

# Checklist to the *Elatostema* (Urticaceae) of Vietnam including 19 new records, ten new combinations, two new names and four new synonyms

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*Elatostema* (Urticaceae) comprises several hundred herbaceous species distributed in tropical and subtropical Africa, Asia, Australia and Oceania. The greatest species richness occurs on limestone karst in Southeast Asia. Taxonomic revisions of *Elatostema* are largely out of date and contradict each other with respect to the delimitation of *Elatostema* and *Pellionia*. Most herbaria in SE Asia and worldwide contain significant amounts of unidentified material. As part of a broader revision of *Elatostema* in SE Asia, we present an updated checklist for Vietnam based on field visits, a review of specimens in herbaria worldwide, a review of type material and nomenclature. We recognize 77 taxa (75 species and two intraspecific taxa) of *Elatostema* in Vietnam, 23 of which were previously ascribed to *Pellionia*. Nineteen of these are new records for the country, i.e. *E. attenuatoides*, *E. austrosinense*, *E. backeri*, *E. brunneinerve*, *E. crassiusculum*, *E. crenatum*, *E. fengshanense*, *E. glochidioides*, *E. malacotrichum*, *E. nanchuanense*, *E. oblongifolium*, *E. obtusum*, *E. oppositum*, *E. pergameneum*, *E. prunifolium*, *E. pseudolongipes*, *E. pycnodontum*, *E. salvinioides* and *E. xichouense*. We place *E. baviensis* in synonymy of *E. platyphyllum*, *E. colaniae* in synonymy of *E. myrtilus*, *P. macroceras* in synonymy of *E. hookerianum*, and *P. tetramera* in synonymy of *E. dissectum* for the first time. Fourteen taxa (18% of all the recognized taxa) are endemic to Vietnam, which makes *Elatostema* one of the richest genera for endemic species in this country; this level of endemism is comparable to levels observed in Orchidaceae. Our checklist suggests that the highest

diversity and endemism of *Elatostema* occurs in northern Vietnam, and that there is the greatest floristic similarity of northern Vietnam to SW China. The relationship among floristic regions is also investigated. We could find no records of *Elatostema* for 33 out of 63 provincial units of Vietnam, including all the southernmost provinces. We propose that further studies on the diversity of *Elatostema* in central and southern Vietnam are severely needed.

1 **Checklist to the *Elatostema* (Urticaceae) of Vietnam including 19 new records, ten new**  
2 **combinations, two new names and four new synonyms**

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28 **Abstract:** *Elatostema* (Urticaceae) comprises several hundred herbaceous species distributed in  
29 tropical and subtropical Africa, Asia, Australia and Oceania. The greatest species richness occurs  
30 on limestone karst in Southeast Asia. Taxonomic revisions of *Elatostema* are largely out of date  
31 and contradict each other with respect to the delimitation of *Elatostema* and *Pellionia*. Most  
32 herbaria in SE Asia and worldwide contain significant amounts of unidentified material. As part of  
33 a broader revision of *Elatostema* in SE Asia, we present an updated checklist for Vietnam based on  
34 field visits, a review of specimens in herbaria worldwide, a review of type material and  
35 nomenclature. We recognize 77 taxa (75 species and two intraspecific taxa) of *Elatostema* in  
36 Vietnam, 23 of which were previously ascribed to *Pellionia*. Nineteen of these are new records for  
37 the country, i.e. *E. attenuatoides*, *E. austrosinense*, *E. backeri*, *E. brunneinerve*, *E. crassiusculum*,  
38 *E. crenatum*, *E. fengshanense*, *E. glochidioides*, *E. malacotrichum*, *E. nanchuanense*, *E.*  
39 *oblongifolium*, *E. obtusum*, *E. oppositum*, *E. pergameneum*, *E. prunifolium*, *E. pseudolongipes*, *E.*  
40 *pycnodontum*, *E. salviniioides* and *E. xichouense*. We place *E. baviensis* in synonymy of *E.*  
41 *platyphyllum*, *E. colaniae* in synonymy of *E. myrtilus*, *P. macroceras* in synonymy of *E.*  
42 *hookerianum*, and *P. tetramera* in synonymy of *E. dissectum* for the first time. Fourteen taxa (18%  
43 of all the recognized taxa) are endemic to Vietnam, which makes *Elatostema* one of the richest  
44 genera for endemic species in this country; this level of endemism is comparable to levels  
45 observed in Orchidaceae. Our checklist suggests that the highest diversity and endemism of  
46 *Elatostema* occurs in northern Vietnam, and that there is the greatest floristic similarity of northern  
47 Vietnam to SW China. The relationship among floristic regions is also investigated. We could find  
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49 southernmost provinces. We propose that further studies on the diversity of *Elatostema* in central  
50 and southern Vietnam are severely needed.

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54 **Introduction**

55 *Elatostema* J.R.Forst. & G.Forst. (Urticaceae) comprises several hundred species of  
56 succulent herbs and subshrubs that grow in shade in forests, gorges, stream sides and caves (Fu et  
57 al., 2017; Monro et al., 2018). There are currently 626 accepted names within the genus  
58 *Elatostema* (The Plant List, 2018). *Elatostema* is most diverse in subtropical and tropical climates  
59 and is characterized by apparently alternate (opposite but frequently with ephemeral and  
60 occasionally absent nanophylls), strongly asymmetrical leaves arranged distichously, small  
61 staminate flowers borne in dense cymes with receptacle-like involucre or paniculate cymes and  
62 minute pistillate flowers borne in dense capitate cymes, the bracts of which form a receptacle-like  
63 involucre (Tseng et al., in press). As in most species in the tribe Elatostemateae (Conn & Hadiah,  
64 2009), the stamens open explosively and the seeds are ejected by reflexive staminodes (Friis,  
65 1989). *Elatostema* is distributed throughout tropical and subtropical Africa, Madagascar, Asia,  
66 Australia and Oceania, with highest diversity on limestone karst in China and Southeast Asia  
67 (Yahara, 1984; Lahav-Ginott & Cronk, 1993; Wang & Chen, 1995; Lin, Friis & Wilmot-Dear,  
68 2003; Wang, 2014). The previous studies suggest that this diversity has been driven by the  
69 challenges of colonising karst substrates, which once overcome leads to species radiations (Chung  
70 et al., 2014; Fu et al., 2017), and that past temperature fluctuations and East Asian monsoons have  
71 driven the rates of plant diversification in karst ecosystems by accelerating the rate of  
72 karstification (Kong et al., 2017).

73 Vietnam comprises 331,000 km<sup>2</sup> of the eastern Indochinese Peninsula between latitudes 8°  
74 and 24°N, and longitudes 102° and 110°E. Mountains account for 40% of the surface area, and ca.  
75 42% of the land is forested (De Queiroz et al., 2013). Vietnam's climate divides broadly into  
76 humid subtropical in the north, monsoon in the centre and tropical savannah in the south (Peel,  
77 Finlayson & McMahon, 2007). However, on the basis of more detailed and accurate climate  
78 classification by Nguyen et al. (2000), seven types of climate are defined in Vietnam (Fig. 1)  
79 which are largely congruent with the floristic region classification (Takhtajan, 1978; Takhtajan,  
80 1986; Averyanov et al., 2003a). Within Vietnam, six floristic regions have been delimited: the  
81 Sikang-Yunnan, South Chinese, North Indochinese, Central Annamese, South Annamese and

82 South Indochinese Floristic Regions (Fig. 2). Vietnam also forms part of the Indo-Burma  
83 biodiversity hotspot and hosts 110 Key Biodiversity Areas (Mittermeier et al., 2004), and 65  
84 Important Bird Areas (BirdLife International, 2002). Its flora comprises ca. 12,000 vascular plant  
85 species (Averyanov et al., 2003a), of which ca. 10% are endemic to the country (Pilgrim & Tu,  
86 2007). Despite Vietnam's rich plant diversity, it is still poorly sampled, with only ca. 14 specimen  
87 records per 100 km<sup>2</sup> (Newman et al., 2007). A comparison of the 20 most species-rich families for  
88 neighbouring southern China places Urticaceae in the top ten most species-rich families (Zhu,  
89 2017), yet it is absent from the top 20 families for Vietnam (Zhu, Yan & Qin, 2003). This suggests  
90 that Urticaceae are undersampled in Vietnam.

91 The delimitation of *Elatostema* has been controversial with respect to *Elatostematoides*  
92 C.B.Rob., *Pellionia* Gaudich. and *Procris* Comm. ex Juss. Using reconstruction of molecular  
93 phylogeny and re-evaluation of morphological characters of leaves, inflorescences and flowers,  
94 the latest study (Tseng et al., in press) demonstrates that *Elatostema* is a monophyletic group  
95 which includes *Pellionia* but excludes *Procris*, *Elatostematoides* and *Pellionia repens* (Lour.)  
96 Merr.

97 Despite the large number of species descriptions and numerous revisions of *Elatostema* in  
98 China (Wang, 1980; Wang & Chen, 1995; Lin et al., 2003; Wei et al., 2011; Wang, 2014; Wang,  
99 2016), there has been little work on the Southeast Asian taxa (Robinson, 1910; Gagnepain, 1930;  
100 Yahara, 1984; Beaman, 2001; Ho, 2003; Hiep, 2005). In addition, the most recent world-scale  
101 revision of this genus was undertaken in the 1930s before much of the region had been extensively  
102 covered by collections (Schroeter & Winkler, 1935; Schroeter & Winkler, 1936). Lack of  
103 taxonomic effort combined with high species diversity of *Elatostema*, high rate of species  
104 discovery and the frequency of point endemism has resulted in many Southeast Asian and world  
105 herbaria having significant numbers of undetermined *Elatostema* collections. The lack of a  
106 comprehensive species and distribution list for *Elatostema* in Vietnam therefore represents a  
107 barrier not only to its study but also to the assessment of extinction threats, conservation and  
108 sustainable use.

109 The first checklist of *Elatostema* in Vietnam (Gagnepain, 1930) documented 34 species  
110 (together with *Pellionia*). This was followed by two studies (Ho, 2003; Hiep, 2005) which  
111 documented 35 species and 32 species (together with *Pellionia*) respectively. Since that time  
112 further 27 species have been recorded from Vietnam in regional floras and checklists and other  
113 works (Wang, 1983; Wang & Chen, 1995; Lin, Friis & Wilmot-Dear, 2003; Lin, 2008; Lin et al.,  
114 2011; Fu et al., 2013; Fu et al., 2014a; Fu et al., 2014b; Lin, Duan & Bi, 2014a; Lin, Duan & Bi,  
115 2014b; Wang, 2014; Do et al., 2017) and several species have had their circumscription changed  
116 (Shao, Lin & Duan, 2004; Wang, 2016). The generic placement of some species was also  
117 reevaluated (see above). Considering these numerous additions, our ongoing research in Southeast  
118 Asian *Elatostema*, the recently revised genus circumscription (Tseng et al., in press) and the need  
119 to critically assess the extinction threat of the species we decided to produce an updated checklist  
120 to support further taxonomic and broader scientific studies.

121

## 122 **Materials & Methods**

123 Fieldtrips were undertaken by two groups, a Sino-Vietnamese Group (SVG) and a Russian-  
124 Vietnamese Group (RVG). Between 2012 and 2017, SVG undertook five fieldtrips to the  
125 provinces or cities of Bac Kan, Cao Bang, Ha Giang, Ha Noi, Hai Phong, Hoa Binh, Nghe An,  
126 Lang Son, Lao Cai, Ninh Binh, Quang Binh, Thanh Hoa, Tuyen Quang and Vinh Phuc in northern  
127 Vietnam. During the course of these trips SVG made ca. 100 *Elatostema* collections. Over the last  
128 30 years RVG has undertaken dozens of fieldtrips throughout Vietnam, which have resulted in ca.  
129 200 *Elatostema* collections. In addition to field collecting we reviewed ca. 1000 specimens of  
130 *Elatostema* at A, BM, GXMI, HN, IBK, IBSC, K, KUN, LE, MHA, MO, MPU, MW, P, PE, SING,  
131 TAI and VNMN. This was accompanied by a literature review which encompassed species  
132 protologues, the most recent monographs (Schroeter & Winkler, 1935; Schroeter & Winkler,  
133 1936), and regional checklists (Robinson, 1910; Gagnepain, 1930; Backer, 1965; Yahara, 1984;  
134 Ho, 2003; Hiep, 2005; Wang, 2014; Wang, 2016). Using these sources of information, we have  
135 generated a preliminary species list. We then confirmed or refuted each name on the list against

136 type material, either the original specimens or high resolution images of them, using the  
137 subscription-based full version of The JSTOR Global Plants portal (2017) and online databases of  
138 some well-digitized herbaria (e.g. E, K, P, PE) and consulting original description of each species  
139 so that only names for which a herbarium specimen or field image could be confidently associated  
140 with a type image or specimen or original description were included in the final checklist.

141 We used the morphological species concepts (Schroeter & Winkler, 1935; Schroeter &  
142 Winkler, 1936; Wang, 1980; Wei, Monro & Wang, 2011; Wang, 2014) to delimit species. These  
143 concepts place emphasis on peduncle bract shape and length, the number, morphology and  
144 arrangement of the bracts comprising the receptacle-like involucre, the number of bracteoles per  
145 flower and leaf lamina length/width ratios. Material was examined under a Changfang XTL-240  
146 binocular microscope and Planapo lens at  $\times 14$  to  $\times 90$  magnifications.

147 For counting the diversity and endemism of *Elatostema* across floristic regions, we followed  
148 the concepts of Takhtajan (1978; Takhtajan, 1986) and Averyanov et al. (2003a) to assign the  
149 location of each specimen to particular floristic region. The specimens without detailed localities  
150 that could not be assigned with confidence to a floristic region were not used in this analysis.

151

## 152 **Results**

### 153 *Diversity & endemism*

154 We document 77 taxa of *Elatostema* in Vietnam, 14 taxa (18%) of which are endemic to the  
155 country. These taxa comprise 75 species, two of which are represented each by two taxa of a lower  
156 level (varieties and subspecies). Table 1 provides a summary of the species richness, national  
157 endemism, and new national records identified here, per floristic region. Figures 3–5 provide field  
158 images of a representative sample of these species.

159 We document the greatest species richness in northern Vietnam (Cao Bang, Ha Giang, Lao  
160 Cai provinces) and the lowest species richness in eight scattered provinces across northern to  
161 central Vietnam and 25 southernmost provincial units where no *Elatostema* species have been  
162 documented: Bac Ninh, Ha Nam, Hai Duong, Hung Yen, Nam Dinh, Thai Binh, Yen Bai (North),



163 Da Nang City (Central) and An Giang, Ba Ria-Vung Tau, Bac Lieu, Ben Tre, Binh Dinh, Binh  
164 Duong, Binh Phuoc, Binh Thuan, Ca Mau, Can Tho City, Dak Nong, Dong Nai, Dong Thap, Hau  
165 Giang, Ho Chi Minh City, Kien Giang, Long An, Ninh Thuan, Phu Yen, Quang Ngai, Soc Trang,  
166 Tay Ninh, Tien Giang, Tra Vinh, and Vinh Long (South, Fig. 6). We recovered the greatest  
167 number of species endemic to the country in northern Vietnam (particularly Bac Kan province and  
168 Ha Noi City) (Fig. 6).

169

#### 170 *Relationship among floristic regions*

171 Figure 7 provides the proportion of diversity and endemism and the relationship of each floristic  
172 region. The order of the proportion of diversity of two floristic regions is the following: South  
173 Chinese - North Indochinese (49.2%) > Sikang-Yunnan - North Indochinese (46.9%) > Sikang-  
174 Yunnan - South Chinese (35.8%) > Central Annamese - South Annamese (35.3%) > North  
175 Indochinese - Central Annamese (30.0%) > South Chinese - Central Annamese (20.7%) > North  
176 Indochinese - South Annamese (19.4%) > Sikang-Yunnan - South Annamese (13.2%) > South  
177 Chinese - South Annamese (13.0%) > Sikang-Yunnan - Central Annamese (10.6%).

178

#### 179 *New records, new combinations, new names & synonymy*

180 We found 19 new records of *Elatostema* for Vietnam, i.e. *E. attenuatoides* W.T.Wang, *E.*  
181 *austrosinense* Y.H.Tseng & A.K.Monro *nom. nov.*, *E. backeri* H.Schroet., *E. brunneinerve*  
182 W.T.Wang, *E. crassiusculum* W.T.Wang, *E. crenatum* W.T.Wang, *E. fengshanense* W.T.Wang &  
183 Y.G.Wei, *E. glochidioides* W.T.Wang, *E. malacotrichum* W.T.Wang & Y.G.Wei, *E.*  
184 *nanchuanense* W.T.Wang, *E. oblongifolium* Fu, *E. obtusum* Wedd., *E. oppositum* Q.Lin &  
185 Y.M.Shui, *E. pergameneum* W.T.Wang, *E. prunifolium* W.T.Wang, *E. pseudolongipes*  
186 W.T.Wang & Y.G.Wei, *E. pycnodontum* W.T.Wang, *E. salvinoides* W.T.Wang, and *E.*  
187 *xichouense* W.T.Wang. All new records came from the northern provinces: Cao Bang, Ha Giang,  
188 Lao Cai, Dien Bien, Lang Son, Phu Tho, Bac Kan, Hoa Binh and Ninh Binh (Table 1); all of them  
189 are also known from the neighbouring regions of China, i.e. Guangxi, Guizhou and Yunnan. Of the

190 Vietnamese provinces, Cao Bang and Ha Giang had the greatest number of new records.

191 We place *Elatostema baviensis* Gagnep. in synonymy of *E. platyphyllum* Wedd. based on the  
192 characters of large lamina (10–25 × 4–7.5 cm) with auriculate base, large stipule (15–25 × 3–5.5  
193 mm) and pistillate inflorescence with short peduncle and obvious receptacle. Then, we place *E.*  
194 *colaniae* Gagnep. in synonymy of *E. myrtilus* Hand.-Mazz. based on the characters of small  
195 lamina (13–28 × 6–10 mm) with auriculate base and furfuraceous stem base. We also place  
196 *Pellionia macroceras* Gagnep. in synonymy of *E. hookerianum* Wedd. based on the characters of  
197 falcate lamina with cordate base. Finally, we place *P. tetramera* Gagnep. in synonymy of *E.*  
198 *dissectum* Wedd. based on the characters of oblong-lanceolate lamina and staminate inflorescence  
199 with long peduncle. In addition and in line with the study by Tseng et al. (in press), we transfer all  
200 previously known *Pellionia* species found in Vietnam (except for *P. repens*) to *Elatostema*  
201 including ten new combinations and two new names proposed accordingly.

