

## *Pyrenula acutispora* in Western Europe, Macaronesia and British Columbia (Canada)

## *Pyrenula acutispora* in Westeuropa, Mazedonien und Britisch Kolumbien (Kanada)

**Emmanuël SÉRUSIAUX & Brian J. COPPINS**

**Key words:** Canary Islands, Azores, Madeira, Kakouetta.

Schlagwörter: Kanarische Inseln, Azoren, Madeira, Kakouetta.

**Summary:** *Pyrenula acutispora* KALB & HAFELLNER (= *Pyrenula kakouettae* SÉRUS. & DIEDERICH) is shown to be a widely distributed species with populations known in Western Europe (British Isles and SW France, where it is very rare), Macaronesia and British Columbia (Western Canada).

**Zusammenfassung:** Es wird gezeigt, dass *Pyrenula acutispora* KALB & HAFELLNER (= *Pyrenula kakouettae* SÉRUS. & DIEDERICH) eine weit verbreitete Spezies ist, welche bekannte Populationen in Westeuropa (Britischen Inseln und SW Frankreich, wo sie sehr selten ist), Mazedonien und Britisch Kolumbien (westliches Kanada) aufweist.

### Introduction

Almost simultaneously, KALB & HAFELLNER (1992) and SÉRUSIAUX & DIEDERICH (1992) described a new species of *Pyrenula*, from Madeira and SW France respectively, with easily recognized ascospores; indeed, they are 3-septate with ovoid to rhomboid lumina, elliptical to almost cylindrical, and are abruptly contracted into conical to triangular tips at both sides (Fig. 2; see also fig. 2d in SÉRUSIAUX & DIEDERICH 1992, and Abb. 16 in KALB & HAFELLNER 1992, their Abb. 3 being misleading as the spores extremities are rarely mucronate as featured in their drawing). Detailed examination of type collections and populations from both localities shows that the two species are identical. As the paper of SÉRUSIAUX & DIEDERICH (1992) was issued several months after that of

KALB & HAFELLNER (1992); *P. kakouettae* must be reduced into synonymy with *P. acutispora*.

The British Lichen Flora (PURVIS & al. 1992) pointed to a «probably undescribed species in W. Scotland, N. W. England and S. W. Ireland with [...] a generally laterally developed ostiole [...]»; that species is listed as «*Pyrenula* aff. *microtheca* R.C. HARRIS» in the Checklist of Lichens of Great Britain and Ireland (COPPINS 2002). Examination of corresponding material shows that their ascospores are identical with those of *P. acutispora*. Two characters seem to put those specimens aside from the latter: the lateral ostioles and a usually rather «dirty» thallus, with numerous, brownish to blackish, hardly delimited patches or dots (here referred to «flecks»; see fig. 1, B-C). However, such characters also occur in the large populations sampled in Madeira and Tenerife (Canary Islands) and in SW France and no clear-cut distinction is possible. Indeed, there are specimens with lateral ostioles but with «clean» thalli and specimens with central ostioles and much darker thalli (but without flecks). Although the overall variation is unexpected, we did not manage to uncover further characters that would provide a sound basis for the separation of two taxa. Therefore, the «*Pyrenula* aff. *microtheca* R.C. HARRIS» of the British Lichen Checklist must be referred to *P. acutispora*.

At an early stage of this study, our colleague and friend Dr. I. M. BRODO (pers. comm.) drew our attention to another species from British Columbia (Canada) that also has lateral ostioles and which has been left undescribed as «*Pyrenula alnicola* R.C. HARRIS ined.» in the National Herbarium of Canada. Examination of relevant collections clearly shows they are identical to *P. acutispora*. Interestingly, the species is mentioned from British Columbia by APTROOT (1996) as *P. acutispora* and as *P. microtheca* R.C. HARRIS, a species of the southern coastal plain of the USA.

Finally, *Pyrenula acutispora* has also been reported from the Azores archipelago (BERGER & APTROOT 2002).

## The species

*Pyrenula acutispora* KALB & HAFELLNER  
Herzogia 9: 84, 1992.

Fig. 1-2

**Type:** Madeira, Ribeiro Frio, unterhalb der Fischzuchtanstalt, entlang der Levada do Furado in Richtung E (Portela), an senkrechten, sehr feuchten Basaltabbrüchen entlang der Levada bzw. alten *Erica arborea* und *Laurus azorica*, 850 m, Aug. 1990, K. & A. KALB 23725 (hb. KALB — holotypus!).

