

9.

A 10 year trial with South American trees and shrubs with special regard to the *Nothofagus* spp.

10 ára royndir við suðurameríkenskum trøum og runnum við serligum atlit at *Nothofagus*-sløgum

Søren Ødum

Abstract

The potential of the ligneous flora of cool temperate South America in arboriculture in the Faroe Isles is elucidated through experimental planting of a broad variety of species collected on expeditions to Patagonia and Tierra del Fuego 1975 and 1979. Particular good results have been obtained with the southernmost origins of *Nothofagus antarctica*, *N. betuloides*, and *N. pumilio*, of which a total of 6.500 plants were directly transplanted from Tierra del Fuego to the Faroe Isles in 1979.

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Introduction

As a student of botany at the University of Copenhagen I got the opportunity to get a job for the summer 1960 as a member of the team mapping the flora of the Faroe Isles (Kjeld Hansen 1966). State geologist of the Faroe Isles and the Danish Geological Survey, Jóannes Rasmussen, provided working facilities for the team at the museum, and also my co-student, Jóhannes Jóhansen participated in the field. This stay and work founded my still growing interest in the Faroese nature and culture, and the initial connections between the Arboretum in Hørsholm and Tórshavn developed from this early contact with Jóannes Rasmussen and Jóhannes Jóhansen.

On our way back to Copenhagen in 1960 onboard “Tjaldur”, we called on Lerwick, Shetland, where I saw *Hebe* and *Olearia* in some gardens. This made it obvious to me, that if the Faroe Isles for historical reasons had been more or less British rather than Nordic, the gardens of Tórshavn would, no doubt, have been speckled with genera from the southern Hemisphere and with other species and cultivars nowadays common in Scottish nurseries and gardens. The idea of introducing trees and shrubs from the cool temperate forests of southernmost Australasia and South America became awakened.

Very few ideas, however, appear to be new ideas. Already Børgesen (1908), inspired by Carl Skottsberg's descriptions of the South Atlantic flora, suggested that woody species of the Tierra del Fuego-flora, such as *Nothofagus antarctica*, *N.*

betuloides, *Maytenus magellanica*, and *Drimys winteri*, ought to be tried in the Faroese gardens. Børgesen spent most of the summers 1895–1902 studying the flora of the islands, incl. the algae (Jóhansen 1985).

The good results of some sporadic and to some extent casual introductions supported the ideas of a more comprehensive effort, cf. the inventory in this volume: *Berberis buxifolia* 'Nana', *Pernettya mucronata*, *Fuchsia* and *Berberis* × *stenophylla* were probably taken along from Scottish and Danish nurseries to some gardens years ago. *Embothrium coccineum* from 53°S in South Chile, introduced to Denmark (where not hardy) on initiative by G. Schlätzer (1967), was in the sixties together with North American coastal species transferred with good results from the Arboretum in Hørsholm to Jóannes Rasmussen's garden, and in the same years landscape-architect Frank Pettersson planted nursery-plants of *Nothofagus antarctica* at the hospital in Tórshavn. Ivar Nyholm and S. A. Christensen shipped in recent years *Chiliodendron*, *Berberis buxifolia*, and in 1975 additionally some species of Tasmanian *Eucalyptus* and South American *Nothofagus* provided by Flemming Juncker.

The possibility of a more comprehensive input became a reality when in 1971 people from the Nordic arboreta, botanical gardens and institutes of experimental arboriculture and forestry met in Bergen at the occasion of the foundation of the Norwegian Arboretum at Milde. It was then decided to establish the Nordic Arboretum Committee (Nordisk Arboretudvalg) which at its first session in Bergen June 1972 agreed on initiating collecting expeditions to Japan, Korea, New Zealand-Tasmania, and southernmost South America with the purpose of introducing plant material of well defined origins to be tested in the various climatical regions (Nordisk Arboretudvalg 1977). Seedlists, additionally offering surplus seed to arboreta and botanical gardens outside the Nordic countries, should secure an optimal yield based on local cultivation and selection.