202

## 203 Discussion

### 204 Diversity & endemism

205 Our checklist of *Elatostema* in Vietnam doubles the number of species cited in the most  
206 recent checklist (Hiep, 2005) bringing the total diversity to 77 taxa (75 species). This is the product  
207 of both recent checklists for the region, field collecting and herbarium specimen examination,  
208 aided by the availability of protologues, type images and other collections online (e.g. The JSTOR  
209 Global Plants portal, 2017; Seregin, 2018).

210 We also document that species richness and endemism increase with latitude, away from the  
211 equator. Whilst counter-intuitive, a similar pattern has been documented for the diversity of  
212 *Begonia* L. (Averyanov & Nguyen, 2012) and Orchidaceae (Averyanov et al., 2003a). This is  
213 likely a reflection of the distribution of karst in Vietnam with which *Elatostema* (Wang 2014),  
214 *Primulina* Hance (Kong et al., 2017) and *Begonia* (Chung et al., 2014) species richness in  
215 Southeast Asia is strongly associated rather than *Elatostema*'s preference for a more seasonal or  
216 cooler climate. Given the total absence of *Elatostema* records from Vietnam's southernmost

217 provinces this pattern may also have been over-emphasised by unequal sampling effort across the  
218 country as well as by unequal distribution of intact vegetation. Indeed, the southernmost provinces  
219 are largely plain and therefore occupied by agricultural landscapes.

220 The documented 18% level of endemism of the *Elatostema* taxa in Vietnam is nearly twice  
221 the average for the country's flora (10%, Pilgrim & Tu, 2007) and comparable to that in the most  
222 species-rich family Orchidaceae (19%, Averyanov et al., 2003a). However, this level is still lower  
223 than the corresponding level in Guizhou (39%), Guangxi (64%) and Yunnan (71%) of China,  
224 which are well documented (Wang, 2014). As in China, an association with karst is likely the  
225 driver for much of this diversity indicating Vietnam's capacity of higher endemism which is likely  
226 to be revealed when *Elatostema* is comprehensively documented. Current researches (Chung et al.,  
227 2014; Kong et al., 2017) suggest that rates of karstification over time, and likely in the Miocene,  
228 associated with seasonal climate and temperature, may have driven speciation on karst. Species  
229 that were able to adapt to what is a relatively inhospitable substrate speciating as karst habitat was  
230 formed. It is notable that of the documented genera that have 'radiations' associated with karst, i.e.  
231 *Begonia*, *Impatiens* L., *Primulina* and *Elatostema*, all are mostly herbaceous, three of the four are  
232 succulent, three of the four are insect-pollinated and all have seeds that are abiotically rather than  
233 animal dispersed.

234

### 235 *Comparison of diversity among floristic regions, and reasons of its differences*

236 Among the six floristic regions delimited in Vietnam (see Fig. 2; Takhtajan, 1978; Takhtajan,  
237 1986; Averyanov et al., 2003a), we found the greatest species richness and endemism in the South  
238 Chinese Floristic Region (Figs. 6–7; see Table 1). We attribute this to widespread presence of karst,  
239 monsoon tropical climate with cold winter and summer rains and tropical forests (Fig. 2) with  
240 which *Elatostema* species richness and endemism is known to be associated (Wang, 2014). For  
241 example, the checklist of *Elatostema* in China documented 184 out of the 280 species recorded as  
242 restricted to karst, many of which are range-restricted endemics (Wang, 2014). A similar pattern in  
243 species richness in Vietnam has been documented for *Begonia* by Averyanov & Nguyen (2012)

244 who also ascribe part of this richness to the presence of karst in this floristic region.

245       The second highest species diversity and endemism occurred in Sikang-Yunnan Floristic  
246 Region. Notably, this region occupies one of the smallest areas in Vietnam, comparable only with  
247 the area of South Annamese Region; this indicates extraordinarily high average *Elatostema*  
248 species density in the Sikang-Yunnan Floristic Region. This region lies within the SSE extension  
249 of the Himalayan Highlands. It can be compared with another representative Himalayan area, i.e.  
250 Xizang province, which is the fourth most species-rich province for *Elatostema* in China (Wang,  
251 2014). Within Sikang-Yunnan Floristic Region, 17 species of *Elatostema* (22.7% of the species  
252 that we document for Vietnam) occur in Hoang Lien Son Range of Lao Cai province. It is notable  
253 that Sikang-Yunnan Floristic Region is the only one within the territory of Vietnam which  
254 represents the Holarctic floristic kingdom, while the other five regions belong to the Palearctic  
255 floristic kingdom (Takhtajan, 1978; Takhtajan, 1986; Averyanov et al., 2003a; Averyanov et al.,  
256 2003b). This explains the high diversity of *Elatostema* in this region, as this genus is also known to  
257 be mostly associated with the southern part of the Holarctic kingdom (Wang, 2014).

258       The next most important floristic region for species richness and endemism of *Elatostema* in  
259 Vietnam is the North Indochinese Floristic Region (Fig. 7; Table 1). It possesses the same species  
260 number as the previous region and a single national endemic species instead of two. This region  
261 covers a chain of continuous limestone plateaux (Averyanov et al., 2003a). Monsoon tropical  
262 climate with cold winter and summer rains is typical of the largest part of the northern portion (Fig.  
263 2) which is similar to those found in the South Chinese Region. Therefore, the diversity and  
264 endemism of this floristic region share similar pattern to the South Chinese Region which is  
265 congruent with our result that nearly half of species (49.2%) co-existed. This region also includes  
266 the southern extension of the Himalayan Highlands and our result revealed 46.9% co-existed  
267 species (Fig. 7) between it and Sikang-Yunnan Region, which also suggests their similarity. It  
268 should also be taken into account that North Indochinese Floristic Region occupies almost the  
269 largest area within Vietnam, comparable only with the area of South Indochinese Region.  
270 Therefore the high species diversity in this region is also an effect of its large territory.

271 We found low species richness and endemism in the Central Annamese Floristic Region (Fig.  
272 6; see Table 1). The representative provinces of this floristic region are Quang Tri and Thua Thien-  
273 Hue which contain karst mountains and a climate very similar to that of the North Indochinese  
274 Floristic Region (Averyanov et al., 2003a); besides, 30.0% of species co-occurred in these two  
275 floristic regions (Fig. 7). We would therefore expect species richness and endemism in Central  
276 Annamese Floristic Region to be similar to those in the North Indochinese Floristic Region rather  
277 than lower (Table 1). We would also expect the diversity to be higher (rather than the same) in the  
278 Central Annamese Floristic Region than in the South Annamese Floristic Region, as the latter  
279 lacks karst and experiences drier climate. We also found 31.3% species shared between Central  
280 Annamese and South Annamese Floristic Regions. Therefore we propose that both of these  
281 phenomena reflect a lack of collecting effort.

282 South Indochinese Floristic Region, the largest in Vietnam (Fig. 2), comprises lowland area  
283 of 23 provincial units and yet we document no species records from all of them (Fig. 6). This is  
284 unlikely to be due to the absence of karst, edaphic factors or climate alone. Whilst this floristic  
285 region has little karst (Kien Giang province only), it does have multiple climate types (Fig. 1) and  
286 significant forest cover (Global Forest Watch, 2014) which elsewhere in SE Asia would support a  
287 diversity of *Elatostema* species (Robinson, 1910; Conn, 2008). Again we propose that this absence  
288 of records is the result of a lack of collecting effort rather than a consequence of total absence of  
289 this genus. This inference is also supported by the absence of known *Elatostema* collections from  
290 several Vietnamese provinces surrounded by areas with rather high diversity of this genus: Yen  
291 Bai, Thai Binh, Nam Dinh, Bac Ninh, Hai Duong, Hung Yen, Ha Nam, Da Nang, Quang Ngai and  
292 Binh Dinh. We therefore propose that South Indochinese Floristic Region should be of a high  
293 priority for subsequent studies of *Elatostema* in Vietnam.

294

## 295 **Conclusions**

296 This study combines taxonomic and field expertise from China, Russia, the United Kingdom  
297 and Vietnam. It has strongly benefited from the availability of type images online which has

298 accelerated the process of identification and the evaluation of taxon names. Ongoing research to  
299 document the floras of Cambodia, Laos, Thailand and Vietnam provides a huge opportunity for the  
300 taxonomy of *Elatostema*. Once combined with the completed Flora of China and Flora Malesiana  
301 accounts our updated checklist for Vietnam will fill a significant knowledge gap for this species-  
302 rich genus and lay the foundations for a global checklist. This fourth checklist for Vietnam not  
303 only doubles estimates of the diversity of the genus, it also identifies major knowledge gaps for the  
304 country, i.e. central Vietnam and most notably, southern Vietnam. We propose that greater  
305 sampling effort of the flora of central Vietnam and southern Vietnam will result in a number of  
306 new additions to the flora of the country.

307

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314

### 315 **References**

- 316 Averyanov LV, Loc PK, Hiep NT, Harder DK. 2003a. Phytogeographic review of Vietnam and  
317 adjacent areas of Eastern Indochina. *Komarovia* 3: 1–83.
- 318 Averyanov LV, Loc PK, Hiep NT, Doan DT. 2003b. Highland vegetation and flora of Van Ban  
319 District, Lao Cai province in northern Viet Nam. *Turczaninowia* 6: 47–86.
- 320 Averyanov L, Cribb PJ, Phan KL, Nguyen TH. 2003c. Slipper orchids of Vietnam: with an  
321 introduction to the Flora of Vietnam. Kew: Royal Botanic Gardens, Kew 308p.
- 322 Averyanov LV, Nguyen HQ. 2012. Eleven new species of *Begonia* L. (Begoniaceae) from Laos  
323 and Vietnam. *Turczaninowia* 15: 5–32.
- 324 Backer CA. 1965. *Elatostema*. In: Backer CA & Bakhuizen van den Brink Jr RC, Eds. *Flora of*

- 325 *Java*, vol. 2. N v P. Noordhoff, Groningen, 42–44.
- 326 Beaman RS. 2001. Phylogeny and biogeography of *Elatostema* (Urticaceae) from Mount Kinabalu.  
327 *Sabah Parks Nature Journal* 4: 71–93.
- 328 BirdLife International. 2002. *Directory of IBAs in Vietnam*. Available at  
329 <http://www.birdlifeindochina.org/datazone/12> (accessed 30 May 2013).
- 330 Chung KF, Leong WC, Rubite R, Repin R, Kiew R, Liu Y, Peng CI. 2014. Phylogenetic analyses  
331 of *Begonia* sect. *Coelocentrum* and allied limestone species of China shed light on the  
332 evolution of Sino-Vietnamese karst flora. *Botanical Studies* 55: 1–15 DOI 10.1186/1999-  
333 3110-55-1.
- 334 Conn BJ. 2008. *Census of vascular plants of Papua New Guinea*. Available at  
335 <http://www.pngplants.org/PNGCensus> (accessed 23 March 2018).
- 336 Conn BJ, Hadiyah JT. 2009. Nomenclature of tribes within the Urticaceae. *Kew Bulletin* 64:349–  
337 352 DOI 10.1007/s12225-009-9108-4.
- 338 De Queiroz JS, Griswold D, Nguyen DT, Hall P. 2013. *Vietnam tropical forest and biodiversity*  
339 *assessment*. USAID Vietnam.
- 340 Do VT, Lin Y, Tran NH, Wei YG. 2017. *Elatostema kimhyense* (Urticaceae), a new species from  
341 Vietnam. *Bulletin of Botanical Research* 37: 321–324.
- 342 Friis I. 1989. Urticaceae. In: Polhill RM, ed. *Flora of tropical East Africa*. Rotterdam: A.A.  
343 Balkema, 1–64.
- 344 Fu LF, Do VT, Wen F, Liu SY, Wei YG. 2013. New records of *Elatostema* and *Pellionia*  
345 (Urticaceae) from Vietnam. *Guihaia* 33: 801–803.
- 346 Fu LF, Do VT, Wen F, He CX. 2014a. *Elatostema arcuatobracteatum* (Urticaceae), a new species  
347 from Vietnam. *Phytotaxa* 174: 111–115 DOI 10.11646/phytotaxa.174.2.6
- 348 Fu LF, Huang SL, Liu Y, Do VT, Wen F, Wei YG. 2014b. A newly recorded species of  
349 *Elatostema* (Urticaceae) from Vietnam. *Taiwania* 59: 281–286 DOI 10.6165/tai.2014.59.281.
- 350 Fu LF, Su LY, Mallik A, Wen F, Wei YG. 2017. Cytology and sexuality of 11 species of  
351 *Elatostema* (Urticaceae) in limestone karsts suggests that apomixis is a recurring

- 352       phenomenon. *Nordic Journal of Botany* 35: 251–256 DOI 10.1111/njb.01281.
- 353 Gagnepain F. 1928. *Pellionia* nouveaux d'Indo-Chine. *Bulletin de la Société Botanique de France*  
354       75: 917–928 DOI 10.1080/00378941.1928.10837115.
- 355 Gagnepain F. 1929. Quelques *Elatostema* et un *Procris* nouveaux d'Indo-Chine. *Bulletin de la*  
356       *Société Botanique de France* 74: 80–82 DOI 10.1080/00378941.1929.10837147.
- 357 Gagnepain F. 1930. *Pellionia* Gaudich. In: Lecomte MH, Ed. *Flore générale de l'Indo-Chine*.  
358       Masson et Cie, Paris, 5: 892–921.
- 359 Global Forest Watch. 2014. *Interactive Map*. World Resources Institute. Available from:  
360       [www.globalforestwatch.org](http://www.globalforestwatch.org) (accessed: 10 January 2018).
- 361 Hiep NT. 2005. Urticaceae Juss. 1789. In: Ban NT, Ed. *Checklist of plant species of Vietnam*, vol.  
362       3. Agriculture Publishing House, Hanoi, 209–226.
- 363 Ho PH. 2003. *An Illustrated Flora of Vietnam* Vol. 2. NXB Tre Press, Ho Chi Minh, 589–593.
- 364 Kong H, Condamine FL, Harris AJ, Chen J, Pan B, Möller M, Hoang VS, Kang M. 2017. Both  
365       temperature fluctuations and East Asian monsoons have driven plant diversification in the  
366       karst ecosystems from southern China. *Molecular Ecology* 26: 6414–6429 DOI  
367       10.1111/mec.14367.
- 368 Lahav-Ginott S, Cronk QCB. 1993. The mating system of *Elatostema* (Urticaceae) in relation to  
369       morphology: a comparative study. *Plant Systematics and Evolution* 186: 135–145 DOI  
370       10.1007/BF00940793.
- 371 Lin Q. 2008. A revision of *Elatostema* section *Weddelia* series *Salvinioidea* (Urticaceae). *Botanical*  
372       *Journal of the Linnean Society* 158: 62–66 DOI 10.1111/j.1095-8339.2008.00848.x.
- 373 Lin Q, Duan LD, Yang ZR. 2009. Lectotypifications of thirty-one names in *Elatostema*  
374       (Urticaceae). *Acta Botanica Boreali-Occidentalia Sinica* 29: 1909–1914.
- 375 Lin Q, Friis I, Wilmot-Dear MC. 2003. *Pellionia & Elatostema*. In: Wu Z, Raven PH, Eds. *Flora*  
376       *of China*, vol. 5. Science Press, Beijing and Missouri Botanical Garden Press, St. Louis, 74–  
377       189.
- 378 Lin Q, Yang ZR. 2010. Lectotypifications of thirteen names in *Pellionia* (Urticaceae). *Bulletin of*



- 379 *Botanical Research* 30: 4–7.
- 380 Lin Q, Yang ZR, Duan LD, Gao TG. 2011. Miscellaneous taxonomic notes on *Elatostema*  
381 (Urticaceae) from China and its adjacent area. *Nordic Journal of Botany* 29:590–597 DOI  
382 10.1111/j.1756-1051.2011.01060.x.
- 383 Lin Y, Duan LD, Bi HY. 2014a. Two newly recorded species of *Pellionia* (Urticaceae) from  
384 Vietnam. *Guihaia* 34: 673–674.
- 385 Lin Y, Duan LD, Bi HY. 2014b. A new variety and two new records of *Elatostema* J. R. Forster &  
386 G. Forster (Urticaceae) from Vietnam. *Bangladesh Journal of Plant Taxonomy* 21(1):27–32  
387 DOI 10.3329/bjpt.v21i1.19254.
- 388 Mittermeier RA, Robles Gil P, Hoffmann M, Pilgrim JD, Brooks TM, Mittermeier CG, Fonseca  
389 GAB da. 2004. *Hotspots revisited: Earth's biologically richest and most endangered*  
390 *terrestrial ecoregions*. Cemex, Mexico.
- 391 Monro AK, Bystriakova N, Fu L, Wen F, Wei Y. 2018. Discovery of a diverse cave flora in China.  
392 *Plos One* 13: e0190801 DOI 10.1371/journal.pone.0190801.
- 393 Newman M, Ketphanh S, Svengsuksa B, Thomas P, Sengdala K, Lamxay V, Armstrong K. 2007.  
394 *A Checklist of the Vascular Plants of Lao PDR*. Royal Botanic Garden Edinburgh Press,  
395 Edinburgh.
- 396 Nguyen KV, Nguyen TH, Phan KL, Nguyen TH. 2000. Bioclimatic diagrams of Vietnam. Hanoi.
- 397 Peel MC, Finlayson BL, McMahon TA. 2007. Updated world map of the Köppen-Geiger climate  
398 classification. *Hydrology and Earth System Sciences* 11: 1633–1644 DOI 10.5194/hess-11-  
399 1633-2007.
- 400 Pilgrim JD, Tu ND. 2007. *Background paper on threatened and alien species in Vietnam and*  
401 *recommendations for the content of the Biodiversity Law*. Report to the Department of  
402 Environment, Ministry of Natural Resources and Environment. BirdLife International  
403 Vietnam Programme, Hanoi.
- 404 Robinson CB. 1910. Philippine Urticaceae. *Philippine Journal of Science C. Botany* 5: 465–542.
- 405 Schroeter H, Winkler H. 1935. Monographie der Gattung *Elatostema* s.l.: Allgemeiner Teil.

