CONCLUSION

In this study, carried out in Sierra de la Laguna, from October 1984 to July 1985 (Pinel, 1987), it appears that morphological characteristics, especially the number of needles per fascicle, vary throughout the *Pinus lagunae* formation. Apart from varying number of needles per fascicle from one specimen to another in La Laguna, previously indicated by Passini (1981), it was noted that the number of needles per fascicle increases with altitude, between 1 400 and 1 700 m. Also, the positive correlation between annual growth unit and the percentage of three needles per fascicle has to be noted. We also draw attention to the fact that very long needles (longer than the average needle length of *Pinus cembroides* Zucc., Zavarin & Snajberk, 1986) are to be found in the trees of the locality. Moreover, considerable variation in the number of needles per fascicle and the percentage of three needles per fascicle has to be noted. Apart from varying number of needles per fascicle from one specimen to another in the Sierra de la Laguna, previously indicated by Pinel (1987), it was noted that the number of needles per fascicle increases with altitude, between 1 400 and 1 700 m. Also, the positive correlation between annual growth unit and the percentage of three needles per fascicle has to be noted. We also draw attention to the fact that very long needles (longer than the average needle length of *Pinus cembroides* Zucc., Zavarin & Snajberk, 1986) are to be found in the trees of the locality.

**Characteristics of description type**: three needles per fascicle, ventral and dorsal stomatal lines, average number of cotyledons (12.6) were confirmed. But the average height of trees is greater than that given in the description. Moreover, considerable variation was noted in the San Francisco locality which is further south than that of La Laguna: the trees, there, are smaller, but at present our studies do not enable us to say whether this variation affects all the trees of the locality.

Two types of seeds were found: a thin shell seed of 0.2 to 0.5 mm and a medium thick shell 0.5 to 0.9 mm. This study enable us to conclude that two varieties of *Pinus lagunae*. Further studies will specify their relations and ecological requirements.

REFERENCES


THE ENDEMIC PINYON OF LOWER CALIFORNIA. *PINUS LAGUNAE* M.-F. PASSINI

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Mexico has been an important center of *Pinus* diversification, in particular of pines belonging to the sub-section *campesiris* which counts, now, 12 species. My study of ecology and distribution of pines from the *cembroides* group (Passini, 1981) led me to describe, the pine in Sierra de la Laguna, Lower California as a variety of *Pinus cembroides* Zucc. (Robert-Passini 1981). In 1983, Bailey decided to give it subspecific rank. The morphological observations made by Pinel (1985) and the results obtained by Zavarin and Snajberk (pers. comm.) justify raising the rank to species


HOLOTYPE: -P, Sierra La Laguna, Delegación Todos Santos, Baja California Sur, 23°34 N, 109°55 W, cristalline rock, 1650 m., 15.02.1978, M.-F.Robert
10021 (HOLO: -P, ISO: -MPU, TLJ, ENC, INIF)

We have some several additional characters to complete the description of the variety, using samples collected in February 1978 and July 1985. *Pinus lagunae* has an upright trunk, generally 12-15 meters high but can grow up to 21 meters. In open surroundings the habit is pyramid shaped whereas in a closed environment the crown is sparse. The bark of mature trees is fissured and exhibits thick regular plates. The grey branches bear 3 needle fascicles (sometimes 2, seldom 4), 4-9 cm long (average length is 6.9 cm) soft to the touch and grey green in colour). Dorsal and ventral surfaces have stomatal lines with more on the ventral surface, 4-5 lines, than on the dorsal surface, 1-3 lines. The sub-globular cones are pedunculate, their average length is 3.9 cm and they grow singly or in twos. The peduncle can be 0.2 to 1.2 mm long and comes away with the cone. The apertural seeds are 10 to 16 mm long, 6 to 10 mm wide with a 0.2 to 0.9 mm thick shell. The endosperm is pink coloured.

The following morphological characters distinguish *Pinus lagunae* from *Pinus cembroides*: longer, more slender needles, longer cone peduncle, higher number of cotyledons (12.6), doubly quick-growing pignons and saplings. But the biochemical characteristics revealed by Zavarin and Snajberk (1985) also bear this difference. *Pinus cembroides* wood is high in α-pinene 87.5% (min. 64.6 max 96.7%), low in α-pinene 3.4% (0.5-10.2%) and in terpinolene 2.1% (0.7-10.2%). On the contrary *Pinus lagunae* is low in α-pinene 13.5% (min 10.6 max 16.1%), high in α-sabinine 31.7% (14.5-45.7%) and in terpinolene 27.2% (19.6-42.1%).
The monoterpene biosynthesis chains of these two taxa are quite distinct. The difference between *Pinus laguna* and *Pinus cembroides* is greater than that between *Pinus remota* and *Pinus cembroides* (Snajberk and Zavarin, 1986). The monoterpene constituents of *Pinus laguna* are more akin to those of *Pinus discolor* than to *Pinus cembroides*. Like *Pinus laguna*, *Pinus discolor* synthesizes sabine and terpinolene as well as a fair amount of phymene (12.4% average). The latter only present in very small quantities in *Pinus laguna* wood (1.7%).