The oceanic conditions and mild winters of the Norwegian SW-coast (see P. Søndergaard's paper in this volume – and Søndergaard 1975) encouraged the ideas of a more systematic collecting for SW-Scandinavia in the temperate forests of the Southern Hemisphere, covering localities close to the tree-lines, around transition zones between forest and steppe, and at very southern latitudes. In 1974–75 the arboreta in Bergen and Hørsholm, respectively, were responsible for the collecting expeditions to New Zealand and to Argentina-Chile (Søndergaard & al. 1977, Ødum & al. 1977).

It was obvious that the Faroe Islands would be of importance when testing and utilizing the material from these expeditions and it was planned that Jóannes Jóhansen should participate in the expedition to South America. Unfortunately this was not possible, but Jóhansen took care of the first seed arriving at Tórshavn during the spring of 1975. As soon as the scope of possibilities and work involved became revealed, Jóhansen and Jóannes Rasmussen established the hence so important contact between the Faroese Plantation Committee and the Nordic Arboretum Committee, which at a meeting in Sept. the same year officially turned

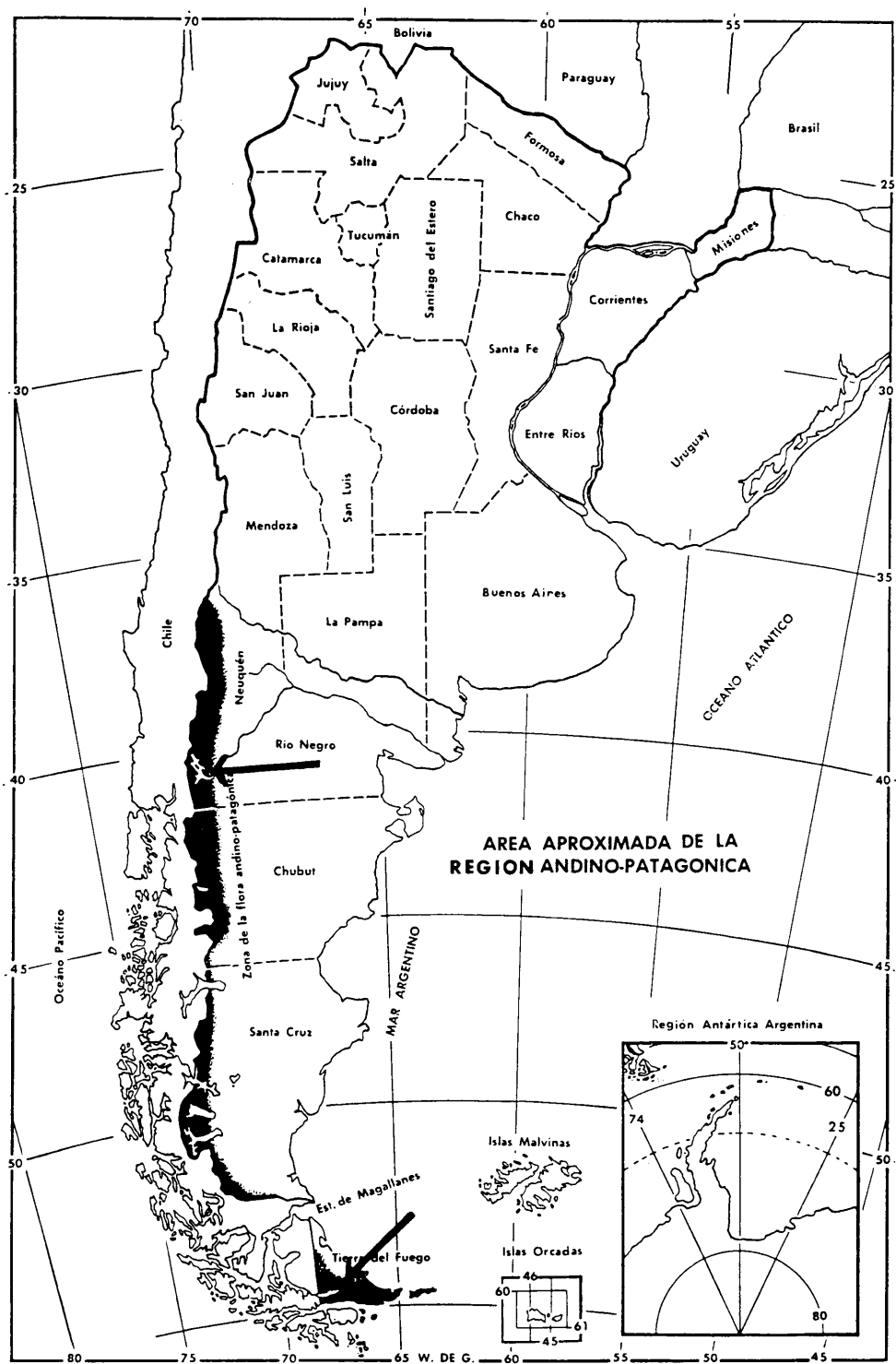
to the Plantation Committee with the proposal of a Southern Hemisphere arboretum in Tórshavn. The Faroese government (Landsstýrið) asked Leivur Hansen to handle such a project and invited two members of the Arboretum Committee to Tórshavn. In April 1976 H. Vedel and I went to the Faroe Isles with approx. 70 species (840 plants) from the expeditions. In the subsequent cooperation on development of the arboretum project Leivur Hansen and Andrias Højgaard were the key persons. Since 1977 Leivur Hansen has represented the Faroe Isles in the Nordic Arboretum Committee. In 1979 Tróndur Leivsson participated in the second collecting expedition to Tierra del Fuego. In 1978 a grant from SNS (Samarbejdsnævnet for Nordisk Skovforskning – The Nordic Committee on Forest Research Cooperation) supported Tróndur Leivsson in returning during periods of 1979–80 from his forestry studies in Norway to follow up in handling and registration in nursery and plantations of the 1975-material as well as of the approx. 6.300 new plants, mainly *Nothofagus*, transferred from Tierra del Fuego in April 1979.