- 406 *Repertorium Specierum Novarum Regni Vegetabilis* 83: 1–71.
- 407 Schroeter H, Winkle H. 1936. Monographie der Gattung *Elatostema* s.l.: Spezieller Teil.
- 408 *Repertorium Specierum Novarum Regni Vegetabilis* 1936: 1–237.
- 409 Seregin A. (Ed.) 2018. *Moscow University Herbarium (MW). Version 1.14.*
- 410 <https://doi.org/10.15468/cpnhcc>.
- 411 Shao Q, Lin Q, Duan LD. 2004. A new synonym of *Pellionia radicans* (Urticaceae). *Acta*
- 412 *Phytotaxonomica Sinica* 42: 571–572.
- 413 Takhtajan A. 1978. *The floristic regions of the world*. Nauka, Leningrad.
- 414 Takhtajan A. 1986. *Floristic Regions of the World*. University of California Press, Berkeley, Los
- 415 Angeles, London.
- 416 The JSTOR Global Plants portal. *Elatostema & Pellionia*. Available at <http://plants.jstor.org/>
- 417 (accessed 30 May 2017)
- 418 The Plant List. 2018. Version 1.1. Available from: <http://www.theplantlist.org/> (accessed: 6 April
- 419 2018).
- 420 Tseng YH, Monro AK, Wei YG, Hu JM. in press. Molecular phylogeny and morphology of
- 421 *Elatostema* s.l. (Urticaceae): implications for inter- and infrageneric classification. *Molecular*
- 422 *Phylogenetics and Evolution*.
- 423 Wang WT. 1980. Classificatio specierum Sinicarum *Elatostematis* (Urticaceae). *Bulletin of*
- 424 *Botanical Laboratory of North-Eastern Forestry Institute* 7: 40–41, 49–50.
- 425 Wang WT. 1983. Notulae de *Pellionia Elatostemateque* (Urticaceae). *Bulletin of Botanical*
- 426 *Research* 3: 56–66.
- 427 Wang WT. 1993. Four new species of *Elatostema* (Urticaceae) from China. *Acta Phytotaxonomica*
- 428 *Sinica* 31: 170–175.
- 429 Wang WT. 2014. *Elatostema* (Urticaceae) in China. Qingdao Publishing House Qingdao.
- 430 Wang WT. 2016. Nova classification specierum sinensium *Pellioniae* (Urticaceae). *Guihaia* 36:
- 431 1–29.
- 432 Wang WT, Chen CJ. 1995. *Pellionia & Elatostema*. In: Wang, W.T. & Chen, C.J. (Eds.) *Flora*

- 433       Reipublicae Popularis Sinicae 23. Science Press, Beijing, 160–317.
- 434 Wei YG, Wang WT. 2009. Notes on *Elatostema* J. R. et G. Forst. (Urticaceae) from Guangxi.
- 435       *Guihaia* 29: 711–718.
- 436 Wei YG, Monro AK, Wang WT. 2011. Additions to the Flora of China: seven new species of
- 437       *Elatostema* (Urticaceae) from the karst landscapes of Guangxi and Yunnan. *Phytotaxa* 29:1–
- 438       27 DOI 10.11646/phytotaxa.29.1.1.
- 439 Yahara T. 1984. *Pellionia* and *Elatostema* in Thailand. Taxonomic studies of Urticaceae II.
- 440       *Journal of the Faculty of Science of the University of Tokyo III* 13:483–499.
- 441 Zhu H. 2017. Tropical flora of southern China. *Biodiversity Science* 25: 204–217 DOI
- 442       10.17520/biods.2016055.
- 443 Zhu H, Yan LC, Qin HN. 2003. Floristic composition and characteristics of Vietnamese flora.
- 444       *Acta Scientiarum Naturalium Universitatis Sunyatseni* 42: 98–102.
- 445
- 446
- 447 Table 1. The species richness, endemism, and new records identified per Floristic Region
- 448
- 449 Figure caption:
- 450
- 451 Figure 1. Climate map of Vietnam (original, based on Nguyen et al. 2000).
- 452
- 453 Figure 2. Map of floristic regions in Vietnam. (original, first published by Averyanov *et al.* 2003c,
- 454 with modifications).
- 455
- 456 Figure 3. Plate I of representative *Elatostema* species in Vietnam: A, *E. crassiusculum*; B, *E.*
- 457 *glochidioides*; C, *E. hookerianum*; D, *E. prunifolium*; E, *E. arcuatobracteatum*; F, *E. retrohirtum*;
- 458 G, *E. obtusum*; H, *E. ramosum*; I, *E. integrifolium*; J, *E. fengshanense*; K, *E. austrosinense*; L, *E.*
- 459 *malacotrichum*.

460

461 Figure 4. Plate II of representative *Elatostema* species in Vietnam: A, *E. heterolobum*; B, *E.*  
462 *atroviride*; C, *E. tenuicaudatum*; D, *E. nasutum*; E, *E. cyrtandrifolium*; F, *E. backeri*; G, *E.*  
463 *veronicoides*; H, *E. dissectum*; I, *E. atropurpureum*; J, *E. paucidentatum*; K, *E. lineolatum*; L, *E.*  
464 *xanthophyllum*.

465

466 Figure 5. Plate III of representative *Elatostema* species in Vietnam: A, *E. caulialatum*; B, *E.*  
467 *radicans*; C, *E. tsoongii*; D, *E. sinense*; E, *E. brevifolium*; F, *E. macintyreii*; G, *E. balansae*; H, *E.*  
468 *myrtillus*; I, *E. platyphyllum*; J, *E. petelotii*; K, *E. longistipulum*; L, *E. pseudolongipes*.

469

470 Figure 6. Variation in *Elatostema* species richness and endemism across provinces of Vietnam  
471 (Based on Vietnam location map.svg (by Uwe Dederling)., CC BY-SA 3.0,  
472 <https://commons.wikimedia.org/w/index.php?curid=17124413>). The tones of green indicate  
473 number of species per province. The red figures in brackets indicate number of national endemic  
474 species recorded for a province where it is non-zero.

475

476 Figure 7. Proportion of diversity and endemism and the relationship of the floristic regions (Large  
477 circles designate floristic regions. Percentage numbers above the line in the large circles indicate  
478 the relative proportion of diversity occurring in a certain region (within Vietnam); percentage  
479 numbers below the line indicate the relative proportion of national endemics occurring in a certain  
480 region; percentage numbers in the small circles indicate the relative proportion of co-exsisted  
481 species occurring in the pairs of region connected by the line and show their relative floristic  
482 relationships).

483 **Appendix. Checklist of *Elatostema* in Vietnam**

484 Species are listed in alphabetical order. Basionyms and synonyms are cited on a separate line  
 485 in alphabetical order. This is followed by the species' global distribution, elevation range within  
 486 Vietnam and the exsiccatee seen for this study. New records for Vietnam are denoted by an '\*'  
 487 next to the name.

488

489 ***Elatostema acuminatum* (Poir.) Brongn.**

490 *Procris acuminata* Poir.

491 *Boehmeria acuminata* Pers., *Elatostema lowii* Stapf., *Elatostema membranaceum* Hassk.,  
 492 *Elatostema membranifolium* Kurz., *Langeveldia acuminata* Gaudich., *Ramium acuminatum* (Pers.)  
 493 Kuntze.

494 Bhutan, China, Indonesia, Malaysia, Myanmar, Nepal, Sikkim, Thailand, Vietnam; 400–  
 495 1650 m.

496 **Cao Bang Province:** Ha Lang District, Dong Loan Municipality, 22°46'N 103°44'E, *L.*  
 497 *Averyanov et al. CBL603* (LE); **Ha Giang Province:** Bac Me District, Phieng Luong Municipality,  
 498 22°39'29"N 105°19'35"E, *L. Averyanov et al. HAL6540* (LE); Quan Ba District, Can Ty  
 499 Municipality, 23°04'N 104°59'E, *N.T. Hiep et al. NTH3622* (LE); Vi Xuyen District, Cao Bo  
 500 Municipality, Tam Ve Village, 22°46'18"N 104°49'01"E, *D.K. Harder et al. 5615* (K, MO); **Ha**  
 501 **Noi City:** Ba Vi District, Ba Vi National Park, 21°04'22"N 105°21'53"E, *L.F. Fu et al.*  
 502 *VMN\_CN35* (IBK, VNMN); **Quang Binh Province:** Minh Hoa District, Dan Hoa Municipality,  
 503 17°45'28"N 105°46'14"E, *L. Averyanov et al. HAL12205* (LE), 17°46'34"N 105°48'56"E, *L.*  
 504 *Averyanov et al. HAL12548* (LE); **Vinh Phuc Province:** Tam Dao District, *L. Averyanov et al.*  
 505 *LX-VN864* (LE).

506

507 ***Elatostema acutidentatum* (W.T.Wang) Y.H.Tseng & A.K.Monro, *comb. nov.***

508 Basionym: *Pellionia acutidentata* W.T.Wang, Bull. Bot. Lab. N.-E. Forest. Inst., Harbin 6: 53.  
 509 1980. Type: China. Yunnan, Xichou county, Fadou village, *C.W. Wang & Y. Liu 85536* (holotype:

510 PE!).

511 China, Vietnam; 1400–1900 m.

512 **Cao Bang Province:** Nguyen Binh District, Nguyen Binh Municipality, 22°37'N 105°52'E, *L.*

513 *Averyanov et al. CBL195* (LE, MO); **Lai Chau Province:** Than Uyen District, Ho Mit

514 Municipality, 22°06'N 103°52'E, *N.T. Hiep et al. NTH2842* (LE); **Lao Cai Province:** Sa Pa

515 District, *Anon. TV-284* (HN); Van Ban District, 21°59'00"N 104°02'00"E, *L. Averyanov et al.*

516 *HAL2215* (LE).

517

518 ***Elatostema albopilosum*** W.T.Wang

519 a. ***Elatostema albopilosum*** var. ***vicinum*** L.D.Duan & Y.Lin

520 Endemic; 200–400 m.

521 **Bac Kan Province:** Cho Don District, Xuan Lac Commune, 22°21'91"N 105°32'95"E, *L.Q.*

522 *Li et al. 0432* (PE); **Tuyen Quang Province:** Na Hang District, *H.N. Qin et al. 319* (PE).

523 This variety is very similar to *E. albopilosum* W.T.Wang var. *albopilosum* and further study  
524 may result in it being treated as a synonym.

525

526 ***Elatostema arcuatobracteatum*** L.F.Fu, V.T.Do & C.X.He

527 Endemic; ca. 500 m.

528 **Ha Giang Province:** Bac Me District, Bac Me Nature Reserve, 22°45'15"N 105°13'43"E,

529 *L.F. Fu et al. VMN\_CN219* (IBK, VNMN).

530

531 ***Elatostema atropurpureum*** Gagnep.

532 China, Vietnam; 300–1150 m.

533 **Cao Bang Province:** Nguyen Binh District, Phia Oac - Phia Den National Park, *F. Wen et al.*

534 *VMN\_CN532* (IBK, VNMN); **Ha Noi City:** Ba Vi District, Ba Vi Mountain, *B. Balansa 2534* (P),

535 21°04.569'N 105°21.765'E, *N.A. Vislobokov & S.P. Kuznetsova s.n.* (MW); **Ha Giang province:**

536 Quan Ba District, Tung Vai Municipality, Thang village, 23°03'13"N 104°51'49"E, *L. Averyanov*

537 *VR558* (LE); **Lao Cai Province**: Sa Pa District, *Sino-Vietnam Expedition 336* (IBSC, PE); Van  
 538 Ban District, Hoang Lien - Van Ban Nature Reserve, *L.F. Fu et al. VMN\_CN920* (IBK, VNMN);  
 539 *P.A. Petelot 5100* (P); **Ninh Binh Province**: Nho Quan District, Cuc Phuong National Park, *F.*  
 540 *Wen et al. VMN\_CN600, VMN\_CN606* (IBK, VNMN); **Phu Tho Province**: Thanh Son District,  
 541 Xuan Son Municipality, Xuan Son National Park, 21°08'00"N 104°55'55"E, *M.S. Nuraliev & N.A.*  
 542 *Vislobokov 1105* (IBK, MW).

543

544 **Elatostema atroviride** W.T.Wang

545 *Elatostema atroviride* var. *lobulatum* W.T.Wang, *E. leiocephalum* W.T.Wang, *E.*

546 *papilionaceum* W.T.Wang.

547 China, Vietnam; 200–1500 m.

548 **Cao Bang Province**: Ha Quang District, Pac Bo, *L.F. Fu et al. VMN\_CN783* (IBK, VNMN);

549 **Ha Giang Province**: Yen Minh District, Lao Va Chai Municipality, 23°07'N 105°08'E, *N.T. Hiep*

550 *et al. NTH3448* (LE); **Hai Phong City**: Cat Hai District, *Y.G. Wei et al. VMN\_CN14* (IBK,

551 VNMN); Cat Hai District, Cat Ba Island, *N. Arnautov et al. LX-VN3626, LX-VN3774, LX-VN3793,*

552 *LX-VN3834* (LE); between Meo Vac District and Dong Van District, 23°15'16"N 105°23'12"E,

553 *L.F. Fu et al. VMN\_CN190* (IBK, VNMN); 22°45'23"N 105°13'46"E, *L.F. Fu et al. VMN\_CN218*

554 (IBK, VNMN); **Hoa Binh Province**: Mai Chau District, Pa Co Municipality, 20°44'32.3"N

555 104°56'26.9"E, *V.X. Phuong et al. HNK639* (K); **Nghe An Province**: Quy Chau District, Pu

556 Huong Natural Reserve, *F. Wen et al. VMN\_CN478* (IBK, VNMN); Con Cuong District, Cay Da

557 Valley, Truong Huong Hamlet, Yen Khe Commune, 19°0'39.3"N 104°51'38"E, *V.D. Nguyen et al.*

558 *HNK2960* (K); **Ninh Binh Province**: Nho Quan District, Cuc Phuong National Park, *J.M. Hu*

559 *Hu2177* (TAI); **Quang Binh Province**: Minh Hoa District, Thong Hoa Municipality, 17°40'N

560 105°57'E, *L. Averyanov et al. VH4797* (LE); Tuyen Hoa District, Lam Hoa Municipality,

561 17°55'41"N 105°49'43"E, *L. Averyanov et al. CPC2620* (LE); **Son La Province**: Moc Chau

562 District, Van Ho Municipality, Hua Tat Village, 20°46'18"N 104°47'45"E, *D.K. Harder et al.*

563 *5774* (HN, K, MO), 20°46'18"N 104°47'29"E, *N.T. Hiep et al. HAL9311* (LE); **Thanh Hoa**

564 **Province:** Quy Chau District, Pu Huong Natural Reserve, *F. Wen et al. VMN\_CN427* (IBK,  
565 VNMN); Thuong Xuan District, Bat Mot Municipality, 20°01'12"N 104°57'48"E, *L. Averyanov et*  
566 *al. CPC6655* (LE).

567

568 \***Elatostema attenuatoides** W.T.Wang

569 China, Vietnam; 500–800 m.

570 **Cao Bang Province:** Ha Lang District, An Lac Municipality, 22°43'N 103°36'E, *L.*

571 *Averyanov et al. CBL786* (LE, MO); Tra Linh District, Quoc Toan Municipality, 22°45'15"N

572 106°17'54"E, *D.K. Harder et al. 4336* (K); 22°45'30"N 106°17'22"E, *L. Averyanov et al. VH4854*

573 (HN, LE, MO), *VH4949* (LE, MO); 22°45'N 106°19'E, *L. Averyanov et al. CBL1256* (LE, MO).

574

575 \***Elatostema austrosinense** Y.H.Tseng & A.K.Monro *nom. nov.*

576 non *E. macrophyllum* Brongn.

577 *Pellionia macrophylla* W.T.Wang, *Acta Bot. Yunnan. 5: 271, 1980*. Type: China. Yunnan,

578 Luchun county, Huanglianshan, *D.D. Tao 845* (holotype: KUN!).

579 China, Vietnam; ca. 1650 m.

580 **Lao Cai Province:** Sa Pa District, Hoang Lien National Park, *L.F. Fu et al. VMN\_CN884*

581 (IBK, VNMN); Van Ban District, 21°58'42"N 104°00'37"E, *L. Averyanov et al. HAL2072,*

582 *HAL2088* (LE).

583 We selected '*austrosinense*' as epithet as it coincides with the origin of its distribution area,

584 South China.

585

586 **Elatostema backanense** (Gagnep.) Y.H.Tseng & A.K.Monro, *comb. nov.*

587 Basionym: *Pellionia backanensis* Gagnep., *Bull. Soc. Bot. France 75: 918. 1928*. Type:

588 Vietnam. Bac Kan, Yen Lac District, *P.A. Eberhardt 4669* (holotype: P!).

589 Endemic; elevation unknown.

590 **Bac Kan Province:** Yen Lac District, *P.A. Eberhardt 4669* (P).



591

592 **\*Elatostema backeri** H.Schroet.

593 China, Indonesia, Vietnam; elevation unknown.

594 **Cao Bang Province:** Bao Lac District, Dinh Phung Municipality, *L.F. Fu et al. VMN\_CN814*595 (IBK, VNMN); Bao Lam District, Tan Viet, Na Dang, *L.F. Fu et al. VMN\_CN829* (IBK, VNMN);596 **Thanh Hoa Province:** Quan Hua District, Pu Luong Nature Reserve. *F. Wen et al. VMN\_CN551*

597 (IBK, VNMN).

