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A boreal bryophyte community in a tropical montane forest of Mexico

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Abstract. A *Nowellia curvifolia* community rich in boreal hepatics is reported from rotten logs in a pine forest in the central highlands of Chiapas, Mexico. The community is probably limited in the tropics to conifer forests of northern Mesoamerica. *Nowellia curvifolia* is reported as new to Brazil and the southern hemisphere, *Cephalozia catenulata* is new to Guatemala and Honduras and *Cephalozia lunulifolia* is new to Guatemala.

The tropical highlands of Mexico are known for their richness in north temperate bryophyte species, occurring commonly at high latitudes in North America, Europe and Asia. The northern affiliations have been documented in detail for mosses by Delgadillo (1971, 1979, 1987). Temperate hepatics were recorded from Mexico by Gradstein and Vána (1987) and Fulford and Sharp (1990). The northern element is most prominent at alpine elevations but it is also well represented in montane forests above 2000 m, e.g., in conifer forests and in the deciduous forests of eastern Mexico. According to Delgadillo (1987), the high peaks of the "Trans-Mexican Volcanic Belt" have acted as an effective dispersal route for the immigrants from the north.

While travelling in southern Mexico in the summer of 1992, the first author and his wife observed the occurrence of a bryophyte community rich in temperate hepatics on rotten logs in a dense evergreen forest in the central highlands of Chiapas, about 15 km SW of San Cristóbal on road to Ocosingo, at an altitude of 2400-2500 m. The forest was dominated by pine, with oak occurring scattered in more open situations and at forest margins. Pine species occurring in these forests include *Pinus michoacana* Martínez, *P. oaxacana* Mirov, *P. oocarpa* Schied. and *P. pseudostrobus* Lindl. (Breedlove 1981).

Logs, in various stages of decomposi-

tion, were plentiful in the dense pine forest and were densely overgrown by bryophytes. Ten species were recognized, including eight species of hepatics and two mosses[1]. *Cephalozia catenulata* and *Nowellia curvifolia* and the mosses *Campylopodiella stenocarpa* and *Dicranum frigidum* were the most abundant species on the logs. *Jamesoniella autumnalis*, *Leptoscyphus amphibolius* and *Lophozia longiflora* were also common and *Anastrophyllum hellerianum* was fairly frequently observed on very humid flanks of the logs. All of these species except *Dicranum frigidum* were growing as pioneers on the smooth, decaying wood; the latter species was mostly found on the older, humose portions of the logs. Two further species of hepatics, *Lepidozia reptans* and *Lophocolea bidentata*, were found only occasionally in the dense bryophyte mats.

There is a striking phytogeographic difference between the mosses and liverworts found on the logs. While the moss species are neotropical taxa reaching their northernmost distribution in Mexico or (*Campylopodiella stenocarpa*) in the eastern U.S.A., most of the hepatics are holarctic species which have their greatest expansion in the temperate portions of the Northern Hemisphere. Six hepatic species, *Anastrophyllum hellerianum, Cephalozia catenulata, Jamesoniella autumnalis, Lepidozia reptans, Lophozia longiflora* and *Nowellia curvifolia,* are characteristic elements of a community of moist decaying logs in boreal conifer forests. This community has variously been described as the "*Nowellia-Jamesoniella associule*" in North America (Schuster 1949) and as the "*Nowellietum*" or "*Riccardio-Nowellietum curvifoliae*" in Europe (Von Hübschmann 1986, Schumacker and De Zuttere 1981), and is widespread throughout the boreal zone of the northern hemisphere. Although many of its species were already known from Mexico, this seems to be the first report of the community from a tropical country.

The Mexican "*Nowellietum*" is remarkable similar in general aspect to the holarctic community, yet there are some floristic differences. First, the Mexican community has several tropical species which are lacking or are very rare in the holarctic: *Campylopodiella stenocarpa, Dicranum frigidum* and *Leptoscyphus amphibolius*. Second, several characteristic species of the holarctic community such as *Anastrophyllum michauxii*, *Cephalozia lunulifolia, Lophozia ascendens, Odontoschisma denudatum, Riccardia latifrons* and *R. palmata* were not collected in the study area. *Riccardia latifrons* and *Lophozia ascendens* are not known from the tropics and *Cephalozia lunulifolia* has not yet been reported from Mexico, but is known from Cuba and from Guatemala (new!): East of Totonicapán, *Sharp 2606 p.p.* (TENN). The other species, however, are known to occur in Mexico and could have been present in the locality of investigation. They might have turned up with a little more collecting.

The ``"*owellietum*" species discussed above seem to occur in the tropics mianly in the Mexican-Guatemalan highlands, with the exception of *Nowellia curvifolia, Jamesoniella autumnalis, Lepidozia reptans and Odontoschisma denudatum* which have wider tropical ranges (Gradstein and Vána 1987). The latter species are not restricted to conifer forests and do not seem to grow in close association with each other elsewhere in the tropics (Gradstein, unpubl. obs.). It would thus appear that the *Nowellia* community reported here is characteristic of the montane conifer forests of northern Mesoamerica and that its tropical distribution is limited to that area.