Collecting and handling of seed and plants

The arboretum expedition to South America in 1975 is dealt with in details by Ødum & al. (1977). The period of collecting lasted from Jan. 18 till May 11. The localities from where the plant material introduced to the Faroe Isles originate, range from Ushuaia, Tierra del Fuego, at 54°51'S to the Lago Tremen – Volcano Lanin region in the Prov. Neuquén, Argentina at 39°34'S. The majority of the seed and plants were collected in Argentina in the transition zone between the rain forest and the Patagonian steppe close to the border to Chile. On the map (Fig. 9.1) is indicated from where the species and reg. Nos. in most cases originate. Two swarms of collecting localities were chosen in Tierra del Fuego (54°51'–52°40'S) and the Bariloche-region (42°47'–39°30'S), respectively, the southern ones from seashore to near tree-line at 450 m alt. Fig 9.2, and the northern ones from the valleys and foothills of the Andes at 550–770 m alt. to tree-line at 1600–1800 m alt.

To avoid mould and rot all seed samples were ventilated and dried after each collecting trip before re-packing and storing. Berries were smashed and treated in the same way. The samples were either mailed by air or taken along by expedition – members flying back to Denmark and kept in plastic-bags in coldstore until sowing. In general each sample would be a mixture of much seed collected from several individual plants of a population.