= *Pyrenula kakouettae* SÉRUS. & DIEDERICH, Nova Hedwigia 55: 533-537, 1992.

**Type:** France, Dépt. Pyrénées-Atlantiques, Gorges de Kakouetta, buxaie humide sur le flanc droit de la vallée, à l'entrée des gorges, sur branchettes de *Buxus*, 400 m, July/Aug. 1985, E. SÉRUSIAUX 7700 (LG — holotypus!).

Thallus present and then usually pale orange-brown to greenish or pale grey or endophloeodal and then hardly invisible; in certain morphs, rather «dirty» or speckled, with numerous, brownish to blackish, hardly delimited patches or dots, especially around the perithecia; pseudocyphellae and crystals absent. Thallus reactions: K, C and UV negative. Photobiont: a species of *Trentepohlia*. Perithecia jet black, scattered over the thallus, rarely contiguous and exceptionally confluent (ostioles never fused), half immersed in the bark and then conical, with a slightly spreading involucrellum, or sessile with a ± constricted base, 0.6-1.0 mm in diam. and c. 0.2-0.3 mm in height, with a central ostiole and then rounded when seen from above, or with a lateral, usually basal ostiole and then ovoid when seen from above; ostiole usually seen as a translucent depression, rarely with a blackish or almost translucent surrounding disc. Exciple carbonized, usually quite thick (up to 0.2 mm in lateral parts), without any crystals. Hymenium I and IKI-, without oil droplets. Hamathecium of branched and anastomosed pseudoparaphyses; ostiole with few periphyses. Asci cylindrical, multi-layered with a thickened apex, discharge fissitunicate. Ascospores 8/ascus, elliptical to almost cylindrical, brown, 3-septate, not constricted at the septa, with ovoid to rhomboid lumina, abruptly contracted into conical to triangular tips at both sides, rarely mucronate (« mucros » best seen in young and fresh ascospores), (19-)21-30(-33) × (8.5-)9.5-14(-15) µm. Pycnidia not found.

**Notes:** As already mentioned in the introduction, a great deal of variation is accepted in this species, regarding the position of the ostioles (central or lateral) and in the general appearance of the thallus (pale or partly endophloeodal vs rather «dirty» with dark flecks, especially around the perithecia). In assessing that variation, two populations were examined and sampled in detail: one in the Montañas de Anaga, NE Tenerife (Feb. & March 1997) and the other in SW France (forêt de St-Pé-de-Bigorre, vallée de Génie Longue, Aug. 2000). In both localities, almost all thalli have no dark patches of flecks around the perithecia, and the ostiole can be lateral or central; individual thalli with both perithecia types are very rare, and it thus seems there is a mosaic of two morphs, one with ovoid perithecia (= those with a lateral ostiole) and one with spherical perithecia (those with a central ostiole). As no further diagnostic character could be detected, the two morphs are accepted as belonging to the same taxon.

In their first descriptions, both *Pyrenula acutispora* and *P. kakouettae* were compared with *P. acutalis* R.C. HARRIS, a species described from Louisiana (HARRIS 1989). The type collection (USA, Louisiana, Tunica Hills, S. TUCKER 8461B, NY) has been examined. It can be distinguished by its smaller perithecia (not exceeding 0.7 mm in diam.) which are numerous and sometimes contiguous, its hymenium interspersed near the ostiole and especially the size and shape of its ascospores; these are smaller (mainly narrower: 9-11 µm) and elliptical (and not

almost cylindrical as in *P. acutispora*), slightly constricted at the septa, with the terminal cells close to the exospore, and mostly distinctly mucronate.

*Pyrenula acutispora* has also been assumed to be close to, or even identical (especially the form with lateral ostioles), with *P. microtheca* R.C. HARRIS (1989), a species from the southern coastal plain of the USA. This species has lateral ostioles, and is distinguished from *P. acutispora* by its smaller spores with rounded ends (although a few have been seen with pointed ends). In the four collections examined (see below), the measurements are 15-18.6-23 x 6-7.4-10 µm (n=53).