598

599 **Elatostema balansae** Gagnep.600 *Elatostema balansae* var. *hispidum* W.T.Wang, *E. platyphyllum* Wedd. var. *balansae*

601 (Gagnep.) Yahara.

602 China, Malaysia, Thailand, Vietnam; 1100–1700 m.

603 **Cao Bang Province:** Nguyen Binh District, Phia Oac - Phia Den Nature Reserve,604 22°37'49"N 105°53'11"E, *L.F. Fu et al. VMN\_CNI70* (IBK, VNMN); **Ha Giang Province:**605 between Meo Vac District and Dong Van District, 23°09'16"N 105°24'52"E, *L.F. Fu et al.*606 *VMN\_CNI92* (IBK, VNMN); **Hoa Binh Province:** Mai Chau District, Hang Kia Municipality,607 20°43'39"N 104°53'43"E, *N.T. Hiep et al. HAL751* (HN); **Lai Chau Province:** Sin Ho District, Ta608 Ngau Municipality, 22°18'N 103°15'E, *N.T. Hiep et al. NTH2783* (LE); **Lam Dong Province:** Lac609 Duong District, Da Chais Municipality, 12°08'N 108°39'E, *L. Averyanov et al. VH4511* (LE, MO);

610 Lac Duong District, Da Chais Municipality, Bi Doup mountains, 12°11'07.0"N 108°42'55.9"E,

611 *A.N. Demidova & N.G. Prilepsky 431* (MW); **Son La Province,** Yen Chau District, Muong Lum612 Municipality, On Oc Village, 20°59'44"N 104°30'03"E, *D.K. Harder et al. 7229* (HN).

613

614 **Elatostema brachyodontum** (Hand.-Mazz.) W.T.Wang615 *Elatostema ficoides* Wedd. var. *brachyodontum* Hand.-Mazz.

616 China, Vietnam; elevation unknown.

617 **Province unknown:** Phuong-Lam, *B. Balansa 2535* (P).

618

619 **Elatostema brevifolium** (Benth.) Hallier f.620 *Pellionia brevifolia* Benth.621 *Amaranthus polychroa* Raeusch., *Elatostema radicans* var. *minimum* (Makino) H.Schroet,622 *Pellionia minima* Makino.

623 China, Japan, Vietnam; 60–1900 m.

624 **Cao Bang Province:** Nguyen Binh District, Phia Oac - Phia Den Nature Reserve,625 22°36'29"N 105°52'15"E, *L.F. Fu et al. VMN\_CN161* (IBK, VNMN); **Lao Cai Province:** Sa Pa626 District, Hoang Lien National Park, Ton Forest Station, *L.F. Fu et al. VMN\_CN915* (IBK, VNMN);627 Sa Pa District, San Sa Ho Municipality, 22°21'10"N 103°46'30"E, *M.S. Nuraliev & D.D. Sokoloff*

628 263 (IBK, K, MW).

629

630 \***Elatostema brunneinerve** W.T.Wang

631 China, Vietnam; 1200–1400 m.

632 **Ha Giang province:** Quan Ba District, Tung Vai Municipality, Thang village, 23°03'42"N633 104°50'42"E, *L. Averyanov et al. VR591* (LE).

634

635 **Elatostema caulialatum** (S.Y.Liou) Y.H.Tseng & A.K.Monro, *comb. nov.*636 Basionym: *Pellionia caulialata* S.Y.Liou, *Guihaia* 3(4): 317. 1983. Type: China. Guangxi,637 Guiping County, Dapingshan, *S.Y. Liu et al. D00322* (holotype: GXMI!, isotypes: PE!).

638 China, Vietnam; 200–415 m.

639 **Bac Kan Province:** Cho Don District, Xuan Lac Community, 22°21.91'N 105°32.95'E, *L.Q.*640 *Li et al. 0386* (HN); Na Ri District, Kim Hy Nature Reserve, 22°17'54"N 106°01'40"E, *L.F. Fu et*641 *al. VMN\_CN128* (IBK, VNMN); **Ha Giang Province:** Meo Vac District, *L.F. Fu et al.*642 *VMN\_CN859* (IBK, VNMN); **Thai Nguyen Province:** Vo Nhai District, Truong Lung643 Municipality, 21°48.75'N 105°58.09'E, *L.Q. Li et al. 0142* (HN); **Tuyen Quang Province:** Na644 Hang District, *Anon. TV-93* (HN).

645

646 **Elatostema chapaense** (Gagnep.) Y.H.Tseng & A.K.Monro, *comb. nov.*

647 Basionym: *Pellionia chapaensis* Gagnep., Bull. Soc. Bot. France 75: 920. 1928. Type:

648 Vietnam. Lao Cai, Sa Pa District, *H. Lecomte & A. Finet 415* (holotype: P!).

649 Endemic; elevation unknown.

650 **Lao Cai Province:** Sa Pa District, *H. Lecomte & A. Finet 415* (P).

651

652 **Elatostema cochinchinense** (Gagnep.) Y.H.Tseng & A.K.Monro, *comb. nov.*

653 Basionym: *Pellionia cochinchinensis* Gagnep., Bull. Soc. Bot. France 75: 921. 1928. Type:

654 Vietnam. Haut Donnai, Con-heu Mountain, *L. Pierre 4814* (holotype: A!).

655 Endemic; elevation unknown.

656 **Province unknown:** Haut Donnai, Con-heu Mountain, *L. Pierre 4814* (A).

657

658 **\*Elatostema crassiusculum** W.T.Wang

659 China, Vietnam; ca. 200 m.

660 **Cao Bang Province:** Bao Lam District, Nam Quang, *L.F. Fu et al. VMN\_CN838* (IBK,

661 VNMN).

662

663 **\*Elatostema crenatum** W.T.Wang.

664 China, Vietnam, elevation unknown.

665 **Phu Tho Province:** Ha Ho District, Ao Chau, *V.X. Phuong 3483* (HN).

666

667 **Elatostema crispulihirtellum** (W.T.Wang) Y.H.Tseng & A.K.Monro, *comb. nov.*

668 Basionym: *Pellionia crispulihirtella* W.T.Wang, Bull. Bot. Res., Harbin 3(3): 57. 1983. Type:

669 China. Yunnan, Pingbian, Shantou county, *C.W. Wang 82383* (holotype: PE!).

670 China, Vietnam; 710 m.

671 **Lao Cai Province:** On the way from Lao Cai to Sa Pa, *Sino-Vietnam Expedition 856* (PE).

672

673 **Elatostema cyrtandrifolium** (Zoll. & Mor.) Miq.674 *Procris cyrtandrifolia* Zoll. & Mor.675 *Elatostema herbaceifolium* Hayata, *E. sessile* var. *cyrtandrifolium* (Zoll. & Mor.) Wedd., *E.*676 *sessile* var. *pubescens* Hook.f., *E. herbaceifolium* Hayata.

677 Bhutan, China, India, Indonesia, Malaysia, Myanmar, Thailand, Vietnam; 200–1050 m.

678 **Cao Bang Province**: Tra Linh District, Luu Ngoc Municipality, 22°47'N 106°18'E, *L.*679 *Averyanov et al. CBL1203* (LE, MO); **Dien Bien Province**: Tua Chua District, Xa Nhe680 Municipality, 21°52'35"N 103°24'21"E, *L. Averyanov et al. CPC2221* (LE); **Ha Giang Province**:681 between Meo Vac District and Dong Van District, 23°13'45"N 105°24'48"E, *L.F. Fu et al.*682 *VMN\_CN244* (IBK, VNMN); Meo Vac District, Sung Cha Municipality, 23°11'N 105°17'E, *N.T.*683 *Hiep et al. NTH3302* (LE); **Hai Phong City**: Cat Hai District, Cat Ba Island, *N. Arnautov et al. LX-*684 *VN3796* (LE); **Ninh Binh Province**: Nho Quan District, Cuc Phuong National Park, *J.M. Hu*685 *Hu2187* (TAI); **Quang Binh Province**: Minh Hoa District, Thong Hoa Municipality, 17°40'N686 105°57'E, *L. Averyanov et al. VH4611* (LE), *VH4793* (HN, LE, MO); **Son La Province**: Moc687 Chau District, Chieng Hac Municipality, 20°51'N 104°38'E, *N.T. Hiep et al. NTH2937* (LE);688 **Thanh Hoa Province**, Quy Chau District, Pu Huong Natural Reserve, *F. Wen et al. VMN\_CN421*

689 (IBK, VNMN).

690

691 **Elatostema dissectum** Wedd., Arch. Mus. Hist. Nat. 9(1–2): 314. 1856. Type: India, Khasia, *D.*692 *Hooker & T. Thomson s.n.* (lectotype: designated by Lin, Duan & Yang, 2009: 1910, P!).693 *Elatostema paragunshanense* W.T.Wang, *Pellionia tonkinensis* Gagnep.694 *Pellionia tetramera* Gagnep., Bull. Soc. Bot. France 75: 925. 1928, *syn. nov.* Type: Vietnam.695 Ba Vi District, Ba Vi Mountain, *B. Balansa 2536* (holotype: P!).

696 Bhutan, China, India, Laos, Sikkim, Thailand, Vietnam; 200–1350 m.

697 **Bac Kan Province**: Phu Thong Hoa, *P.A. Eberhardt 4724* (P); **Ha Noi City**: Ba Vi District,698 Ba Vi National Park, *V.D. Nguyen et al. HNK 1268* (K); Ba Vi District, Ba Vi Mountain, *B.*

699 *Balansa* 2536 (P); **Ha Giang province**: Quan Ba District, Tung Vai Municipality, Thang village,  
700 23°03'13"N 104°51'49"E, *L. Averyanov et al. VR554, VR559, VR563, VR660, VR713* (LE); **Hoa**  
701 **Binh Province**: Da Bac District, Cao Son Municipality, Buoï Truong Station, 20°52'31"N  
702 105°11'48"E, *N.T. Hiep et al. HAL540* (HN, MO); Mai Chau District, *F. Wen et al. VMN\_CN262*  
703 (IBK, VNMN); Mai Chou District, Hang Kia-Pa Co Nature Reserve, *F. Wen et al. VMN\_CN326,*  
704 *VMN\_CN331, VMN\_CN337* (IBK, VNMN); **Kon Tum Province**: Dak Gleï District, *L. Averyanov*  
705 *et al. VHI757* (HN, MO); **Lang Son Province**: Bac Son District, Tan Tri Municipality, *L.*  
706 *Averyanov et al. HAL6783* (LE); **Lao Cai Province**: Sa Pa District, Hoang Lien National Park,  
707 Ton Forest Station, *L.F. Fu et al. VMN\_CN916* (IBK, VNMN); Van Ban District, Khanh Yen Ha  
708 Municipality, to the S of Na Nheo Village, 21°59'04"N 104°15'08"E, *L. Averyanov et al. HAL2814*  
709 (HN, LE); Van Ban District, Nam Xe Municipality, 22°01'27"N 104°00'25"E, *D.K. Harder et al.*  
710 *DKH7051* (LE); **Nghe An Province**: Con Cuong District, Chau Khe Municipality, Pu Mat  
711 National Park, 18°55'56"N 104°35'01"E, *M.S. Nuarliev 2128* (MW); Quy Chau District, Pu Huong  
712 Natural Reserve, *F. Wen et al. VMN\_CN486* (IBK, VNMN); Tuong Duong District, Tam Hop  
713 Municipality, 19°05'07"N 104°20'55"E, *L. Averyanov et al. HLF7074* (LE); **Quang Binh**  
714 **Province**: Minh Hoa District, Dan Hoa Municipality, 17°41'50"N 105°45'54"E, *L. Averyanov et al.*  
715 *HAL12410* (LE); **Quang Tri Province**: Huong Hoa District, Huong Viet Municipality,  
716 16°51'14"N 106°34'13"E, *N.T. Hiep et al. HLF5947* (LE); **Son La Province**: Chieng Yen District,  
717 *N.H. Hien et al. VN239* (HN); **Tuyen Quang Province**: Bach Ngoc, *P.A. Eberhardt 4818* (P); Na  
718 Hang District, Vinh Yen Municipality, 22°21'09"N 105°25'20"E, *L.V. Cham et al. HLF299* (HN).

719 We place *Pellionia tetramera* in synonymy based on its shared characters with *Elatostema*  
720 *dissectum*: oblong-lanceolate lamina and staminate inflorescence with long peduncle.

721

722 ***Elatostema eberhardtii*** (Gagnep.) Y.H.Tseng & A.K.Monro, *comb. nov.*

723 Basionym: *Pellionia eberhardtii* Gagnep., Bull. Soc. Bot. France 75: 921. 1928. Type:

724 Vietnam. Quang Tri, Cu Bi, *P.A. Eberhardt 1962* (holotype: P!).

725 Endemic; elevation unknown.

- 726 **Quang Tri Province:** Cu Bi, *P.A. Eberharadt 1962 (P)*.  
727
- 728 **Elatostema eurhynchum** Miq.  
729 Indonesia, Vietnam; 1600 m.
- 730 **Kon Tum Province:** Dak Glei District, 15°04'00"N 107°59'00"E, *L. Averyanov et al. VH797*  
731 (HN, LE, MO).  
732
- 733 **\*Elatostema fengshanense** W.T.Wang & Y.G.Wei  
734 China, Vietnam; elevation unknown.
- 735 **Cao Bang Province:** Ha Quang District, Pac Bo, *L.F. Fu et al. VMN\_CN786 (IBK, VNMN)*.  
736
- 737 **Elatostema ficoides** Wedd.  
738 *Elatostema mariannae* C.B.Clarke.  
739 China, India, Nepal, Sikkim, Vietnam; 400 m.
- 740 **Bac Kan Province:** Na Ri District, Kim Hy Nature Reserve, 22°11'56"N 106°04'04"E, *L.F.*  
741 *Fu et al. VMN\_CN129 (IBK, VNMN)*. **Hoa Binh Province:** Crieng Xen, *P.A. Petelot 2965 (P)*.  
742
- 743 **\*Elatostema glochidioides** W.T.Wang  
744 China, Vietnam; 300–1190 m.
- 745 **Ha Giang Province:** Between Meo Vac District and Dong Van District, *L.F. Fu et al.*  
746 *VMN\_CN233 (IBK, VNMN)*; Quan Ba District, Bat Dai Son Nature Reserve, Thanh Van  
747 commune, Mo Sai village, 23°07'46"N 104°57'56"E, *L. Averyanov et al. VR417 (LE)*; Quan Ba  
748 District, Thang village, 23°03'13"N 104°51'49"E *L. Averyanov et al. VR553 (LE)*.  
749
- 750 **Elatostema grijsii** (Hance) Y.H.Tseng & A.K.Monro, *comb. nov.*  
751 Basionym: *Pellionia grijsii* Hance, *J. Bot.* 6(62): 49. 1868. Type: China. Fujian, *Exsicc. 6704*  
752 (holotype: BM!).

753 *Pellionia funingensis* W.T.Wang.

754 China, Vietnam; 800–1900 m.

755 **Cao Bang Province:** Nguyen Binh District, Nguyen Binh Municipality, 22°37'N 105°52'E, *L.*

756 *Averyanov et al. CBL069* (LE, MO); Nguyen Binh District, Phia Oac - Phia Den Nature Reserve,

757 22°36'24"N 105°52'46"E, *L.F. Fu et al. VMN\_CNI57* (IBK, VNMN); **Lang Son Province:** Bac

758 Son District, Tan Tri Municipality, *L. Averyanov et al. HAL6753* (LE); **Lao Cai Province:** Van

759 Ban District, Hoang Lien - Van Ban Nature Reserve, *L.F. Fu et al. VMN\_CN921* (IBK, VNMN);

760 **Vinh Phuc Province:** Tam Dao Range, *N. Arnautov et al. LX-VN4004* (LE).

761

762 **Elatostema heterolobum** (Wedd.) Hallier f.

763 *Pellionia heteroloba* Wedd.

764 *Elatostema bicuspidatum* Hallier f., *E. griffithianum* (Wedd.) Hallier f., *E. henryanum* Hand.-

765 Mazz., *Pellionia heteroloba* var. *minor* W.T.Wang, *P. keitaoensis* Yamam., *P. menglianensis*

766 Y.Y.Qian.

767 Bhutan, China, India, Laos, Myanmar, Sikkim, Vietnam; 400–1900 m.

768 **Cao Bang Province:** Bao Lac District, Dinh Phung Municipality, *L.F. Fu et al. VMN\_CN816*

769 (IBK, VNMN); Nguyen Binh District, Nguyen Binh Municipality, 22°37'N 105°52'E, *L.*

770 *Averyanov et al. CBL035, CBL062* (HN, LE, MO); **Ha Giang Province:** Meo Vac District,

771 Vicinities of Meo Vac Town, 23°10'N 105°24'E, *N.T. Hiep et al. NTH3385* (LE); Quan Ba District,

772 Tung Vai Municipality, *L.F. Fu et al. VMN\_CN870* (IBK, VNMN); **Ha Noi City:** Ba Vi District,

773 Ba Vi National Park, *V.D. Nguyen et al. HNK1266* (K); **Hoa Binh Province:** Mai Chau District,

774 Pa Co Municipality, *V.X. Phuong 2397* (HN); **Lao Cai Province:** Sa Pa District, *B. Khao & V.*

775 *Trung 2545* (HN); Van Ban District, Khanh Yen Ha Municipality, 21°58'28"N 104°15'52"E, *L.*

776 *Averyanov et al. HAL2312* (LE, MO); **Nghe An Province:** Con Cuong District, Chau Khe

777 Municipality, Pu Mat National Park, 18°55'51"N 104°36'20"E, *M.S. Nuarliev et al. 2042* (MW);

778 **Quang Binh Province:** Minh Hoa District, Dan Hoa Municipality, 17°41'50"N 105°45'54"E, *L.*

779 *Averyanov et al. HAL12250, HAL12412* (LE); **Son La Province:** Van Ho District, Tan Xuan

780 Municipality, 20°40'33"N 104°39'00"E, *L. Averyanov et al. CPC7127* (LE).

781

782 **Elatostema heyneanum** (Wedd.) Hallier f.