Plants (10–30 cm saplings) were dug up on localities spotted on previous collecting tours, normally a few days prior to the journey home of an expedition-member. B. Søgaard carried plants back on April 1, J. P. Hjerting on May 4, while a third lot dug up on Tierra del Fuego was sent air-freight May 13. The samples were bundled with the roots and some moss or peat wrapped tight in plastic-bags, tops free. The bundles were stowed in cardboardboxes for final transportation just before taking off. At the Arboretum in Hørsholm the plants were potted immedi-



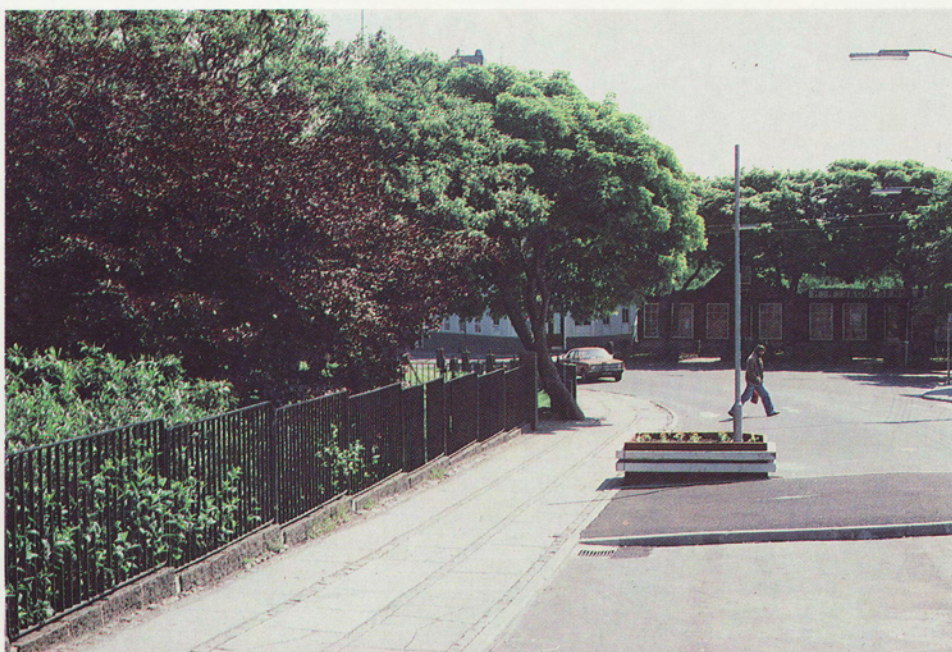
9.1. Kort, ið vísir útbreiðsluna av tí tempraða skóginum í Argentina (Dimitri 1972). Pílarnir vísa á høvuðsinnsvinningarøkini á rannsóknarferðunum í 1975 og 1979.

Map showing the distribution of the temperate forest in Argentina (Dimitri 1972). The arrows indicate the main collecting regions during the 1975 and 1979 expeditions.



Viðarlundin í Hoydølum.

The plantation at Hoydalar. Photo O. Wich, July 1988.



Vaglið og N. Finsensgøta, Tórshavn. Tað reyða træið er blóðbók, á Vaglinun ahorn.

Tórshavn center. Fagus sylvatica »Atropunicea« and Acer pseudoplatanus. Photo T. í Hoyvík, Aug. 1983.