In addition to these characteristics pointed out by Passini, Bailey, Zavarin and Snajberk, the existence, in Sierra de la Laguna, of two varieties (Pine1, 1985): one with a thin shell, 0.25-0.3 mm, the other with a thick shell (0.6-1 mm), has led me to raise *Pinus cembroides subsp. laguna* (M.-F.Robert-Passini) D.K.Bailey to specific status.

Differentiating a taxon distinct from *Pinus cembroides* in Sierra de la Laguna was facilitated by the long term isolation which the mountains in the far southern tip of the Lower California peninsula underwent throughout the Tertiary period. This geographical isolation was accentuated in the Miocene by the La Paz-Todos Santos north-south fault.

This endemic species of Lower California, which adapts to chalky parent rock soils, offers many advantages for retimbering dry, eroded areas, since growth rate is rapid (Passini, 1981). On these grounds, genetic studies will have to be pursued.

ACKNOWLEDGEMENTS

My grateful thanks go to Dr Zavarin for having allowed me to use the results of analyses performed in this laboratory and for his helpful suggestions.

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Harold St. John
Bishop Museum, Box 19000A, Honolulu Hawaii 96817, USA.

It was known that the species of Delissea (or Cyanea) were numerous on the island of Kauai. Now, due to the intensive exploration and the collections made by Charles Christensen, it is revealed that they are multidinous. The types, unless otherwise indicated, are in the Bishop Museum, Honolulu.

**Delissea alba sp. nov.**

**Prutex ramosus**, ramulis glabris, petiolis 2.7-4 cm longis glabris, laminis 42.5-50.5 X 9.6-12 cm oblongo-lanceolatis subacuminalibus basi cuneata et decurrenti infra in nervis scabre puberulis, racemis 7-9 cm longis, pedunculo 3-4 cm longo puberulo, bracteis 5-6 mm longis lanceolatis, pedicellis 9-12 mm longis, lobis calycis 5-6 mm longis lanceolatis, corollis 40 mm longis albis purpureo-linearibus, tubo filamentarum 31 mm longo glabro, antheris superis 9.5 mm longis glabris. Typus: Kauai I., Lumahai, C. Christensen 210.

**D. albillinea sp. nov.**

**Prutex ext**, caule simplici, petiolis 1.8-2 cm longis puberulis, laminis 24-34 X 3.5-5.4 cm oblongo-lanceolatis subacuminalibus basi cuneatae et decurrenti infra in nervis scabre puberulis, racemis 8 cm longis 10-floriferis, pedunculo 18 mm longo, bracteis 4-5 mm longis lanceolatis puberulis, pedicellis 13-15 mm longis puberulis, lobis calycis 6 mm longis lanceolato-deltoides puberulis, corollis 39 mm longis purpureis albillineatis puberulis, tubo filamentarum 30 mm longo glabro, antheris superis 10 mm longis glabris. Typus: Kauai I., Kahili Mt., C. Christensen 300.

**D. brevipedicellata sp. nov.**

**Prutex ext**, caule simplici, petiolis 9-10.5 cm longis glabris, laminis 37-42 X 9.7-10.8 cm oblongo-lanceolatis acutis basi cuneatae et decurrenti infra in nervis principalibus puberulis, racemis 5-7 cm longis puberulis, pedunculo 1.5-2 cm longo, bracteis 2 mm longis lanceolatis, pedicellis 8-12 mm longis puberulis, lobis calycis 1.8-2.5 mm longis deltoidelibus puberulis, corollis 37 mm longis. Typus: Kauai I., Waipa Valley C. Christensen 239.

**D. cataracta sp. nov.**

**Prutex ramosus est**, petiolis 3-3.5 cm longis, laminis 45-54 X 13.5-16.7 cm oblongo-lanceolatis basi cuneatae et decurrenti infra nervis puberulis nervulis pilosulis, pedicellis 8-17 mm longis, lobis calycis 6-7.
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