783 *Pellionia heyneana* Wedd.

784 Cambodia, China, India, Indonesia, Sri Lanka, Thailand, Vietnam; 100–300 m.

785 **Ha Noi City:** Ba Vi District, Ba Vi Mountain, *B. Balansa 2549* (P); **Quang Binh Province:**

786 Tuyen Hoa District, Lam Hoa Municipality, 17°56'51"N 105°49'18"E, *L. Averyanov et al.*

787 *CPC2679, CPC2696* (LE); **Quang Tri Province:** Da Krong District, Ta Rut Municipality,

788 16°24'29"N 107°01'07"E, *L. Averyanov et al. CPC3049* (LE).

789

790 **Elatostema hookerianum** Wedd., Arch. Mus. Hist. Nat. 9(1–2): 309. 1856, Type: Sikkim, *J.D.*

791 *Hooker s.n.* (holotype: P!, isotype: MPU!).

792 *Elatostema subfalcatum* W.T.Wang.

793 *Pellionia macroceras* Gagnep., Bull. Soc. Bot. France 75: 922. 1928, *syn. nov.* Type:

794 Vietnam. Lao Cai, Sa Pa District, *P.A. Petelot 2294* (lectotype: P: P00601742!, designated here,

795 isolectotype: P: P00601741!).

796 Bhutan, China, India, Sikkim, Vietnam; 1200–2100 m.

797 **Lai Chau Province:** Than Uyen District, Ho Mit Municipality, 22°06'N 103°52'E, *N.T. Hiep*

798 *et al. NTH2668, NTH2809, NTH2832, NTH2874* (LE); **Lao Cai Province:** Sa Pa District, Hoang

799 Lien Natinal Park, *L.F. Fu et al. VMN\_CN882* (IBK, VNMN), *P.A. Petelot 2294* (P); **Son La**

800 **Province:** Yen Chau District, Muong Lum Municipality, Lum Village, 21°00'17"N 104°29'08"E,

801 *D.K. Harder et al. 7217* (HN); **Province unknown** (Northern Vietnam): *G.V. Mikeshin s.n.*

802 (MHA).

803 Note: The protologue of *Pellionia macroceras* (Gagnepain, 1928) includes a description of

804 the species with two type localities of ‘Chapa’ (Vietnam) and Sikkim. The former relates to the

805 collection *P.A. Petelot 2294* with two duplicates housed at P (barcodes P00601741, P00601742),

806 while the latter is represented by the collection *J. de Rémy 1863* with a single specimen at P



807 (barcode P00601743). All of these specimens contain the name ‘*Pellionia macroceras* Gagnep.’  
808 written in Gagnepain’s handwriting and match the protologue description well. The dates of these  
809 collections (1925 and 1863) are before the publication of the protologue (1928), and therefore  
810 were used during its preparation. We select the specimen *P.A. Petelot 2294* (P: P00601742) as the  
811 lectotype because it contains anatomical drawing with short notes made by Gagnepain; the other  
812 one (P: P00601741) is isolectotype. The status of the specimen *J. de Rémy 1863* (P: P00601743)  
813 can be indicated as a remaining syntype.

814 We place *Pellionia macroceras* in synonymy based on the same characters of falcate lamina  
815 with cordate base with *Elatostema hookerianum*.

816

817 ***Elatostema integrifolium*** (D.Don) Wedd.

818 *Procris integrifolia* D.Don.

819 *Elatostema cuspidiferum* Miq., *E. miquelianum* Wedd., *E. pulgarensense* Elmer, *E. sesquifolium*  
820 (Reinw. ex Blume) Hassk., *E. sesquifolium* var. *integrifolium* (D.Don) Wedd., *E. viridicaule*  
821 W.T.Wang, *E. zollingerianum* Wedd., *Procris sesquifolia* Reinw. ex Blume.

822 Bhutan, China, India, Indonesia, Myanmar, Nepal, Thailand, Vietnam; 600–900 m.

823 **Cao Bang Province:** Bao Lac District, Dinh Phung Municipality, *L.F. Fu et al. VMN\_CN819*  
824 (IBK, VNMN); **Hai Phong City:** Cat Hai District, *Y.G. Wei et al. VMN\_CN06* (IBK, VNMN); Cat  
825 Hai District, Cat Ba Island, *N. Arnautov et al. LX-VN3778* (LE); **Hoa Binh Province:** Lac Son  
826 District, Tu Do Municipality, 20°25'29"N 105°19'36"E, *N.Q. Hieu et al. CPC1538* (LE); **Kon**  
827 **Tum Province:** Sa Thay District, Ro Koi Municipality, Chu Mom Ray National Park, 14°28'20"N  
828 107°43'00"E, *M.S. Nuraliev & S.P. Kuznetsova 1257* (IBK, MW); **Lam Dong Province:** Bao Loc  
829 District, *L. Averyanov et al. III-LX-VN1183* (LE); **Quang Tri Province:** Da Krong District, Ta Rut  
830 Municipality, 16°24'29"N 107°01'07"E, *L. Averyanov et al. CPC3039* (LE); Huong Hoa District,  
831 Huong Viet Municipality, 16°51'06"N 106°34'38"E, *L. Averyanov et al. CPC2815* (LE).

832

833 ***Elatostema kimhyense*** Y.G.Weï & V.T.Do

834 Endemic; 350–1200 m.

835 **Bac Kan Province:** Na Ri District, Kim Hy National Park, 22°11'56"N 106°4'5"E, *Y.G. Wei*  
836 & *V.T. Do V-23* (IBK, PE, VNMN), *L.F. Fu et al. VMN\_CN194* (IBK, VNMN).

837

838 **Elatostema laevissimum** W.T.Wang

839 *Elatostema laevissimum* W.T.Wang var. *puberulum* W.T.Wang.

840 China, Vietnam; 780–2200 m.

841 **Ha Giang Province:** Meo Vac District, Vicinities of Meo Vac Town, 23°10'N 105°24'E, *N.T.*

842 *Hiep et al. NTH3378, NTH3390* (LE); Quan Ba District, Tung Vai, *L.F. Fu et al. VMN\_CN871*

843 (IBK, VNMN); between Meo Vac District and Dong Van District, 23°07'31"N 105°25'42"E, *L.F.*

844 *Fu et al. VMN\_CN188* (IBK, VNMN); **Kon Tum Province:** Dak Glei District, 15°04'23"N

845 108°01'34"E, *L. Averyanov et al. VH062* (HN, MO), 15°04'00"N 107°59'00"E, *L. Averyanov et al.*

846 *VH629* (HN, LE, MO), *VH074, VH590* (LE, MO); **Lai Chau Province:** Than Uyen District, Ho

847 Mit Municipality, 22°06'N 103°52'E, *N.T. Hiep et al. NTH2812* (LE); **Lao Cai Province:** Van Ban

848 District, 21°58'42"N 104°00'37"E, *L. Averyanov et al. HAL2013* (LE); **Nghe An Province:** Que

849 Phong District, Hanh Dich Municipality, Pu Hoat Nature Reserve, 19°44'15"N 104°48'59"E, *M.S.*

850 *Nuraliev 2192* (MW); **Quang Nam Province:** *L. Averyanov et al. VH923* (LE).

851

852 **Elatostema leiocarpum** (W.T.Wang) Y.H.Tseng & A.K.Monro, *comb. nov.*

853 Basionym: *Pellionia leiocarpa* W.T.Wang, *Guihaia* 2(3): 115. 1982. Type: China. Guangxi,

854 Napo, Baidu, Nunghua, *D. Fang et al. 25142* (holotype: GXMI!).

855 China, Vietnam; ca. 1200 m.

856 **Ha Giang Province:** Quan Ba District, Bat Dai Son Nature Reserve, 23°09'18"N

857 105°00'09"E, *D.K. Harder et al. 5029* (HN); Quan Ba District, Can Ty Municipality, 23°04'N

858 104°59'E, *N.T. Hiep et al. NTH3618* (LE); Quan Ba District, San Chu village, 23°08'55"N

859 104°59'46"E, *L. Averyanov et al. VR079* (LE); Quan Ba District, Tung Vai Municipality, Thang

860 village, 23°03'41"N 104°50'42"E, *L. Averyanov et al. VR575* (LE).

861

862 **Elatostema lineolatum** Wight863 *Elatostema lineolatum* var. *majus* Wedd., *E. tumidulum* Koidz.

864 Bhutan, China, India, Myanmar, Nepal, Sikkim, Sri Lanka, Thailand; 150–1300 m.

865 **Cao Bang Province:** Bao Lac District, Xuan Truong Municipality, *L.F. Fu et al.*866 *VMN\_CN809* (IBK, VNMN); Nguyen Binh District, Phia Oac - Phia Den Nature Reserve,867 22°37'40"N 105°53'10"E, *L.F. Fu et al. VMN\_CN163* (IBK, VNMN); **Dak Lak Province:** Lak868 District, Bong Krang Municipality, Chu Yang Sin National Park, 12°25'00"N 108°23'00"E, *M.S.*869 *Nuraliev et al. 925* (K, MW); **Ha Giang Province:** Bac Me District, Bac Me Nature Reserve, *L.F.*870 *Fu et al. VMN\_CN232* (IBK, VNMN); **Gia Lai Province:** K'Bang District, Son Lang Municipality,871 Kon Chu Rang Nature Reserve, 14°30'55"N 108°32'48"E, *M.S. Nuraliev 2010* (MW), 14°30'59"N872 108°32'27"E, *M.S. Nuraliev 2020* (MW); **Lang Son Province:** Bac Son District, Tan Tri873 Municipality, *L. Averyanov et al. HAL6787* (LE); **Lao Cai Province:** Sa Pa District, San Sa Ho874 Municipality, Hoang Lien National Park, Cat Cat village area, 22°20'N 103°49'E, *M.S. Nuraliev &*875 *D.D. Sokoloff 282* (MW); Van Ban District, Nam Xe Municipality, 22°02'35"N 103°57'23"E, *D.K.*876 *Harder et al. 7010* (HN, LE); **Nghe An Province:** Con Cuong District, Chau Khe Municipality, Pu877 Mat National Park, 18°57'38"N 104°40'44"E, *M.S. Nuraliev 2065* (MW); Tuong Duong District,878 Tam Quang Municipality, 19°03'09"N 104°36'53"E, *L. Averyanov et al. HLF6758* (LE); **Quang**879 **Binh Province:** Bo Trach District, Hung Trach Municipality, 17°27'30"N 106°23'06"E, *S.K. Wu*880 *et al. WP923* (HN); **Vinh Phuc Province:** *N. Arnautov et al. LX-VN3985* (LE); Tam Dao District,881 21°28'02"N 105°38'39"E, *L.F. Fu et al. VMN\_CN51* (IBK, VNMN).

882

883 **Elatostema longibracteatum** W.T.Wang884 a. **Elatostema longibracteatum** var. **glabricaule** W.T.Wang

885 Endemic; 650–800 m.

886 **Cao Bang Province:** Tra Linh District, Quoc Toan Municipality, *L. Averyanov et al. VH2468*887 (HN, LE); 22°45'25"N 106°17'58"E, *D.K. Harder et al. 4288* (K); Tra Linh District, Luu Ngoc

888 Municipality, 22°47'N 106°18'E, *L. Averyanov et al. CBL1199* (LE, MO).

889 This variety is very similar to *Elatostema longibracteatum* W.T.Wang var. *longibracteatum*  
890 and further study may result in it being treated as a synonym.

891

892

893 ***Elatostema longipedunculatum*** (W.T.Wang) Y.H.Tseng & A.K.Monro, *comb. nov.*

894 Basionym: *Pellionia longipedunculata* W.T.Wang, Bull. Bot. Res., Harbin 2(1): 1. 1982.

895 Type: China. Guangxi, Shangsi County, Shiwandashan, *S.C. Chen 4918* (holotype: IBSC!).

896 *Pellionia subundulata* W.T.Wang var. *angustifolia* W.T. Wang.

897 China, Vietnam; 197–1000 m.

898 **Ha Noi City:** Ba Vi District, Ba Vi Mountain, 21°04.096'N 105°21.501'E, *N.A. Vislobokov &*

899 *S.P. Kuznetsova 681* (MW); **Ha Tinh Province:** Huong Son District, Rao An-Ngam Thép village,

900 18°21'53"N 105°13'12"E, *T.H. Nguyen et al. 184* (MO); **Vinh Phuc Province:** Tam Dao District,

901 *Sino-Vietnam Expedition 1996A* (PE).

902

903 ***Elatostema longistipulum*** Hand.-Mazz.

904 China, Vietnam; 140–1450 m.

905 **Cao Bang Province:** Ha Lang District, Thang Loi Municipality, 22°45'N 106°42'E, *P.K. Loc*

906 *et al. CBL1661* (LE, MO); **Ha Giang Province:** Bac Me District, Bac Me Nature Reserve,

907 22°38'37"N 105°28'36"E, *L.F. Fu et al. VMN\_CN220* (IBK, VNMN); **Ha Noi City:** Ba Vi District,

908 Ba Vi National Park, *V.D. Nguyen et al. HNK1282* (K); **Hoa Binh Province:** Lac Son District, Tu

909 Do Municipality, 20°24'57"N 105°13'16"E, *N.Q. Hieu et al. CPC1403* (LE); Mai Chau District, *F.*

910 *Wen et al. VMN\_CN274, VMN\_CN274, VMN\_CN317, VMN\_CN323* (IBK, VNMN); **Lang Son**

911 **Province:** Huu Lung District, Huu Lien Municipality, 21°40'59"N 106°20'30"E, *D.K. Harder*

912 *4116* (MO); **Nghe An Province:** Con Cuong District, Chau Khe Municipality, Pu Mat National

913 Park, 18°57'42"N 104°41'40"E, *M.S. Nuraliev 2077* (MW); Quy Hop District, Chau Thai

914 Municipality, Bom Village, *V.D. Nguyen et al. HNK1611* (K); **Ninh Binh Province:** Nho Quan

915 District, Cuc Phuong National Park, *J.M. Hu Hu2110* (TAI); *L. Averyanov et al. LX-VN1732* (LE),  
 916 *V.D. Nguyen et al. HNK1334* (K); **Phu Tho Province**: Tan Son District, Xuan Son Municipality,  
 917 21°02'55"N 104°56'51"E, *L. Averyanov et al. HAL12722* (LE), 21°06'57"N 104°57'17"E, *L.*  
 918 *Averyanov et al. HAL12677* (LE); **Quang Binh Province**: *G.V. Mikeshin, O.V. Daeva s.n.* (MHA);  
 919 **Son La Province**: Van Ho District, Tan Xuan Municipality, 20°40'33"N 104°39'00"E, *L.*  
 920 *Averyanov et al. CPC7143* (LE); Yen Chau District, Muong Lum Municipality, 21°00'35"N  
 921 104°29'06"E, *L. Averyanov et al. CPC1884* (LE); **Thai Nguyen Province**: Vo Nhai District, Than  
 922 Sa Municipality, 21°48'N 105°54'E, *N.T. Hiep et al. NTH3780* (LE); **Thanh Hoa Province**: Quy  
 923 Chau District, Pu Huong Natural Reserve, *F. Wen et al. VMN\_CN428* (IBK, VNMN); Quan Hoa  
 924 District, Hien Chung Municipality, Xuan Lien Reserve, *F. Wen et al. VMN\_CN398, VMN\_CN410*  
 925 (IBK, VNMN); Quan Hoa District, Pu Hu Nature Reserve; *F. Wen et al. VMN\_CN350* (IBK,  
 926 VNMN); Thuong Xuan District, Bat Mot Municipality, 19°59'11"N 104°58'32"E, *L. Averyanov et*  
 927 *al. CPC6440* (LE); **Tuyen Quang Province**: Na Hang District, Vinh Yen Municipality,  
 928 22°21'14"N 105°25'11"E, *P.K. Loc et al. HLF-009* (HN).

929

930 ***Elatostema macintyreii* Dunn**

931 Bhutan, China, India, Thailand, Vietnam; 1000–1100 m.

932 **Cao Bang Province**: Bao Lac District, Xuan Truong Municipality, *L.F. Fu et al.*933 *VMN\_CN807* (IBK, VNMN); **Gia Lai Province**: Mang Yang District, A Yun Municipality, Kon934 Ka Kinh National Park, 14°13'17"N 108°18'59"E, *M.S. Nuraliev et al. 1492* (IBK, MW), *M.S.*935 *Nuraliev 1882* (IBK, MW); **Ha Giang Province**: between Meo Vac District and Dong Van936 District, 23°09'06"N 105°24'59"E, *L.F. Fu et al. VMN\_CN185* (IBK, VNMN).

937

938 **\**Elatostema malacotrichum* W.T.Wang & Y.G.Wei**

939 China, Vietnam; 400 m.

940 **Cao Bang Province**: Ha Lang District, An Lac Municipality, 22°46'N 103°44'E, *L.*941 *Averyanov et al. CBL607* (LE); Ha Quang District, Pac Bo, *L.F. Fu et al. VMN\_CN784* (IBK,

942 VNMN).

943

944 **Elatostema monandrum** (Buch.-Ham. ex D.Don) H.Hara

945 *Procris monandra* Buch.-Ham. ex D.Don

946 *Elatostema diversifolium* Wedd., *E. laetum* Wedd., *E. monandrum* var. *ciliatum* (Hook.f.)

947 Murti, *E. monandrum* var. *pinnatifidum* (Hook.f.) Murti, *E. monandrum* var. *serpens* (Hook.f.)

948 Murti, *E. monandrum* var. *zeylanicum* (Hook.f.) Murti, *E. muscicola* W.T.Wang, *E. surculosum*

949 Wight, *Pellionia mairei* H.Lév.

950 Bhutan, China, India, Myanmar, Nepal, Sikkim, Sri Lanka, Thailand, Vietnam; 2000–2300 m.

951 **Lao Cai Province**: Sa Pa District, *P.A. Petelot 5049* (P); **Nghe An Province**: Ky Son District,

952 Na Ngoi Municipality, 19°11'58"N 104°11'39"E, *L. Averyanov et al. CPC6150* (LE); 19°12'23"N

953 104°11'34"E, *L. Averyanov et al. CPC6215* (LE).