**Ecology and distribution:** *Pyrenula acutispora* is known from Western Europe (W Scotland, NW England, Wales, SW Ireland and SW France), two islands in the Canary Islands (La Palma and Tenerife, where it has been seen only in the NE mountain range), Madeira, and three islands in the Azores (Pico, São Miguel and São Jorge), and in British Columbia (Western coast of Canada). Its distribution range is thus quite similar to another, well-known and more common species of *Pyrenula*, *P. occidentalis* (R.C. HARRIS) R.C. HARRIS [= *P. neglecta* auct. europ., non R.C. HARRIS; = *P. pseudobufonia* auct. europ., non (REHM) R.C. HARRIS; = *P. harrisii* KALB & HAFELLNER]. This distribution type, more precisely Macaronesia and/or Western Europe and the western parts of the New World is shared by several other lichen species; examples are: *Alectoria imshaugii* BRODO & D. HAWKSW. (ØSTHAGEN & KROG 1979), *Arthothelium macounii* (G. MERR.) W.J. NOBLE (KALB & HAFELLNER 1992), *Pseudocyphellaria arvidssonii* D.J. GALLOWAY (TØNSBERG 1999), *Peltigera britannica* (GYELN.) HOLTAN-HARTWIG & TØNSBERG (MARTÍNEZ & al. 2003) and *Thelomma californicum* (TUCK.) TIBELL (HUNECK & al. 1986). Two hypotheses can explain such distribution patterns: long distance dispersal or survival of disjunct populations after a major historical disturbance that broke down a wider distribution range. This is an interesting debate and conflicting signals arise from detailed analysis of distribution patterns of bryophytes and pteridophytes in Macaronesia (VANDERPOORTEN & al. 2007). Such studies are urgently needed for the lichen flora.

In the British Isles *P. acutispora* is a rare species confined to sites of high lichen biodiversity and conservation importance, mostly in ancient valley woodlands and ravines. At two Scottish sites (Ardura and Resipole) it was associated with *Pyrenula hibernica* (NYL.) APTROOT, and at another (Knoydart) it grew with *P. dermatodes* (BORRER) SCHAER. at the latter's only known Scottish location. Additional associated lichens on the Scottish specimens include *Arthonia ilicina* TAYLOR, *Pyrenula occidentalis*, *Thelotrema lepadinum* (ACH.) ACH. and *T. petracoides* P.M. JØRG. & BRODO. The most common phorophyte in the British Isles is *Corylus*, but it is also known from *Fraxinus*, *Quercus* and *Sorbus aucuparia*. At Allt Ryhyd y Groes in Wales, it was found growing with *Thelotrema lepadinum* at the base of an ancient *Quercus*, and was almost dismissed in the field as a form of *Acrocordia gemmata*. The only Irish collection is from *Ilex*.

In SW France, the species seems to be very local and confined to humid valleys and deep gorges in well-preserved localities, but it can be quite common where it grows. Its most important locality is the « Gorges of Kakouetta », a deep, narrow and very humid gorge where several interesting lichens are known: *Gyalidea cylindrica* ETAYO & VEZDA (so far known only from Kakouetta; ETAYO & VEZDA, 1994), *Porina atlantica* (ERICHs.) P.M. JØRG. (SÉRUSIAUX & al. 2007), *Pyrenula hibernica* (to our knowledge, its only locality in continental Europe), and an impressive set of foliicolous lichens with rare species such as *Gyalectidium puntilloi* SÉRUS. and *G. setiferum* VEZDA & SÉRUS. (FERRARO & al. 2001).

In Macaronesia, the species is known from the three main archipelagos, and, when suitable habitats are carefully explored, it can be easily detected and is thus assumed to be abundant, especially in the laurisilvas of Madeira and in the Montañas de Anaga in Tenerife. It can survive in disturbed stands of the laurisilva, incl. when the secondary « Fayal-Brezal » bushes are dominant. In the cloud forests of Pico island in the Azores, it can be a common species on *Ilex perado* subsp. *azorica*, especially in very wet stands where mosses and blue-green lichen species are dominant.

The localities in British Columbia (Canada) have not been explored by the authors, but all examined recent collections come from the Vancouver area and the Queen Charlotte Islands, and thus from the maritime and hyper-maritime parts of British Columbia (GOWARD 1999).