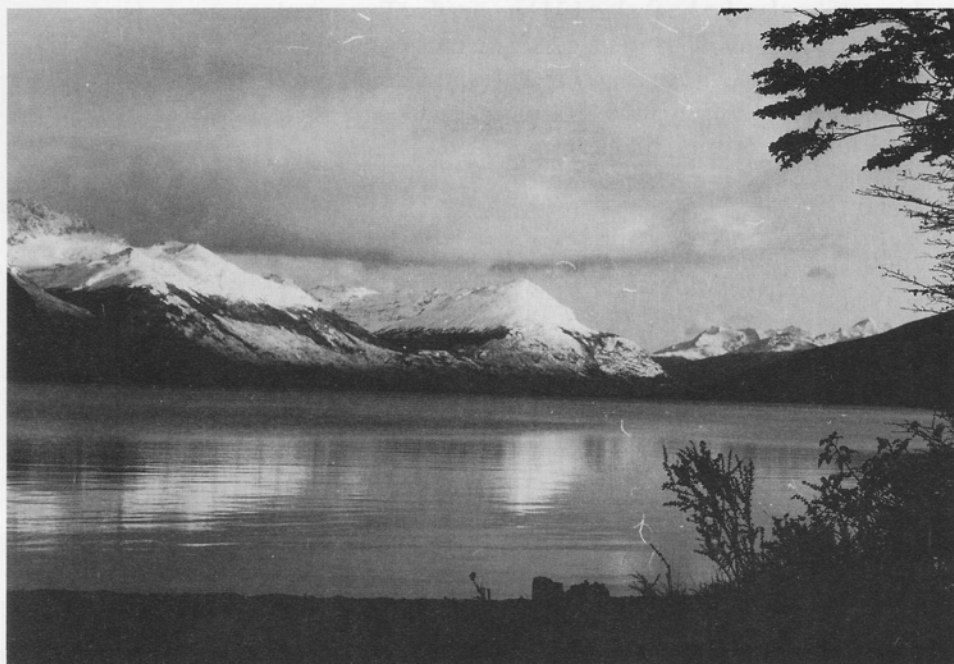
Rabarbugarður. Svínøi.

A rhubarb garden in the village of Svínøi. Photo S. Rasmussen, Aug. 1981.



Úr gamla kirkjugarðinum í Havn. Royniviður, ahorn, flammublómur (reyðar og hvítar) og akursinoppur (gulur).

From the old churchyard in Tórshavn. Sorbus intermedia, Acer pseudoplatanus, flowering Phlox (red and white), and Sinapis arvensis (yellow). Photo T. í Hoyvík, June 1982.



9.2. Landslagið og náttúruumstøðurnar vestan fyri Ushuaia, Tierra del Fuego, líkjast nógv teimum í Føroyum, Íslandi og fram við strondina í Vestur-Noregi. Leggið til merkis skógnámið í um leið 300 m hædd, og landslagið longri niðri, har kavi ikki legst.
The landscape and nature conditions W of Ushuaia, Tierra del Fuego, expose strong similarities with the Faroe Isles, Iceland and coastal W-Norway. Obs. the tree-line at approx. 300 m alt. and the still snow-free lower altitudes. S.Ø. phot., May 8, 75.

ately after arrival and placed in semishade. Survival was close to 100% and fortunately their first winter in Denmark 1975–76 was very mild. In Denmark a major part of the Southern Hemisphere material died during subsequent severe winters (see Ødum (1986) and P. Søndergaard in this volume).

Totally was collected 107 ligneous species (62 genera, 42 families), and the living samples comprised 303 seed samples and 132 samples of plants, 1.100 plants totally. Most seed was distributed and sown immediately or the following winter-spring, while the potted plants were planted in the nurseries in Hørsholm, Milde (Bergen) and Tórshavn 1976.

In Tórshavn the first arriving seed-samples were sown by Jóhannes Jóhansen in the museum-garden in the spring of 1975. Later sendings were sown in the nursery in Hoydalar by Leivur Hansen. With a few exceptions (e. g. *Buddleia globosa*), the moist soil-conditions and temperatures are unfavourable for sowing outdoor, especially in case of slow germination. Plants produced from seed were therefore in general taken along from Hørsholm when ready in the nursery there: *Araucaria*, *Aristotelia maqui*, *Azara lanceolata*, *Berberis empetrifolia*, *Embothrium*, *Escallo-*



9.3. Tilfarið frá sunnaru hálvu, ið stavar frá tí norrønu arboretrannsóknarferðini í 1975, verður sett niður í Hoydølum í apríl 1976.

The southern Hemisphere material from the Nordic Arboretum Expedition 1975 being planted out in Hoydalar in April 76. S.Ø. phot.

nia, *Fuchsia*, *Lomatia*, *Ovidia*, *Ribes cucullatum* and *R. magellanicum*, see the inventory.