954

955 **Elatostema myrtilus** (H.Lév.) Hand.-Mazz., *Symb. Sin.* 7(1): 146. 1929. Types: China. Pin-Fa, *J.*

956 *Cavalerie 559* (syntype: P!); Kouy-Tchéou, *E. Bodinier 1548* (syntype: E); Kan-Yen-Tong, *J.*

957 *Esquirol 698* (syntype: E).

958 *Pellionia myrtilus* H.Lév.

959 *Elatostema colaniae* Gagnep., *Bull. Soc. Bot. France* 76: 81. 1929, *syn. nov.* Type: Vietnam.

960 Lang Met, *P.A. Colani 2927* (holotype: P!, isotype: P!).

961 China, Vietnam; 500–1600 m.

962 **Bac Giang Province**: Lang Met, *P.A. Colani 2927* (P); **Cao Bang Province**: Tra Linh

963 District, Quoc Toan Municipality, vicinity of Thang Heng and Lung Tao Villages, 22°45'30"N

964 106°17'22"E, *L. Averyanov et al. VH4855* (HN, LE); Tra Linh District, Quoc Toan Municipality,

965 22°45'15"N 106°17'54"E, *D.K. Harder et al. 4312* (K); **Ha Giang Province**: between Meo Vac

966 District and Dong Van District, 23°15'02"N 105°23'09"E, *L.F. Fu et al. VMN\_CNI97* (IBK,

967 VNMN); Meo Vac District, Sung Cha Municipality, 23°11'N 105°17'E, *N.T. Hiep et al. NTH3287*

968 (K, LE); Meo Vac District, Sung Cha Municipality, 23°10'12"N 105°17'39"E, *L. Averyanov et al.*

969 *HAL8490* (LE); Quan Ba District, Bat Dai Son Nature Reserve, Thanh Van commune, Mo Sai  
 970 village, 23°07'46"N 104°57'56"E, *L. Averyanov et al. VR409* (LE); Quan Ba District, Tung Vai  
 971 Municipality, *L.F. Fu et al. VMN\_CN869* (IBK, VNMN); Quan Ba District, Tung Vai  
 972 Municipality, Thang village, 23°03'13"N 104°51'49"E, *L. Averyanov et al. VR742* (LE).

973 We place *Elatostema colaniae* in synonymy based on the same combination of characters as  
 974 in *E. myrtillus*: small lamina (13–28 × 6–10 mm) with auriculate base and furfureous stem base.

975

976 **\**Elatostema nanchuanense*** W.T.Wang

977 China, Vietnam; 1050–1150 m.

978 **Ha Giang province**: Quan Ba District, Tung Vai Municipality, Thang village, 23°03'13"N  
 979 104°51'49"E, *L. Averyanov et al. VR552* (LE).

980

981 ***Elatostema nasutum*** Hook.f.

982 *Elatostema hainanense* W.T.Wang, *E. stipulosum* Hand.-Mazz.

983 Bhutan, China, Nepal, Vietnam; 1100–2100 m.

984 **Cao Bang Province**: Nguyen Binh District, Nguyen Binh Municipality, 22°37'N 105°52'E, *L.*  
 985 *Averyanov et al. CBL077, CBL171* (LE, MO); Nguyen Binh District, Phia Oac - Phia Den Nature  
 986 Reserve, 22°36'29"N 105°52'18"E, *L.F. Fu et al. VMN\_CN162* (IBK, VNMN); **Ha Giang**

987 **Province**: Vi Xuyen District, Cao Bo Municipality, Tam Ve village, 22°46'30"N 104°49'01"E,

988 *D.K. Harder 5425* (MO); Yen Minh District, Du Gia Municipality, [23°56'N 105°13'E], *P.K. Loc*

989 *et al. CBL2028, CBL2080* (LE, MO); **Kon Tum Province**: Dak Glei District, *N.T. Hiep et al.*

990 *VH1757* (LE); **Lai Chau Province**: Than Uyen District, Ho Mit Municipality, 22°06'N 103°52'E,

991 *N.T. Hiep et al. NTH2669, NTH2812, NTH2874* (LE); **Lao Cai Province**: Sa Pa District, San Sa

992 Ho, Sin Chai Municipality, 22°20'44.3"N 103°48'77.0"E, *V.X. Phuong et al. HNK470* (K); **Nghe**

993 **An Province**: Ky Son District, Na Ngoi Municipality, 19°11'59"N 104°11'24"E, *N.T. Hiep et al.*

994 *CPC6286* (LE); **Son La Province**: Bac Yen District, Chu Village, 21°15'40.0"N 104°29'27.0"E,

995 *V.D. Nguyen et al. HNK2726* (K); **Thanh Hoa Province**: Thuong Xuan District, Bat Mot

996 Municipality, 19°58'18"N 104°59'24"E, *L. Averyanov et al. CPC6555* (LE); **Vinh Phuc Province:**

997 Tam Dao District, Tam Dao Range, *N. Arnautov et al. LX-VN3858* (LE).

998

999 ***Elatostema neobaviense*** Y.H.Tseng & A.K.Monro *nom. nov.*

1000 *Pellionia baviensis* Gagnep., Bull. Soc. Bot. France 75: 919. 1928. Type: Vietnam. Ha Noi

1001 City, Ba Vi District, Ba Vi Mountain, *B. Balansa 2548* (lectotype: designated by Lin & Yang,

1002 2010: 1912, P!).

1003 Endemic; elevation unknown.

1004 **Ha Noi City:** Ba Vi District, Ba Vi Mountain, *B. Balansa 2548* (P).

1005 We select '*neobaviense*' as epithet as it takes the place of '*baviense*' which would be in

1006 conflict with the homonym *Elatostema baviensis*.

1007

1008 ***Elatostema neriifolium*** W.T.Wang & Z.Y.Wu

1009 China, Vietnam; 50–750 m.

1010 **Lao Cai Province:** *Sino-Vietnam Expedition 755* (PE); **Quang Binh Province:** Minh Hoa

1011 District, Thuong Hoa Municipality, 17°39'22"N 105°54'59"E, *N.T. Hiep et al. CPC3819* (LE);

1012 **Thanh Hoa Province:** Ba Thuoc District, Co Lung Municipality, Khuyn village, 20°26'39"N

1013 105°15'33"E, *L. Averyanov et al. 3130* (MO); 10 km SW of Ba Thuoc, *B.A. Korotiaev s.n.* (LE);

1014 **Tuyen Quang Province:** Na Hang District, Thanh Tuong Municipality, 22°16'26"N 105°25'58"E,

1015 *P.K. Loc et al. HAL149* (HN).

1016

1017 **\**Elatostema oblongifolium*** S.H.Fu

1018 *Pellionia bodinieri* H.Lév.

1019 *Elatostema multicanaliculatum* B.L.Shih & Yuen P.Yang.

1020 China, Vietnam; 1050–1400 m.

1021 **Ha Giang province:** Quan Ba District, Tung Vai Municipality, Thang village, 23°03'13"N

1022 104°51'49"E, *L. Averyanov et al. VR560* (LE), 23°03'42"N 104°50'42"E, *L. Averyanov et al. VR634*



1023 (LE).

1024

1025 **\*Elatostema obtusum** Wedd.

1026 *Dorstenia pubescens* Blanco, *Elatostema delicatulum* Wedd.

1027 Bhutan, China, India, Nepal, Sikkim, Thailand, Vietnam; 1400–1900 m.

1028 **Cao Bang Province**: Nguyen Binh District, Nguyen Binh Municipality, 22°37'N 105°52'E, *L.*

1029 *Averyanov et al. CBL206* (LE, MO, P); **Lao Cai Province**: Sa Pa District, Hoang Lien National

1030 Park, Ton Forest Station, *L.F. Fu et al. VMN\_CN971* (IBK, VNMN).

1031

1032 **\*Elatostema oppositum** Q.Lin & Y.M.Shui

1033 China, Vietnam; ca. 1100 m.

1034 **Ha Giang Province**: Quan Ba District, 23°06'57"N 105°01'48"E, *D.K. Harder et al. 4973*

1035 (HN, MO), *4997* (HN).

1036

1037 **Elatostema paucidentatum** H.Schroet.

1038 a. **Elatostema paucidentatum** var. **paucidentatum**

1039 *Pellionia paucidentata* (H.Schroet.) Chien

1040 *Elatostema henryanum* var. *oligodontum* Hand.-Mazz., *Pellionia longgangensis* W.T.Wang,

1041 *P. paucidentata* var. *hainanica* Chien & S.H.Wu, *P. subundulata* W.T.Wang.

1042 China, Vietnam; 180–300 m.

1043 **Cao Bang Province**: Bao Lam District, Bac Mieu Municipality, *L.F. Fu et al. VMN\_CN827*

1044 (IBK, VNMN); **Ha Giang Province**: between Meo Vac District and Dong Van District, *L.F. Fu et*

1045 *al. VMN\_CN240* (IBK, VNMN); **Lai Chau Province**: Muong Te District, Muong Te Municipality,

1046 22°32'06"N 102°32'29"E, *N.T. Hiep et al. HAL10102, HAL10123* (LE); **Lang Son Province**:

1047 Lung District, Huu Lien Municipality, 21°39'31"N 106°22'06"E, *D.E. Atha et al. NY-HN 73* (MO);

1048 **Ninh Binh Province**: Nho Quan District, Cuc Phuong National Park, 20°17'33"N 105°39'54"E,

1049 *D.D. Soejarto 10498* (MO), 20°17.55'N 105°39.90'E, *N.T. Hiep et al. 1998* (P); **Quang Ninh**

- 1050 **province:** Dam Ha District, Lomg Ngong village, Sai Vong Mo Leng mt., *W.T. Tsang 30277*  
1051 (SING); Ha-coi, near Chuk-phai, Taai Wong Mo Shan, *W.T. Tsang 29166* (SING); **Thai Nguyen**  
1052 **Province:** Vo Nhai District, Thuong Lung Municipality, 21°48.75'N 105°58.09'E, *L.Q. Li et al.*  
1053 *0078* (HN); **Thanh Hoa Province:** Quan Hoa District, Hien Chung Municipality, Xuan Lien  
1054 Nature Reserve, *F. Wen et al. VMN\_CN413* (IBK, VNMN); **Vinh Phuc Province:** *N. Arnautov et*  
1055 *al. LX-VN3988* (LE).
- 1056
- 1057 **b. *Elatostema paucidentatum* var. *dolichoceras* W.T.Wang**
- 1058 Endemic; 100–150 m.
- 1059 **Lao Cai Province:** *Sino-Vietnam Expedition 590* (PE).
- 1060
- 1061 **\**Elatostema pergameneum* W.T.Wang**
- 1062 China, Vietnam; 100–250 m.
- 1063 **Lang Son Province:** Huu Lung District, Huu Lien Municipality, 21°40'59"N 106°20'30"E,  
1064 *D.K. Harder et al. 4121* (K); **Quan Binh Province:** Minh Hoa District, 17°40'N 105°57'E, *L.*  
1065 *Averyanov et al. VH4611* (HN).
- 1066
- 1067 ***Elatostema petelotii* Gagnep.**
- 1068 China, Vietnam; 260–1300 m.
- 1069 **Cao Bang Province:** Phia Oac, *P.A. Petelot 720* (P); **Ha Giang Province:** between Meo Vac  
1070 District and Dong Van District, *L.F. Fu et al. VMN\_CN239* (IBK, VNMN); Quan Ba District,  
1071 Tung Vai Municipality, *L.F. Fu et al. VMN\_CN868* (IBK, VNMN); Quan Ba District, Thang  
1072 village, around point 23°03'13"N 104°51'49"E, *L. Averyanov et al. VR540, VR731* (LE); Yen Minh  
1073 District, Du Gia Municipality, 23°56'N 105°13'E, *P.K. Loc et al. CBL2022, CBL2024* (LE); **Nghe**  
1074 **An Province:** Que Phong District, Hanh Dich Municipality, Pu Hoat Nature Reserve, 19°45'19"N  
1075 104°47'45"E, *M.S. Nuraliev 2142* (MW); **Phu Tho Province:** Thanh Son District, Xuan Son  
1076 Municipality, *V.X. Phuong 3930* (HN).

1077

1078 **Elatostema platyphyllum** Wedd., Arch. Mus. Hist. Nat. 9: 301. 1856. Type: India. Khasia, *J.D.*

1079 *Hooker & T. Thomsom s.n.* (lectotype: designated by Lin, Duan & Yang, 2009: 1912, K!).

1080 *E. platyphylloides* B.L. Shih & Yuen P. Yang, *E. platyphyllum* Wedd. var. *polycephalum* Hara.

1081 *Elatostema baviensis* Gagnep., Bull. Soc. Bot. France 76: 80. 1929, *syn. nov.* Type: Vietnam.

1082 Ha Noi City, Ba Vi District, Ba Vi Mountain, *B. Balansa 2537* (holotype: P!).

1083 Bhutan, China, India, Nepal, Philippines, Vietnam; 800–1669 m.

1084 **Gia Lai Province:** K'Bang District, Song Lang Municipality, Kon Chu Rang Nature Reserve,

1085 14°31'04"N 108°36'23"E, *M.S. Nuraliev et al. 1996* (MW); **Ha Giang Province:** between Meo

1086 Vac District and Dong Van District, 23°13'44"N 105°24'48"E, *L.F. Fu et al. VMN\_CN191* (IBK,

1087 VNMN); **Ha Noi City:** Ba Vi District, Ba Vi National Park, 21°04'23"N 105°21'36"E, *L.F. Fu et*

1088 *al. VMN\_CN33* (IBK, VNMN), Ba Vi District, Ba Vi Mountain, *B. Balansa 2537* (P); **Ninh Binh**

1089 **Province:** Nho Quan District, Cuc Phuong National Park, *J.M. Hu Hu2122* (TAI); **Thanh Hoa**

1090 **Province:** Quan Hoa District, Hien Chung Municipality, Xuan Lien Nature Reserve, *F. Wen et al.*

1091 *VMN\_CN399, VMN\_CN408* (IBK, VNMN).

1092 We place *Elatostema baviensis* in synonymy based on the same combination of characters as

1093 in *E. platyphyllum*: large lamina (10–25 × 4–7.5 cm) with auriculate base, large stipule (15–25 ×

1094 3–5.5 mm) and pistillate inflorescence with short peduncle and obvious receptacle.

1095

1096 \***Elatostema prunifolium** W.T. Wang

1097 China, Vietnam; elevation unknown.

1098 **Ha Giang Province:** Quan Ba District, Tung Vai Municipality, *L.F. Fu et al. VMN\_CN866*

1099 (IBK, VNMN).

1100

1101 **Elatostema pseudodissectum** W.T. Wang

1102 China, Vietnam; 1000–1300 m.

1103 **Cao Bang Province:** Bao Lac District, Ca Thanh Municipality, 22°44'N 105°50'E, *L.*

- 1104 *Averyanov et al. CBL389* (LE, MO); **Vinh Phuc Province**: Tam Dao District, Tam Dao National  
1105 Park, 21°27'47"N 105°38'68"E, *L.Q. Li et al. 559* (PE).  
1106
- 1107 **\*Elatostema pseudolongipes** W.T.Wang & Y.G.Wei  
1108 China, Vietnam; 150–600 m.
- 1109 **Bac Kan Province**: Ba Be District, Nam Mau Municipality, Ba Be National Park,  
1110 22°26'.875"N 106°37.028'E, *D.E. Atha et al. DA4722* (HN); Na Ri District, Liem Thuy  
1111 Municipality, 21°57'.36"N 106°04.622'E, *D.E. Atha et al. DA4773* (HN), Na Ri District, Kim Hy  
1112 Municipality, 22°17'N 106°03'E, *N.T. Hiep et al. NTH3688, NTH3691* (LE); **Cao Bang Province**:  
1113 Tra Linh District, Quoc Toan Municipality, Thang Heng vicinity and Lung Tao Villages,  
1114 22°45'30"N 106°17'22"E, *L. Averyanov et al. VH4850, VH4928, VH4929* (HN, LE, MO); **Ha**  
1115 **Giang Province**: Bac Me District, Bac Me Nature Reserve, 22°45'23"N 105°13'46"E, *L.F. Fu et*  
1116 *al. VMN\_CN221* (IBK, VNMN); **Ninh Binh Province**: Cuc Phuong National Park, *L. Wu et al.*  
1117 *VN0049* (HN, IBK); **Quang Binh Province**: Bo Trach District, Son Trach Municipality,  
1118 17°31'02"N 106°16'48"E, *L. Averyanov et al. HAL6382* (LE); Minh Hoa District, Thuong Hoa  
1119 Municipality, 17°39'12"N 105°54'53"E, *N.T. Hiep et al. CPC3753* (LE); Tuyen Hoa District, Lam  
1120 Hoa Municipality, 17°56'10"N 105°49'15"E, *L. Averyanov et al. CPC2452* (LE); **Thanh Hoa**  
1121 **Province**: Ba Thuoc District, Co Lung Municipality, Eo Dieu Village, 22°25'35"N 105°14'26"E, *L.*  
1122 *Averyanov et al. HAL3354* (HN).  
1123
- 1124 **\*Elatostema pycnodontum** W.T.Wang  
1125 China, Vietnam; 1400–1500 m.
- 1126 **Cao Bang Province**: Bao Lac District, Dinh Phuong Municipality, 22°47'N 105°49'E, *P.K.*  
1127 *Loc et al. CBL1489* (LE, MO).  
1128
- 1129 **Elatostema radicans** (Siebold & Zucc.) Wedd.  
1130 *Procris radicans* Siebold & Zucc.