### Specimens examined of *Pyrenula acutispora*:

**Canada.** British Columbia: Hastings, on tree, April 1889, MACOUN 96 (CANL); *ibid.*, on birch tree, MACOUN s. n. (CANL); Graham Island, Port Chanal off Athlow Bay, along the stream to Mercer Lake, on *Alnus sinuata* in the forest, June 1967, I.M. BRODO 10398 (CANL); Dawson Inlet, stream valley on west side of inlet near its head, on *Alnus sinuata* at edge of stream, June 1967, I. M. BRODO 10135 (CANL); Vancouver Is, West Coast Trail, near Thresher's Cove, on *Alnus rubra*, Aug. 1994, A. APTROOT 35039 (ABL); Vancouver, Lighthouse Park, on *Alnus rubra*, Aug. 1994, A. APTROOT 34504 (ABL). **France.** Dépt. Pyrénées-Atlantiques: Ste-Engrâce, Gorges de Kakouetta, fourrés de *Buxus* très humides à l'entrée des gorges, sur *Buxus*, 400 m, July 1989, P. W. JAMES, F. ROSE, J. VIVANT & E. SÉRUSIAUX 10536 (LG); *ibid.*, végétation mixte à *Buxus* et *Corylus*, sur *Corylus*, *Crateagus*, et *Sorbus*, July 1990 & 1991, P. DIEDERICH 9418, P. DIEDERICH & J. ETAYO 9550, 9553 à 9555, 9564 (hb DIEDERICH); *ibid.*, on *Fraxinus*, July 1992, P. VAN DEN BOOM 12859 (hb VAN DEN BOOM); *ibid.*, Jan. 1993, J. ETAYO 1360 (LG, hb ETAYO). Dépt. Hautes-Pyrénées: Lourdes, St-Pé-de-Bigorre, in valle Gérie [orthographic mistake for Génie] Braque, ad corticem *Ilicis*, 500 m, J. VIVANT (Vezda Lich. Rariores Exsicc. n° 176, sub *P. macrospora* — hb. T. LUMBSCH); forêt

