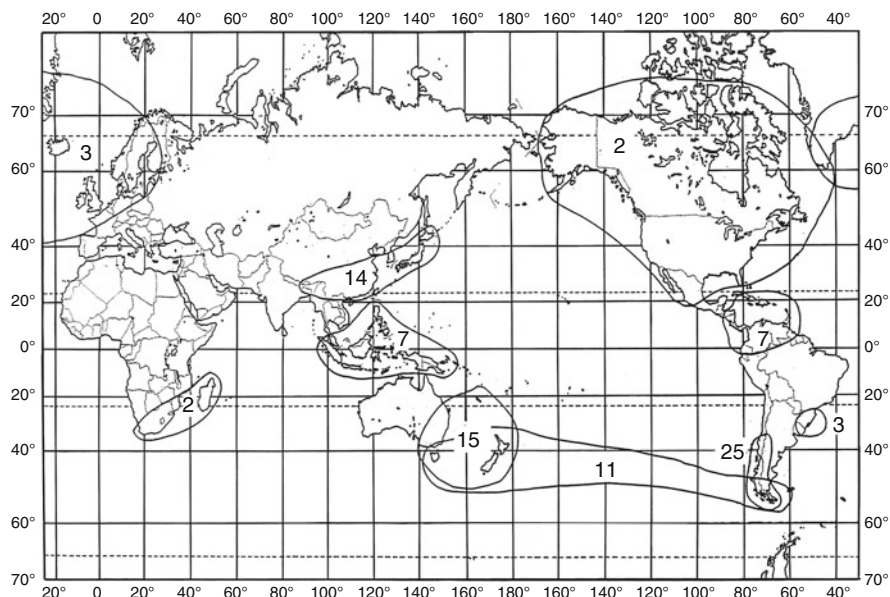


## 2 Biodiversity of Bryophytes

The Marchantiophyta (liverworts) includes three classes, the Haplomitriopsida, Marchantiopsida, and Jungermanniopsida, and 15 orders, 82 families, 316 genera (Table 1.1), and 6,000 species. These small plant groups are distributed nearly everywhere in the world. New species are still being recorded in the literature. There are 54 endemic genera in countries of the southern hemisphere, such as New Zealand and Argentina, as shown in Fig. 2.1 (364). In Asia including Japan, a relatively large number of endemic genera (21) have been recorded, but Europe, North America, and Africa including Madagascar are quite poor regions for endemic genera. The richness of the endemic genera of bryophytes in the southern hemisphere suggests that the bryophytes might have originated in the past from what is now Antarctica some 350,000,000 years ago and then they were introduced to the northern hemisphere during a long-range evolutionary process. In Japan, Yaku Island is considered an important place to locate bryophyte species. In the southern hemisphere, New Zealand is one of the best countries to observe many different species of the Marchantiophyta, which are totally different from those found in Japan.

Notably, countries displaying the highest species density of liverworts with over 250 species per 10,000 km<sup>2</sup>, include New Zealand, New Caledonia, Japan (615 species each), and Costa Rica (561). Areas or countries with more than 151 species per 10,000 km<sup>2</sup> include Nepal (353 species), Bhutan (277), Taiwan (498), the Philippines (514), the island of Borneo (608), Colombia (752), Ecuador (606), and Sao Paulo province in Brazil (472). French Guyana, Norway, the British Isles, Madagascar, and the Iberian Peninsula are also rich areas for liverworts, with 75–150 species per 10,000 km<sup>2</sup> (437).

In Siberia (Russia), 280 liverworts have been recorded, and, of those known at present from Siberia, about 71% are found as widespread species of circumpolar or semi-circumpolar distribution. Only five species are known to be endemic to Siberia. The most commonly encountered liverwort in this region is *Scapania rufidula* (438).



**Fig. 2.1** Number of endemic genera of bryophytes

India and Sri Lanka are also rich source countries of liverworts and 555 and 110 species have been recorded, respectively. In Nepal and Bhutan, in turn, 36 and 44 taxa of liverworts are known (154).

Research on the distribution of liverworts in the Great Himalayan National Park was carried out by Singh and Singh, and the presence of 92 species in over 39 genera and 23 families was recorded (758). This accounts for about 11.3% of the total Indian liverworts and hornworts in just 0.04% of its geographical region.

Liverwort diversity at the summit of Khao Nan, Khao Nan National Park, Nakhon Si Thammarat Province, Thailand, has been investigated by Sukkharak and associates. A total of 547 specimens were collected, accounting for 103 species in 40 genera and 17 families. Among the 40 genera of liverworts studied, *Frullania*, *Radula*, *Plagiochila*, *Bazzania*, and *Drepanolejeunea* species were represented by the largest number of species (786).

Iwatsuki listed 332 genera and 1,135 species of mosses occurring in Japan (368). Thus, Japan is rich in moss species. Anderson and coworkers reported that there are 1,320 species of mosses from North America. The area of Japan is about 370,000 km<sup>2</sup> and hence only 1/48 of the area of North America (29).

In Mongolia, 442 species of mosses from 152 genera and 38 families have been reported, and their distribution pattern resembles that of Siberia (904).

Mainland China (genera/species: 409/1,835), Taiwan (278/835), Indochina (249/953), West Malaysia and Singapore (145/466), Sulawesi (144/340), Java (204/566), Sumatra (8,163/489), Borneo (190/673), Papua New Guinea (263/918), the Lesser Sunda Islands (162/368) and the Philippines (246/743) are also rich in mosses (473).

In tropical regions such as Borneo, Sumatra, and Papua New Guinea, there are rain forests where many liverwort species have been found. However, different species like those in the Lejeuneaceae family are intermingled with one another, so it is time-consuming work to adequately separate and document these. In Ecuador and Colombia, bryophyte species grow preferentially at altitudes above 2,000 m. In Table 1.1, each subclass, order, family, and genus of the Marchantiophyta is shown. Each underlined genus is that chemically studied since 1956.

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