1131 *Elatostema cavaleriei* (H.Lév.) Hand.-Mazz., *E. radicans* var. *grande* (Gagnep.) H.Schroet.,  
1132 *Pellionia arisanensis* Hayata, *P. cavaleriei* H.Lév., *P. chikushiensis* Yamam., *P. iseana* (Makino  
1133 ex Hatus.) Hatus. ex Kimura, *Pellionia pauciflora* W.T.Wang, *P. radicans* (Siebold & Zucc.)  
1134 Wedd., *P. radicans* f. *grandis* Gagnep., *P. radicans* var. *chikushiensis* (Yamam.) S.S.Ying, *P.*  
1135 *radicans* var. *grandis* (Gagnep.) W.T.Wang.  
1136 China, Japan, Korea, Vietnam; 600–2700 m.  
1137 **Cao Bang Province:** Nguyen Binh District, Nguyen Binh Municipality, 22°37'N 105°52'E, *L.*  
1138 *Averyanov et al. CBL064* (HN, LE, MO); Nguyen Binh District, Phia Oac - Phia Den Nature  
1139 Reserve, 22°36'29"N 105°52'18"E, *L.F. Fu et al. VMN\_CN160* (IBK, VNMN); **Gia Lai Province:**  
1140 K'Bang District, Son Lang Municipality, Kon Chu Rang Nature Reserve, 14°31'04"N  
1141 108°36'23"E, *M.S. Nuraliev et al. 1994* (MW), 14°30'59"N 108°32'27"E, *M.S. Nuraliev et al. 2019*  
1142 (MW), 14°30'02"N 108°34'27"E, *M.S. Nuraliev et al. 2027* (MW); **Ha Giang Province:** Meo Vac  
1143 District, vicinities of Meo Vac Town, 23°10'N 105°24'E, *N.T. Hiep et al. NTH3377* (LE); **Khanh**  
1144 **Hoa Province:** Khanh Son District, 12°12'N 108°44'E, *L. Averyanov et al. VH4353* (LE, MO);  
1145 **Kon Tum Province:** *L. Averyanov et al. VH543* (LE, MO); **Lam Dong Province:** Lac Duong  
1146 District, Da Chais Municipality, 12°09'N 108°41'E, *L. Averyanov et al. VH2890, VH2914* (LE),  
1147 12°05'N 108°40'E, *L. Averyanov et al. VH2974* (HN, LE), 12°07'N 108°41'E, *L. Averyanov et al.*  
1148 *VH3435* (LE, MO), 12°06'N 108°39'E, *L. Averyanov et al. VH4493* (HN, MO); **Lang Son**  
1149 **Province:** *Sino-Vietnam Expedition 1597* (PE); **Lao Cai Province:** Sa Pa District, Hoang Lien  
1150 National Park, *L.F. Fu et al. VMN\_CN886* (IBK, VNMN); Van Ban District, 21°58'42"N  
1151 104°00'37"E, *L. Averyanov et al. HAL2094* (LE), 21°59'04"N 104°15'08"E, *L. Averyanov et al.*  
1152 *HAL2094* (LE); **Nghe An Province:** Ky Son District, Na Ngoi Municipality, 19°11'52"N  
1153 104°10'55"E, *L. Averyanov et al. CPC6098* (LE); **Ninh Binh Province:** Nho Quan District, Phuoc  
1154 Binh, 12°07'N 108°41'E, *L. Averyanov et al. VH3369* (HN, LE); **Quang Binh Province:** Minh  
1155 Hoa District, Dan Hoa Municipality, 17°45'27"N 105°47'46"E, *L. Averyanov et al. HAL12539*  
1156 (LE); **Quang Nam Province:** *L. Averyanov et al. VH919* (HN, LE); **Quang Ninh Province:** Ba  
1157 Mun, 21°05'N 107°35'E, *L. Averyanov & E. Kudriavtseva 221* (LE); **Vinh Phuc Province:** *N.*

1158 *Arnautov et al. LX-VN3941* (LE); Tam Dao District, 21°28'02"N 105°38'39"E, *L.F. Fu et al.*  
1159 *VMN\_CN50* (IBK, VNMN); Tam Dao National Park, *N. Arnautov et al. LX-VN3859, LX-VN3859,*  
1160 *LX-VN3920, LX-VN4045* (LE), *L. Averyanov 65-A* (LE).

1161

1162 ***Elatostema ramosum*** W.T.Wang

1163 *Elatostema ramosum* var. *villosum* W.T.Wang.

1164 China, Vietnam; 500–1400 m.

1165 **Cao Bang Province:** Nguyen Binh District, Yen Lac Municipality, 22°45'34"N 105°51'49"E,

1166 *L. Averyanov et al. CPC5424* (LE); **Ha Giang Province:** Bac Me District, Bac Me Nature Reserve,

1167 22°45'14"N 105°13'36"E, *L.F. Fu et al. VMN\_CN227* (IBK, VNMN); Quan Ba District, Bat Dai

1168 Son commune, Bat Dai Son Nature Reserve, San Chu village, 23°08'55"N 104°59'46"E, *L.*

1169 *Averyanov et al. VR065* (LE); **Hoa Binh Province:** Lac Son District, Tu Do Municipality,

1170 20°25'29"N 105°19'36"E, *N.Q. Hieu et al. CPC1559* (LE); **Ninh Binh Province:** Cuc Phuong

1171 National Park, *T.H. Nguyen NTH 3015* (MO); Nho Quan District, Cuc Phuong National Park, *J.M.*

1172 *Hu Hu2065* (TAI).

1173

1174 ***Elatostema retrohirtum*** Dunn

1175 China, Vietnam; 87–1100 m.

1176 **Bac Kan Province:** Na Ri District, Kim Hy Nature Reserve, 22°11'49"N 106°03'51"E, *L.F.*

1177 *Fu et al. VMN\_CN120* (IBK, VNMN); **Gia Lai Province:** K'Bang District, Son Lang Municipality,

1178 Kon Chu Rang Nature Reserve, 14°30'55"N 108°32'48"E, *M.S. Nuraliev 2009* (MW); **Ha Giang**

1179 **Province:** Bac Me District, Bac Me Nature Reserve, 22°45'24"N 105°13'49"E, *L.F. Fu et al.*

1180 *VMN\_CN217* (IBK, VNMN); between Meo Vac District and Dong Van District, *L.F. Fu et al.*

1181 *VMN\_CN186, VMN\_CN196, VMN\_CN245* (IBK, VNMN); Quan Ba District, Tung Vai

1182 Municipality, *L.F. Fu et al. VMN\_CN864* (IBK, VNMN); **Ha Noi City:** Ba Vi District, Ba Vi

1183 National Park, 21°04'22"N 105°21'36"E, *L.F. Fu et al. VMN\_CN34* (IBK, VNMN), 21°03'35"N

1184 105°21'50"E, *M.S. Nuraliev 1917* (IBK, MW); **Hai Phong City:** Cat Hai District, Cat Ba Island,

1185 Cat Ba National Park, Frog pond, 20°48.005'N 107°1.600'E, *N.A. Vislobokov 13030* (MW); **Hoa**  
 1186 **Binh Province**: Lac Son District, Ngoc Son Municipality, 20°26'31"N 105°19'32"E, *N.Q. Hieu et*  
 1187 *al. CPC1615* (LE); **Lam Dong Province**: Bao Loc, *L. Averyanov et al. LX-VN1713* (LE); **Nghe**  
 1188 **An Province**: Que Phong District, Hanh Dich Municipality, Pu Hoat Nature Reserve, 19°46'19"N  
 1189 104°47'00"E, *M.S. Nuraliev 2180* (MW); **Ninh Binh Province**: Nho Quan District, Cuc Phuong  
 1190 National Park, *J.M. Hu Hu2099* (TAI); **Son La Province**: Phu Yen District, Gia Phu Municipality,  
 1191 Nhet Village, 21°36'27.7"N 104°04'22.8"E, *V.D. Nguyen et al. HNK2469* (K); **Tuyen Quang**  
 1192 **Province**: Na Hang District, Vinh Yen Municipality, 22°21'07"N 105°25'06"E, *N.T. Hiep et al.*  
 1193 *HLF-229* (HN).

1194

1195 **Elatostema rhizomatosum** (Gagnep.) Q.Lin1196 *Pellionia rhizomatosa* Gagnep.

1197 Endemic; ca. 500 m.

1198 **Province unknown**: Annam, col des Nuages près Tourane, *M. Poilane 7909* (P).

1199

1200 **Elatostema rupestre** (Buch.-Ham. ex D.Don) Wedd.1201 *Procris rupestris* Buch.-Ham. ex D.Don.1202 *Elatostema zollingerianum* Miq.

1203 India, Nepal, Vietnam; elevation unknown.

1204 **Tuyen Quang Province**: Na Hang District, *A. Gramain et al. 649* (HN).

1205

1206 **\*Elatostema salvinioides** W.T.Wang1207 a. **Elatostema salvinioides** var. **robustum** W.T.Wang

1208 China, Vietnam; 1100–1650 m.

1209 **Dien Bien Province**: Muong Cha District, Mua Ngai Municipality, 21°53'46"N 103°10'07"E,1210 *L. Averyanov et al. CPC1048, CPC1920* (LE); **Lai Chau Province**: Sin Ho District, Ta Ngau1211 Municipality, 22°18'N 103°15'E, *N.T. Hiep et al. NTH2772* (LE).

1212

1213 **Elatostema scabrum** (Benth.) Hallier f.1214 *Pellionia scabra* Benth.1215 *Elatostema pellioniifolium* W.T.Wang, *Pellionia cephaloidea* W.T.Wang, *P. scabra* subvar.1216 *pedunculata* Yamam., *Polychroa scabra* (Benth.) Hu.

1217 China, Japan, Vietnam; 700–1800 m.

1218 **Hoa Binh Province:** Da Bac District, Cao Son Municipality, Buoï Truong station,1219 20°54'09"N 105°12'15"E, *N.T. Hiep et al. HAL592* (HN); **Kon Tum Province:** *L. Averyanov et al.*1220 *VH255* (HN, LE, MO); **Phu Tho Province:** Tan Son District, Xuan Son Municipality, 21°06'49"N1221 104°56'03"E, *L. Averyanov et al. HAL12749* (LE); **Son La Province:** Yen Chau District, Muong1222 Lum Municipality, 20°59'06"N 104°28'46"E, *D.K. Harder et al. 7298* (HN).

1223

1224 **Elatostema simplicissimum** Q.Lin1225 *Pellionia imbricata* Gagnep.

1226 Endemic; 200–220 m.

1227 **Lai Chau Province:** 22°03'N 103°09'E, *N.T. Hiep et al. NTH2747* (LE); Muong Lay District,1228 Nam Hang Municipality, 22°08'14"N 102°58'18"E, *D.K. Harder et al. 5884* (K, LE).

1229

1230 **Elatostema sinense** H.Schroet.1231 *Elatostema sinense* var. *trilobatum* W.T.Wang.

1232 China, Vietnam; ca. 500 m.

1233 **Ha Giang Province:** Bac Me District, Bac Me Nature Reserve, *L.F. Fu et al. VMN\_CN216A*1234 (IBK, VNMN); Quan Ba District, Tung Vai Municipality, *L.F. Fu et al. VMN\_CN872* (IBK,1235 VNMN); **Hoa Binh Province:** Mai Chau District, Pa Co Municipality, *F. Wen et al. VMN\_CN330*,1236 *VMN\_CN333* (IBK, VNMN); **Son La Province:** Bac Yen District, Ta Sua Municipality, Chu1237 Village, 21°15'40.0"N 104°29'27.0"E, *V.D. Nguyen et al. HNK2724* (K).

1238



- 1239 **Elatostema sublineare** W.T.Wang  
1240 China, Vietnam; elevation unknown.  
1241 **Cao Bang Province:** Bao Lac District, Dinh Phung Municipality, *L.F. Fu et al. VMN\_CN815*  
1242 (IBK, VNMN); **Lang Son Province:** Van Lang District, *Anon. 1036* (LE); **Ninh Binh Province:**  
1243 Nho Quan District, Cuc Phuong National Park, *J.M. Hu Hu2106* (TAI); **Tuyen Quang Province:**  
1244 Na Hang District, *Anon. TV-74* (HN).  
1245  
1246 **Elatostema tenuicaudatum** W.T.Wang  
1247 China, Vietnam; 240–1700 m.  
1248 **Cao Bang Province:** Bao Lac District, Xuan Truong Municipality, *L.F. Fu et al.*  
1249 *VMN\_CN808* (IBK, VNMN); **Dak Lak Province:** Krong Bong District, Cu Pui Municipality,  
1250 12°30'N 108°30'E, *L. Averyanov et al. VH6036* (HN); **Dien Bien Province:** Muong Cha District,  
1251 Mua Ngai Municipality, 21°53'46"N 103°10'17"E, *L. Averyanov et al. CPC1921* (LE); **Gia Lai**  
1252 **Province:** Mang Yang District, A Yun Municipality, Kon Ka Kinh National Park, 14°13'10"N  
1253 108°19'10"E, *M.S. Nuraliev et al. 1827* (IBK, MW); **Ha Giang Province:** Vi Xuyen District, Cao  
1254 Bo Municipality, Tam Ve village, 22°46'03"N 104°49'42"E, *D.K. Harder et al. 5454* (MO),  
1255 22°46'12"N 104°49'33"E, *D.K. Harder et al. 5370* (MO); Yen Minh District, Du Gia Municipality,  
1256 [23°56'N 103°13'E], *P.K. Loc et al. CBL2063* (LE); **Hoa Binh Province:** Lac Son District, Tu Do  
1257 Municipality, 20°26'07"N 105°17'19"E, *N.Q. Hieu et al. CPC1499* (LE); **Khanh Hoa Province:**  
1258 Khanh Son District, 12°12'N 108°44'E, *L. Averyanov et al. VH4313* (HN, LE, MO); **Lam Dong**  
1259 **Province:** Lac Duong District, Da Chais Municipality, 12°09'N 108°41'E, *L. Averyanov et al.*  
1260 *VH2891* (HN, LE, MO), 12°07'N 108°41'E, *L. Averyanov et al. VH3413* (LE), 12°11'N 108°43'E,  
1261 *L. Averyanov et al. VH4387* (LE, MO); **Lao Cai Province:** Van Ban District, Khanh Yen Ha  
1262 Municipality, 21°57'59"N 104°14'06"E, *L. Averyanov et al. HAL2462* (HN, LE); Van Ban District,  
1263 Nam Xe Municipality, 22°01'27"N 104°00'25"E, *D.K. Harder et al. DKH7060* (LE); **Phu Tho**  
1264 **Province:** Tan Son District, Xuan Son Municipality, 21°06'57"N 104°57'17"E, *L. Averyanov et al.*  
1265 *HAL12639* (LE); **Quang Nam Province:** *L. Averyanov et al. VH905* (HN, LE); **Tuyen Quang**

- 1266 **Province:** Na Hang District, Vinh Yen Municipality, 22°21'09"N 105°25'20"E, *Le Van Cham et al.*  
1267 *HLF-061* (HN); **Vinh Phuc Province:** Tam Dao District, 21°27'35"N 105°38'58"E, *L.F. Fu et al.*  
1268 *VMN\_CN45* (IBK, VNMN); Tam Dao Range, *N. Arnautov et al. LX-VN3921* (LE).  
1269  
1270 ***Elatostema trichosanthum*** (Gagnep.) H.Schroet.  
1271 *Pellionia trichosantha* Gagnep.  
1272 Endemic; elevation unknown.  
1273 **Ha Noi City:** Ba Vi District, Ba Vi Mountain, *B. Balansa 2529* (P).  
1274  
1275 ***Elatostema tsoongii*** (Merr.) H.Schroet.  
1276 *Polycharoa tsoongii* Merr.  
1277 *Pellionia cristulata* Gagnep.  
1278 Cambodia, China, Vietnam; 115–1100 m.  
1279 a. ***Elatostema tsoongii* ssp. *tsoongii***  
1280 **Bac Kan Province:** Na Ri District, Kim Hy Nature Reserve, 22°18'01"N 106°01'38"E, *L.F.*  
1281 *Fu et al. VMN\_CNI39* (IBK, VNMN); **Dak Lak Province:** Krong Bong District, Cu Pui  
1282 Municipality, 12°30'N 108°30'E, *L. Averyanov et al. VH5928* (HN); Lak District, Bong Krang  
1283 Municipality, Chu Yang Sin National Park, 12°23'50"N 108°21'00"E, *M.S. Nuraliev 997* (K, MW);  
1284 **Gia Lai Province:** Mang Yang District, A Yun Municipality, Kon Ka Kinh National Park,  
1285 14°12'53"N 108°18'56"E, *M.S. Nuraliev et al. 1449* (IBK, MW); **Ha Tinh Province:** Huong Son  
1286 District, Son Hong Municipality, 18°34'06"N 105°11'40"E, *P.K. Loc et al. HAL5193* (HN, LE);  
1287 **Lam Dong Province:** Bao Lam District, Lac Bac Municipality, 11°43'28"N 107°41'59"E, *M.S.*  
1288 *Nuraliev et al. s.n.* (photo: MW); **Lang Son Province:** Huu Lung District, Huu Lien Municipality,  
1289 Huu Lien Protected Area, 21°40'59"N 106°20'30"E, *D.K. Harder et al. 4120* (K); Pac Mo District,  
1290 *Anon. 1149* (LE); **Quang Binh Province:** Minh Hoa District, Thong Hoa Municipality, vicinities  
1291 of Yen Son Village, 17°40'N 105°57'E, *L. Averyanov et al. VH4729* (HN, LE, MO); **Quang Tri**  
1292 **Province:** Da Krong District, Ta Rut Municipality, 16°24'29"N 107°01'07"E, *L. Averyanov et al.*

1293 *CPC3017* (LE); Lang Khoai, *Polilane 10741* (P); **Thanh Hoa Province**: Quan Hoa District, Pu  
1294 Hu Nature Reserve, *F. Wen et al. VMN\_CN352* (IBK, VNMN); **Thua Thien Hue Province**: Phu  
1295 Loc District, Bach Ma National Park, 16°14'11"N 107°44'28"E, *N.T. Hiep et al. HLF1649* (HN,  
1296 MO); **Tuyen Quang Province**: Na Hang District, Thanh Tuong Municipality, near Ban Bung  
1297 Village, 22°16'26"N 105°25'58"E, *P.K. Loc et al. HAL164* (HN); **Vinh Phuc Province**: Tam Dao  
1298 National Park, *N. Arnautov et al. LX-VN4005* (LE).