The plants brought to Tórshavn in April 1976 were partly material of genera such as *Aristotelia*, *Coprosma*, *Griselinia*, *Hebe*, *Hoheria*, *Olearia*, and *Podocarpus* from New Zealand sent airmail as cuttings to Hørsholm, where rooted successfully in greenhouse, partly a broad selection of the plants dug up in South America (Table 1). A nursery-bed at Leivur Hansen's house in Hoydalar was prepared inside the old base of a greenhouse to avoid damages from sheep and hares (Fig. 9.3). This base provided some wind-shelter, but except from that the place was exposed to the macro-climate as such. The rather peaty soil was mechanically

treated for aeration and was in the winter 1976–77 covered on top with approx. 5 cm horse-manure. In Sept. 1977 NPK 8–2–3 fertilizer was loosely spread.

In 1977 additional material of plants from New Zealand and Tasmania was transferred by Søndergaard from the Norwegian Arboretum in Milde, Bergen (e.g. *Phyllocladus*, *Athrotaxis*, *Neopanax*, *Libocedrus*, *Nothofagus* a. o., see the inventory and Søndergaard's paper in this volume). These plants were placed in similar beds next to the greenhouse-base.

Results in the nursery with the first introduction

The above-mentioned material comprised in 1976–77 35 genera and 71 species. In 1986 only 12 species (11 genera) had disappeared completely. These were from South America: *Asteranthera ovata*, *Cynanchum descolei*, *Desfontainea spinosa*, *Myrtus apiculatus*, *Myrceugenia exsucca*, *Weinmannia trichosperma*, and from New Zealand: *Carmichaelia* sp., *Hebe elliptica*, *Hebe* sp., *Leptospermum ericoides*, *Metrosideros* sp., *Phyllocladus alpinus*. Survival, adaptation and growth was recorded most years and regularly the first summers. Notes were taken occasionally on phenological phenomena, particularly when flowering was observed. From Table 1 it is obvious, that not least the *Nothofagus*-species composing forests on Tierra del Fuego, the evergreen *N. betuloides* and the deciduous *N. antarctica* and *N. pumilio*, seemed to be well adapted and rather fastgrowing.

The 1979-collections from Tierra del Fuego

The Danish Scientific Expedition to Patagonia and Tierra del Fuego (Madsen & al. 1980) implied the opportunity of a more comprehensive introduction of the Tierra del Fuego-origins of the three *Nothofagus* species (Ødum 1980). From April 10 to 16 Trondur Leivsson and I travelled by car from Rio Grande to Ushuaia and back, digging up the small *Nothofagus*-plants on localities registered on the 1975-tours, particularly on roadsides and in other places with disturbed soil where it was easy too loosen the roots from sand og gravel (Fig. 9.4). The plants were bundled with roots in sphagnum and plastic-bags like in 1975 (Fig. 9.5) and stowed in the sort of big bags normally used for meat (some ventilation). In Buenos Aires they were kept in cold store at the harbour, and April 22, after landing in Denmark, they were carried by Flogfelag Føroya to the Faroe Isles.

The collecting localities cover a transect from the National Park W of Ushuaia with luxuriant, partly evergreen rainforest over tree-line (*Nothofagus pumilio*) at Paso Garibaldi through the zonation caused by rapid decline in precipitation (rain-shelter), starting with *N. pumilio* and ending in the dry transition zone towards steppe vegetation South of Rio Grande with scattered scrub-forest of *N. antarctica*. At Ushuaia was additionally collected suckers of *Berberis ilicifolia*, 30 plants of *Drimys winteri*, a number of plants of *Chiliotrichum diffusum* and *Maytenus magellanica*, a.o., and seed of *Embothrium coccineum*. *Embothrium* and

