44 (Erichsfelde), 37 km N of Okahandja, 7 km N of road D2180, on calcareous soil, 21°35' S, 16°56' E, 1500 m, 30. X. 2001, L. Zedda 5844 [M-0038978; M-0039542].

***Pyxine nubila* Moberg (= *Culbersonia nubila* (Moberg) Essl.)**

This species deviates from typical members of the genus by the negative reaction of the cortex with both KOH and UV-light. It is rather conspicuous due to the frosted-looking upper surface of the lobes. It is a subtropical species, already known from Lesotho and South Africa, where it grows on both trees and rocks (MOBERG 2004). New to Namibia.

Specimen examined: Namibia. Omaheke Province, Sandveld Research Farm, NE of Drimiopsis, *Acacia-Terminalia*-savannah, on E-exposed, somewhat shaded, mid-trunk of *Acacia erioloba*, 22°02'39.8''S, 19°08'09.5''E, 1525 m, 2. III. 2006, M. Schultz 19104 [HBG, M-0039711].

***Pyxine petricola* Nyl.**

This pantropical to nearly cosmopolitan species has been reported from tropical East Africa (SWINSCOW & KROG 1988), Zimbabwe (BECKER 2002) and South Africa (MOBERG 2004). It is mainly corticolous, in fairly open situations. New to Namibia.

Specimen examined: Namibia: Omaheke Province, Sandveld Research Farm, NE of Drimiopsis, *Acacia-Terminalia*-savannah, on E-exposed, somewhat shaded, mid-trunk of *Acacia erioloba*, 22°02'39.8''S, 19°08'09.5''E, 1525 m, 2. III. 2006, M. Schultz 19108 [HBG, M-0039717].

***Thyrea plicatissima* (Nyl.) Zahlbr.**

Thyrea plicatissima is characterized by its very thin lobes densely covered by minute globose granules giving the lobes a rough appearance. It has been reported from northern Africa (MORENO & EGEE 1992c) and the Canary Islands (SCHULTZ & VAN DEN BOOM 2007). It is reported for the first time from Namibia, and is new to southern Africa, where it is expected to have a wide distribution range.

Specimen examined: Namibia. Khomas Province, W of Kuiseb Canyon, Rooisand farm, slope of small mountain, SE of farm buildings and BIOTA observatory, on 45° inclined, W-exposed, schistose rock face, 23°17'34.9''S, 16°07'43.5''E, 1270 m, 5. XI. 2005, M. Schultz 19040 [HBG, M].

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