de St-Pé-de-Bigorre, S de Peyras, vallée de Génie Longue, fourrés de *Buxus* et de *Corylus* en fond de vallon, sur *Corylus*, 300-400 m, Aug. 2000, E. SÉRUSIAUX s. n. (LG); Pédestarrès, NW du Pic de Merdanson, ruisseau de l'Issou, taillis dense de *Buxus* en sous-bois d'aulnaie et de *Corylus* en bord de ruisseau, sur *Corylus*, 480-500 m, Aug. 2000, E. SÉRUSIAUX s. n. (E, LG); St-Christau (vallée d'Aspe), Bois du Pacq de Laouga et Laquinie, hêtraie mélangée de fond de vallon, sur jeune tronc de *Ulmus*, 470 m, Aug. 2002, E. SÉRUSIAUX s. n. (LG). **Azores. Pico.** Road to Pico da Urze, disturbed cloud forest with *Juniperus brevifolia*, *Erica azorica* and other typical tree species, on *Ilex*, 800-810 m, Oct. 2007, E. SÉRUSIAUX s. n. (LG); near Pico Caveiro, very wet stand of cloud forest by a small river, on *Ilex*, 760 m, Oct. 2007, E. SÉRUSIAUX s. n. (LG); between Redondo and Cabeço da Macela, heavily disturbed cloud forest within pastures, on *Ilex*, 930 m, Nov. 2007, E. SÉRUSIAUX s. n. (LG). **São Miguel.** Furnas, Botanischer Garten Terras nostras, Park, auf toten Ästchen, 285 m, July 2001, F. BERGER 15927 (hb BERGER); Pico da Vara, « up to 1100 m », on *Vaccinium*, March 2005, F. RODRIGUEZ s. n. (ABL). **Canary Islands. La Palma.** Los Tilos (W of Las Lomados), laurisilve dominée par *Ocotea foetens*, riche en *Hedera*, 600-700 m, July 1997, E. SÉRUSIAUX s. n. (LG). **Tenerife.** Montañas de Anaga, Monte de Las Mercedes, Chinobre, 800-870 m, July 1983, O. BREUSS 3254 (hb BREUSS); *ibid.*, Fayal-Brezal an der Straße nach Taborno, 750-800 m, July 1984, O. BREUSS 3545 (hb BREUSS); *ibid.*, au-dessus de El Draguillo, sous le mirador du Cabezon del Tejo, fourrés du Fayal-Brezal, avec quelques éléments de la laurisilve, 650 m, Feb. 1997, E. SÉRUSIAUX s. n. (LG); *ibid.*, promenade allant de El Pajara vers Cabezon del Tejo, par Chinobre et Roque de Anambro, laurisilva, 700-800 m, March 1997, E. SÉRUSIAUX s. n. (E, LG); *ibid.*, Cruz del Carmen, laurisilva, April 2003, P. DIEDERICH 15588 (hb DIEDERICH). **Madeira.** Fanal (route Ribeira de Janela vers Paul da Serra), vieux *Ocotea foetens* dans un pâturage, 1100 m, July 2003, E. SÉRUSIAUX s. n. (LG); S of Seixal, Chão da Ribeira, laurisilve peu perturbée, 500 m, July 2003, E. SÉRUSIAUX s. n. (LG); route Ribeira Brava/São Vicente, N of Boca de Encumeada, fourrés de Fayal-Brezal avec quelques fûts de Lauraceae, 900 m, July 2003, E. SÉRUSIAUX s. n. (LG); S de Santana, Casas das Queimadas, le long de la levada vers Caldeirão Verde, fourrés d'*Erica* et arbres plantés, 900 m, July 2003, E. SÉRUSIAUX s. n. (LG). **Ireland.** North Kerry (V.C. H2), Killarney, S shore of Muckcross Lake, on *Ilex*, F. ROSE et al. s. n. (E). **United Kingdom.** England: North-west Yorkshire (V.C. 65), Upper Ribblesdale, Ling Gill NNR, on *Corylus*, May 1976, O. L. GILBERT s. n. (E); Cumberland (V.C. 70), Seatoller, Low Stile Wood, on *Corylus*, November 1990, B.J. COPPINS 13750 (E). Wales: Carmarthen (V.C. 44), Allt Rhyd y Groes, near base of old *Quercus*, November 2001, B. J. & A.M. COPPINS [20365] & R.G. WOODS (E); Merioneth (V.C. 48), Allt y Benglog, on *Corylus* and *Fraxinus*, February 2002, S.R. DAVEY s. n. (E); Nannau, Coed-y-môch, on *Fagus*, April 2003, V. J. GIAVARINI s. n. (E). Scotland: Westernness (V. C. 97), N side of Loch Sunart, Resipole, ravine of Allt Mhic Chiarain, on *Corylus*, 50-150 m, March 1983, B.J. COPPINS [9426] & P.M.

JØRGENSEN (E, NY); *ibid.*, B.J. COPPINS & al. 15366 (E, LG); Knoydart, Barisdale, Allt Slochd Nighinn Bheathain, on *Sorbus aucuparia*, May 1975, B. J. COPPINS [3360] & F. ROSE (E); Argyll Main (V.C. 98), Inverary, Glen Shira, woods above Drimlee, on *Corylus*, March 1996, B.J. & A.M. COPPINS 16918 (E); Mid Ebudes (V.C. 103), Mull, Ardura, Abhainn a' Choire ravine, on *Fraxinus*, May 2000, B.J. & A.M. COPPINS 19027 (E).

### Specimens examined of *Pyrenula microtheca* R.C. HARRIS:

USA. Florida, Dade Co, Everglades Nat. Park, May 1967, R. C. HARRIS 2988B (MSC); Franklin Co, N of Carrabelle, May 1967, R. C. HARRIS 1754B (MSC). Lake Co, Ocala Nat. Forest, April 1976, R. C. HARRIS 1926 (MSC); Marion Co, Ocala Nat. Forest, April 1967, R. C. HARRIS 2377-B (MSC).

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**Annex:** fig. 1 & 2 on page V & VI

**addresses:**

E. SÉRUSIAUX

Plant Taxonomy & Conservation Biology Unit

University of Liège

Sart Tilman B22

B-4000 Liège, Belgium

**email:** e.serusiaux@ulg.ac.be

B. J. COPPINS

Royal Botanic Garden

Edinburgh EH3 5LR

United Kingdom

**email:** b.coppins@rbge.org.uk



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