1299

1300 **b. *Elatostema tsoongii* ssp. *subpeltatum* (Gagnep.) H.W.Li**

1301 *Pellionia subpeltata* Gagnep.

1302 China, Vietnam; elevation unknown.

1303 **Bac Giang Province**: Lang Met, *P.A. Petelot 2929* (P).

1304

1305 ***Elatostema veronicoides* (Gagnep.) H.Schroet.**

1306 *Pellionia veronicoides* Gagnep.

1307 China, Vietnam; elevation unknown.

1308 **Hoa Binh Province**: Da Bac District, Cho Bo, *B. Balansa 2251* (P); **Thanh Hoa Province**:

1309 Pu Huong Natural Reserve, *F. Wen et al. VMN\_CN422* (IBK, VNMN).

1310

1311 ***Elatostema vietnamense* Q.Lin & L.D.Duan**

1312 Endemic; elevation unknown.

1313 **Thua Thien Hue Province**: Phu Loc District, Bach Ma National Park, *H.N. Qin et al. 156*

1314 (PE).

1315

1316 ***Elatostema xanthophyllum* W.T.Wang**

1317 China, Vietnam; 400–1450 m.

1318 **Bac Kan Province**: Na Ri District, Kim Hy Nature Reserve, 22°11'56"N 106°04'05"E, *L.F.*

1319 *Fu et al. VMN\_CN134* (IBK, VNMN); Na Ri District, Kim Hy Nature Reserve, *Y.G. Wei & V.T.*

1320 *Do VMN\_CN24* (IBK, VNMN); **Ha Giang Province**: Quan Ba District, 23°06'57"N 105°01'47"E,  
1321 *D.K. Harder et al. 4830* (HN); Quan Ba District, Can Ti Municipality, 23°04'N 104°59'E, *N.T.*  
1322 *Hiep et al. NTH3614* (K); Quan Ba District, San Chu village, 23°08'55"N 104°59'46"E, *L.*  
1323 *Averyanov et al. VR063* (LE); Quan Ba District, Thanh Van commune, Mo Sai village, 23°07'46"N  
1324 104°57'56"E, *L. Averyanov et al. VR394* (LE); **Son La Province**: Van Ho District, Tan Xuan  
1325 Municipality, 20°40'33"N 104°39'00"E, *L. Averyanov et al. CPC7117* (LE).

1326

1327 **\**Elatostema xichouense*** W.T.Wang

1328 China, Vietnam; 300–1100 m.

1329 **Ha Giang Province**: Quan Ba District, Bat Dai Son Nature Reserve, 23°09'N 104°59'E, *D.K.*  
1330 *Harder et al. 5120* (HN), *L. Averyanov et al. VR052* (LE), *N.T. Hiep & L. Averyanov 5120* (MO);  
1331 Quan Ba District, Bat Dai Son Nature Reserve, Thanh Van commune, Mo Sai village, 23°07'46"N  
1332 104°57'56"E, *L. Averyanov et al. VR365* (LE); Meo Vac District, *L.F. Fu et al. VMN\_CN852* (IBK,  
1333 VNMN); **Hoa Binh Province**: Lac Son District, Tu Do Municipality, 20°26'07"N 105°17'19"E,  
1334 *N.Q. Hieu et al. CPC1482* (LE); Mai Chau District, Van Mai Municipality, 20°35'26"N  
1335 105°02'00"E, *D.K. Harder et al. 8170* (MO); **Ninh Binh Province**: Nho Quan District, Cuc  
1336 Phuong National Park, *L. Averyanov et al. LX-VNI728* (LE).

1337

1338 **Excluded taxa**

1339 ***Elatostema cuneatum*** Wight

1340 *Elatostema approximatum* Wedd., *E. densiflorum* Franch. & Sav., *E. nipponicum* Makino., *E.*  
1341 *webbianum* Wedd.

1342 Bhutan, China, India, Indonesia, Laos, Thailand.

1343 This species was indicated by Ho (2003) and Hiep (2005) as occurring in Vietnam but no  
1344 specimen was cited and we were unable to locate any specimen from Vietnam.

**Table 1** (on next page)

The species richness, endemism, and new records identified per Floristic Region

the data indicates a summary of the species richness, national endemism, and new national records identified here, per floristic region.

1 Table 1. The species richness, endemism, and new records identified per Floristic Region

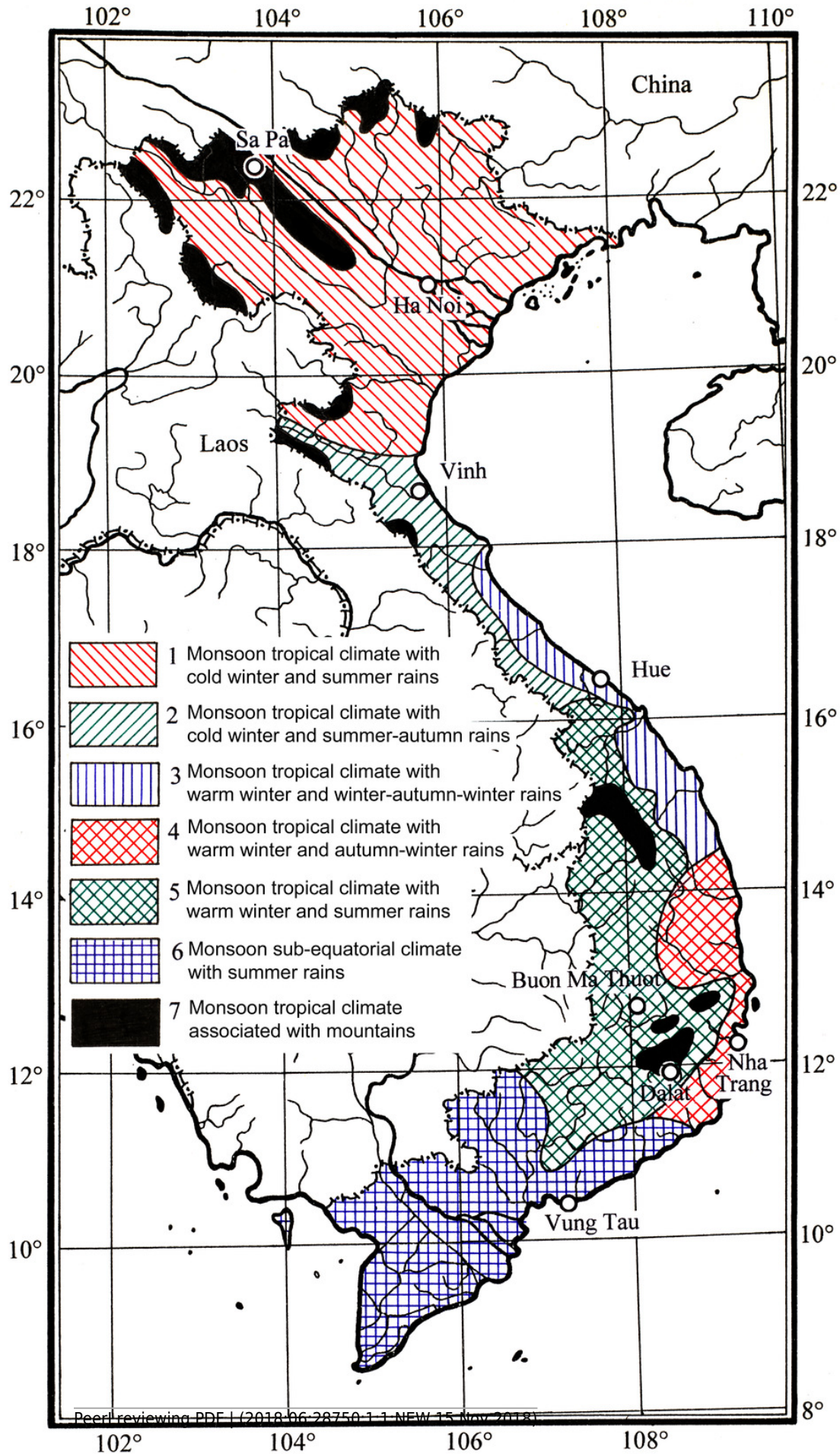
Floristic Region	Species no.	Endemic species no.	New records no.
Sikang-Yunnan Floristic Region	36	2	9
South Chinese Floristic Region	54	5	12
North Indochinese Floristic Region	36	1	4
Central Annamese Floristic Region	16	2	0
South Annamese Floristic Region	7	0	0
South Indochinese Floristic Region	0	0	0

2

# Figure 1

Climate map of Vietnam

the data based on Nguyen et al. 2000 showing seven types of climate in Vietnam

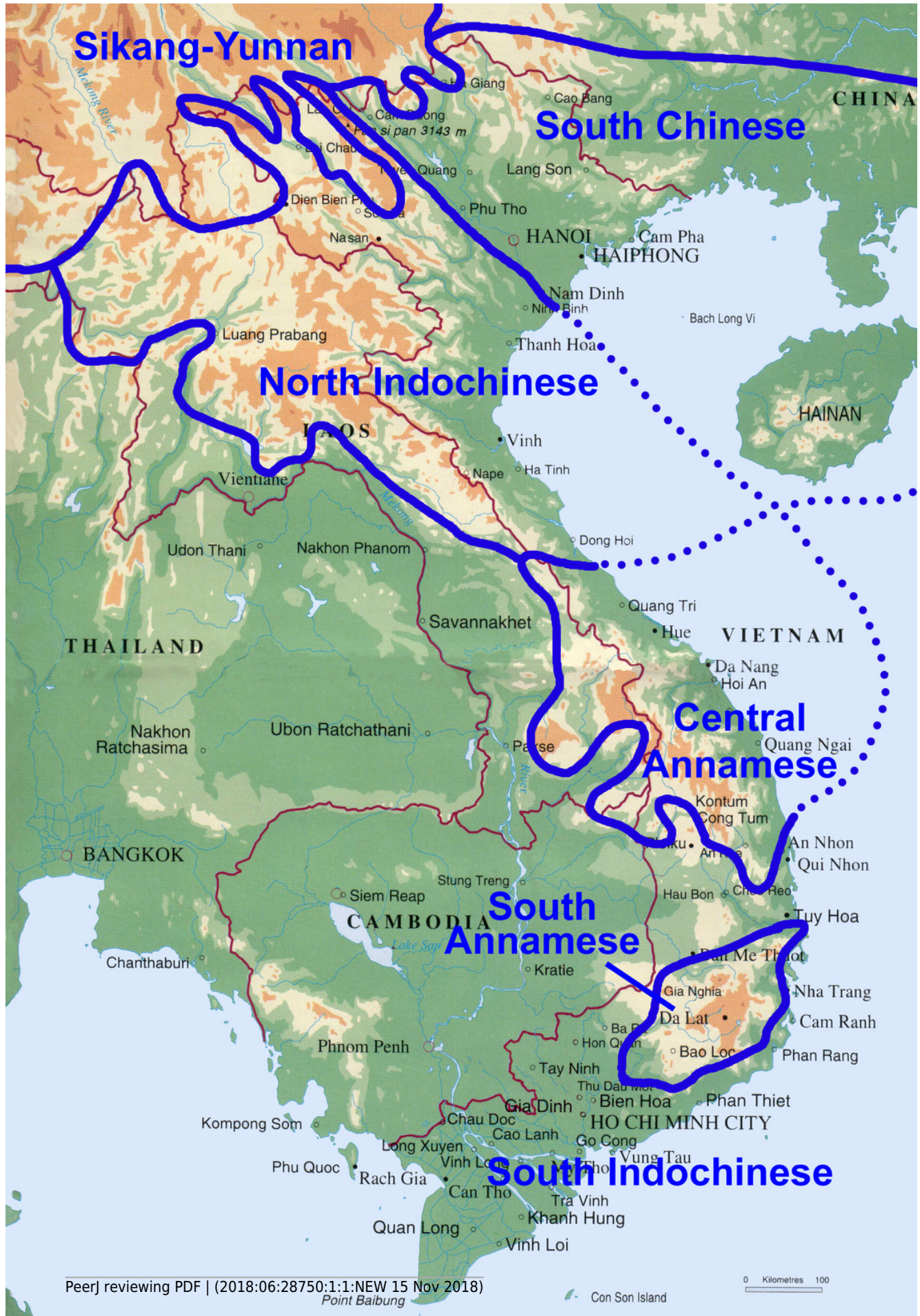




## Figure 2

Map of floristic regions in Vietnam

the data modified from Averyanov *et al.* 2003c showing six floristic regions in Vietnam



## Figure 3

Plate I of representative *Elatostema* species in Vietnam: A, *E. crassiusculum*; B, *E. glochidioides*; C, *E. hookerianum*; D, *E. prunifolium*; E, *E. arcuatobracteatum*; F, *E. retrohirtum*; G, *E. obtusum*; H, [i]E. ra

The data showed representative *Elatostema* species in Vietnam.



## Figure 4

Plate II of representative *Elatostema* species in Vietnam: A, *E. heterolobum*; B, *E. atroviride*; C, *E. tenuicaudatum*; D, *E. nasutum*; E, *E. cyrtandrifolium*; F, *E. backeri*; G, *E. veronicoides*; H, [i]E. dissectum

The data showed representative *Elatostema* species in Vietnam.



## Figure 5

Plate III of representative *Elatostema* species in Vietnam: A, *E. caulialatum*; B, *E. radicans*; C, *E. tsoongii*; D, *E. sinense*; E, *E. brevifolium*; F, *E. macintyreii*; G, *E. balansae*; H, *E. myrtilus*; I, [i]

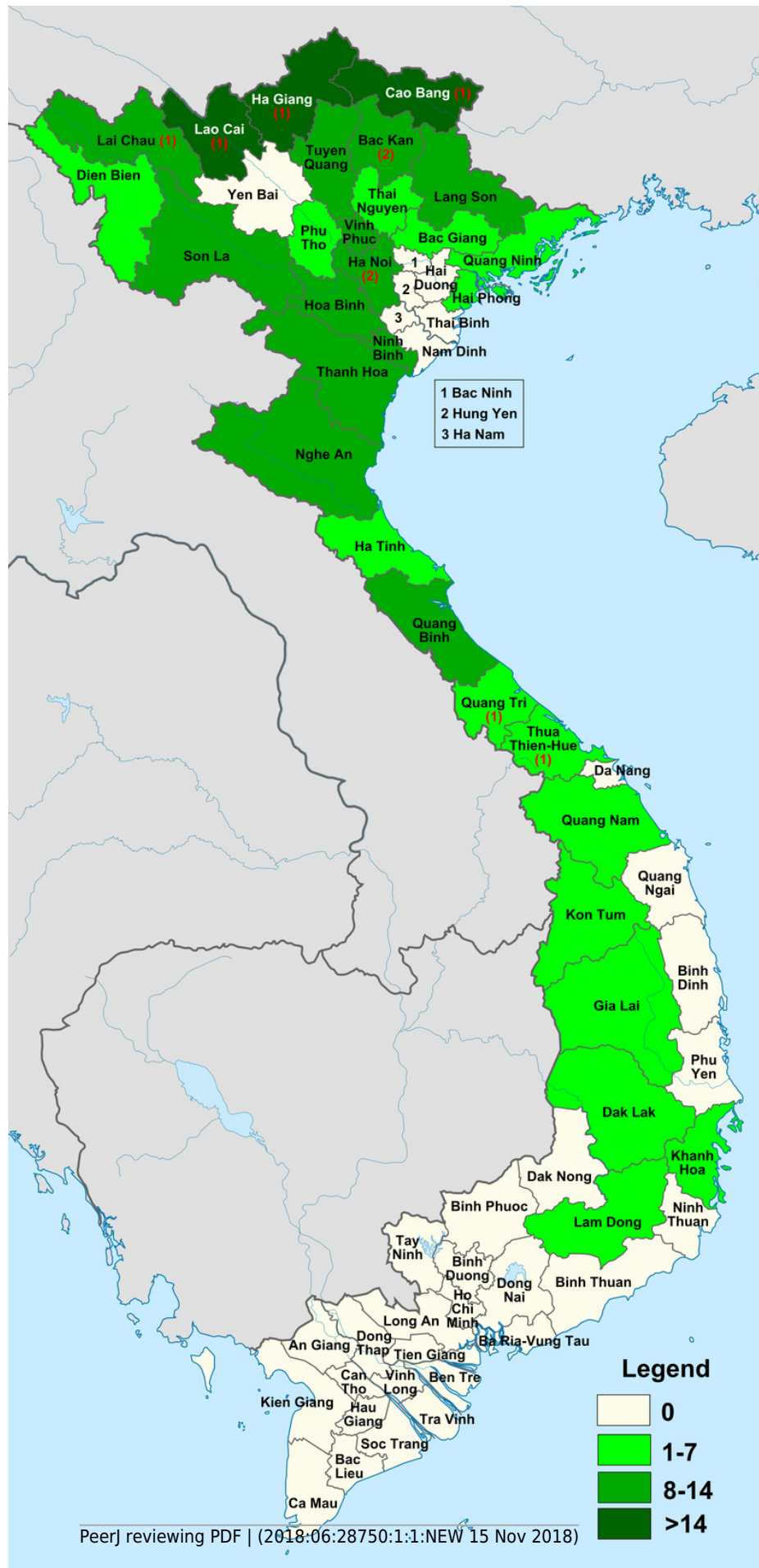
The data showed representative *Elatostema* species in Vietnam



## Figure 6

Variation in *Elatostema* species richness and endemism across provinces of Vietnam

The data showed the diversity and endemism of *Elatostema* in each Province of Vietnam



## Figure 7

Proportion of diversity and endemism and the relationship of the floristic regions

Large circles designate floristic regions. Percentage numbers above the line in the large circles indicate the relative proportion of diversity occurring in a certain region (within Vietnam); percentage numbers below the line indicate the relative proportion of national endemics occurring in a certain region; percentage numbers in the small circles indicate the relative proportion of co-exsisted species occurring in the pairs of region connected by the line and show their relative floristic relationships