List of species

The bryophyte species collected on logs in the pine forest near San Cristóbal are listed in alphabetical order. Frequency refers to the estimated presence of the species in the community. Numbers refer to the first authors's

[1]Dr. Claudio Delgadillo (in litt.) has pointed out to me that the number of moss species occurring on these logs is probably higher. "Although my experience in this matter is rather limited, I believe that deending on the decaying stage, there may be other moss species; I have seen at least *Symblepharis vaginata* and *Zygodon obtusifolius* in similar conditions elsewhere in Mexico" (letter of 29 June 1993).

collection numbers. All specimens are kept in U with duplicates in MEXU and PRC.

hepatics

Anastrophyllum hellerianum (Nees ex Lindenb.) Schust. - *8312, 8304 p.p.*; on soft flanks of logs, usually associated with *Cephalozia catenulata*.

Distribution: Circumboreal. In the tropics known only from Mexico (Durango, Distrito Federal, Oaxaca). New to the state of Chiapas (Bourell 1992). Map: Gradstein and Vána 1987, Fig. 1.

Cephalozia catenulata (Hüb.) Lindenb. - *8277, 8296, 8303 p.p., 8304 p.p., 8312 p.p., 8320 p.p. 8324 p.p.*, very abundant, forming extensive mats on smooth, decorticated wood.

Distribution: Circumboreal. In the tropics *Cephalozia catenulata* is known from Mexico, Guatemala (new!) and Honduras (new!). In Mexico the species has been collected in numerous states, from Tamaulipas south to Chiapas (Fulford and Sharp 1990). From Guatemala we have seen three collections (El Progreso, *Steyermark 43434 p.p.*, F; Quetzaltenango, above Chiquival, *Sharp 2121*, TENN; East of Totonicapán, *Sharp 2606p.p.*, TENN) and from Honduras one specimen is available (Morazán, Cerro de Uyuca, *Standley 11896 p.p.*, F). The species was not listed from Chiapas by Bourell (1992).

Jamesoniella autumnalis (DC.) Steph. - *8293, 8303, 8312, 8324*; abundant on smooth decaying wood and on older, humose portions of the logs.

Distribution: throughout the holarctic, furthermore in northern tropical America (Mexico to Colombia) and in the Philippines (Gradstein and Vána 1987, Fig. 17).

Lepidozia reptans (L.) Dum. - *8324a*; occasional.

Distribution: Common throughout the Holarctic; also in tropical America (Mexico to Colombia) and SE Asia (Borneo, Philippines) (Gradstein and Vána 1987, Fig. 19).

Leptoscyphus amphibolius (Nees) Grolle - *8290, 8324*; abundant.

Distribution: Common throughout the mountains of tropical America.

Lophocolea bidentata (L.) Dum. (*L. coadunata* (Sw.) Nees) - *8290a*.

Distribution: A widespread temperate species, occurring throughout the Holarctic, in the mountains of tropical America, Africa and Asia, and in New Zealand.

Lophozia longiflora (Nees) Schiffn. (*L. guttulata* (Lindb. & Arn.) Schiffn.) - *8303, 8304, 8324 p.p*; abundant on smooth, decorticated wood, usually mixed with *Jamesoniella autumnalis* and *Cephalozia catenulata*.

Distribution: imperfectly circumboreal, mainly in continental regions; in the tropics only known from Mexico and Guatemala (Gradstein and Vána 1987, Fig. 2). New to the state of Chiapas (Bourell 1992).

Nowellia curvifolia (Dicks.) Mitt. - *8294, 8303 p.p., 8317, 8312 p.p.*; very abundant, forming extensive homogeneous mats on decorticated wood.

Distribution: suboceanic regions of eastern North America, Europe and Asia; furthermore in northern tropical America (Mexico to northern Venezuela) and in the mountains of South Asia (Gradstein and Vána 1987, Fig. 21). Recently, the species was collected for the first time in Brazil: Bahia, Mun. Abaira, mountains west of Catolés, 13°18'S, 41°53'W, elev. 1400 m, *R.M. Harley 27862a*, 26 Dec 1988 (K, NY). This is the first record of *Nowellia curvifolia* from the southern hemisphere. The locality constitutes a remarkable extension of the range of the species.

mosses

Campylopodiella stenocarpa (Wils.) P. Müll. & Frahm (*Atractylocarpus costaricensis* (C.M.) Williams) - *8299*; abundant, forming dense mats.

Distribution: mountains of Mexico and Central America; a single record of eastern U.S.A. (Frahm 1991, Fig. 162).

Dicranum frigidum C.M. - *8292, 8320*; abundant, forming dense mats on older, humose portions of logs.

Distribution: throughout the high mountains of tropical America.

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