

## CONCLUSION

In this study, carried out in Sierra de la Laguna, from October 1984 to July 1985 (Pinel, 1985), 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 at La Laguna, and shorter needles in southern collection localities.

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 at the San Francisquito 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.

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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 *cembroides* 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 rang to species

*PINUS LAGUNAE* (M.-F. Robert-Passini, D.K. Bailey) M.F. Passini, *comb. nov.*  
*Pinus cembroides* subsp. *lagunae* (Robert-Passini) D.K. Bailey, *Phytologia*, 54, 2, 89-99, 1983  
*Pinus cembroides* var. *lagunae* M.-F. Robert-Passini, *Adansonia*, ser. 4, 3, sec. B, n°1, 64-66, 1981  
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, ENCB, 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 branchlets 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, 4-8 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 apterous 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* s.l. : longer, more slender needles, longer cone peduncle, higher number of cotyledons (12,62), doubly quick-growing plantlets and saplings. But the biochemical characteristics revealed by Zavarin and Snajberk (1985) also bear this difference. *Pinus cembroides* wood is high in  $\alpha$ -pinene : 87,5% (min. 64,6 max. 96,7 %), low in sabinene : 3,4% (0,5-10,2 %) and in terpinolene : 2,1% (0,7-10,2 %). On the contrary *Pinus lagunae* is low in  $\alpha$ -pinene : 13,5% (min. 10,6 max. 16,1 %), high in sabinene : 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 lagunae* and *Pinus cembroides* is greater than that between *Pinus remota* and *Pinus cembroides* (Snajberk and Zavarin, 1986). The monoterpene constituents of *Pinus lagunae* are more akin to those of *Pinus discolor* than to *Pinus cembroides*. Like *Pinus lagunae*, *Pinus discolor* synthesizes sabinene and terpinolene as well as a fair amount of p-cymene (12.4% average). The latter only present in very small quantities in *Pinus lagunae* 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 (Pinel, 1985) - one with a thin shell, 0.25-0.5 mm, the other with a thick shell (0.6-1 mm), has led me to raise *Pinus cembroides* subsp. *lagunae* (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 reforestation of dry, eroded areas, since growth rate is rapid (Passini, 1981). On these grounds, genetic studies will have to be pursued.

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#### DIAGNOSES OF DELISSEA SPECIES (LOBELIACEAE) FROM KAUAI HAWAIIAN PLANT STUDIES 145

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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 multitudinous. The types, unless otherwise indicated, are in the Bishop Museum, Honolulu.

#### *Delissea alba* sp. nov.

Frutex ramosus, ramulis glabris, petiolis 2.7-4 cm longis glabris, laminis 42.5-50.5 X 9.6-12 cm oblanceolatis subacuminatis 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 purpureolineatis puberulis, tubo filamentarum 31 mm longo glabro, antheris superis 9.5 mm longis glabris. Typus: Kauai I., Lumahai, C. Christensen 210.

#### *D. albilineata* sp. nov.

Frutex est, caule simplicis, petiolis 1.8-2 cm longis puberulis, laminis 24-34 X 3.5-5.4 cm oblanceolatis subacuminatis basi cuneata et decurrenti infra in nervis 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 lanceo-deltoides puberulis, corollis 39 mm longis purpureis albi-lineatis 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.

Frutex est, caule simplicis, petiolis 9-10.5 cm longis glabris, laminis 37-42 X 9.7-10.8 cm oblanceolatis acutis basi cuneata 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 deltoideis puberulis, corollis 37 mm longis. Typus: Kauai I., Waipa Valley C. Christensen 239.

#### *D. cataracta* sp. nov.

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

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## CONTENTS

ZDERO, C., BOHLMANN, F., & KING, R.M., <i>Chemistry of the Barnadesiinae (Asteraceae)</i> .....	313
ROBINSON, H., <i>Some suggestions regarding the significance of chloroplast DNA variation in the Asteraceae</i> .....	316
SCHUSTER, R.M., & DAMSHOLT, K., <i>Some new taxa of Jungermanniales</i> .....	325
OCHOA, C., <i>Solanum longiusculus (Sec. Petota), nova specie peruviana</i> .....	329
PASSINI, M.-F., & PINEL, N., <i>Morphology and phenology of Pinus lagunae</i> .....	331
PASSINI, M.-F., <i>The endemic pinyon of Lower California: Pinus lagunae M.-F. Passini</i> .....	337
ST. JOHN, H., <i>Diagnosis of Delissea species (Lobeliaceae) from Kauai: Hawaiian Plant Studies 145</i> .....	339
ST. JOHN, H., <i>Diagnoses of Clermontia species (Lobeliaceae): Hawaiian Plant Studies 146</i> .....	350
ST. JOHN, H., MEDEIROS, A. C., <i>A Haleakala variety of Lobelia (Lobeliaceae): Hawaiian Plant Studies 147</i> .....	366
ST. JOHN, H., <i>Diagnoses of Rollandia species (Lobeliaceae): Hawaiian Plant Studies 148</i> .....	367
ST. JOHN, H., <i>Diagnoses of Panicum species (Graminae): Hawaiian Plant Studies 149</i> .....	368
TURNER, B.L., <i>A new species of Perymenium (Asteraceae-Heliantheae) from Tamaulipas, Mexico</i> .....	396
FOOTE, M., <i>The algae of New Jersey (U.S.A.). XIII Chlorophyta (Green Agae). D. Zygnematales (Zygnemataceae and Mesotaeniaceae)</i> .....	399
SÁNCHEZ V., P.E., <i>Mirtaceas Nicaraguenses I: Eugenia sanjuanensis sp. nov.</i> .....	402
SÁNCHEZ V., P.E., & ORTEGA T., L.M., <i>Nueva especie de Eugenia L. (Myrtaceae) de Veracruz, Mexico</i> .....	404
ROBINSON, H., <i>Studies in the Liabaeae (Asteraceae). XVIII. A new species of Munnozia from Bolivia</i> .....	407
REED, C.F., <i>New combinations required for the Flora of Central Eastern United States</i> .....	410

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