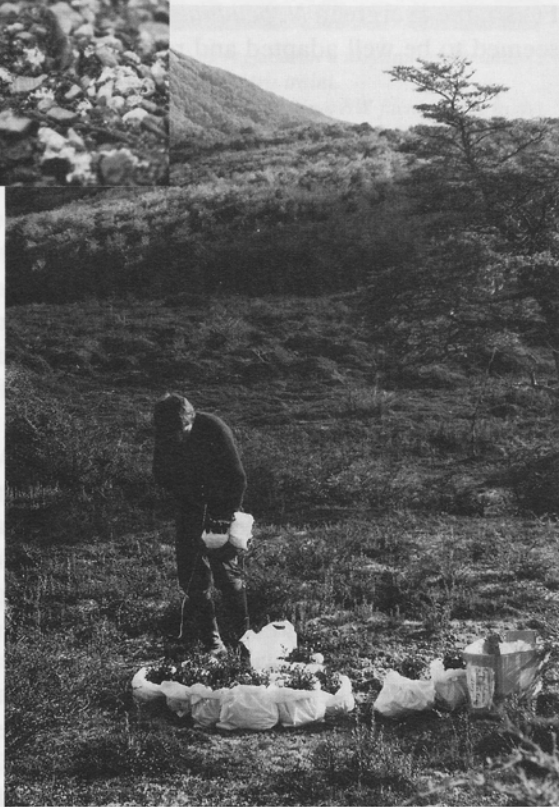


Fig. 9.4. Ein sjálvsáað eldlandsbók í eyri við vegjaðaran tætt við Lago Escondido, Tierra del Fuego. Ungtrø av hesi stødd vóru løtt at taka upp við heilari rót.

A 15 cm self-sown *Nothofagus betuloides* in gravel at a road-side near Lago Escondido, Tierra del Fuego. Saplings of this size were easily taken up with an intact root-system. S.Ø. phot., April 79.

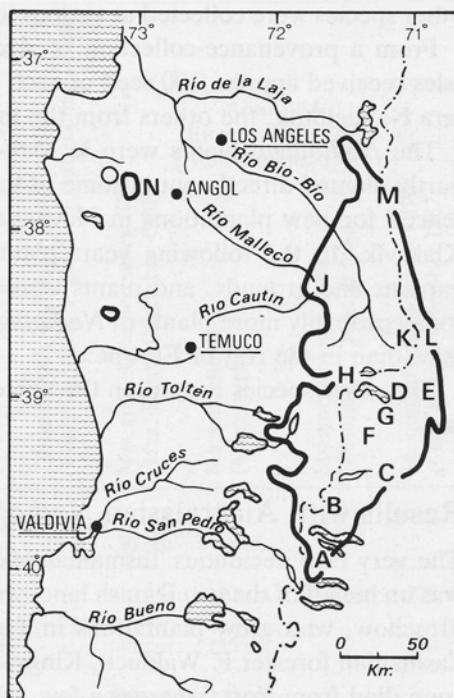
9.5. Her sæst Tróndur Leivsson pakka nakrar av teimum nærum 6.500 *Nothofagus* plantunum niður, ið vóru grivnar upp á Tierra del Fuego í apríl 1979. Bundi av plantum verða pakkað niður, soleiðis at sphagnum frá mýrini verður lagt oman á rótina, og bundið verður aftur við einum snóri rundan um plastposan, ovasti parturin av plantunum stendur uppi.

Tróndur Leivsson packing some of the approx. 6.500 *Nothofagus* plants dug up on Tierra del Fuego in 1979. Bundles of plants are packed with their roots covered by sphagnum from the bog and tightened up with a string around the plastbag, tops of plants kept free. S.Ø. phot.



9.6. Kort, ið vísir hövuðsúbreiðsluþekið hjá *Araucaria araucana*. Bókstafirnir A-O vísa á ymsk inn-savningarstöð.

Map of main distribution of *Araucaria araucana*. The letters A-O refer to different sampling localities. (Map: Montaldo 1974).



9.7. Natúrligt vakstrarstað hjá *Araucaria araucana*.

Natural stand of *Araucaria araucana* at Lago Tromen (Loc. B). S.Ø. phot., March 75.

other species were collected at various localities further north in Patagonia as well.

From a provenance-collection of *Araucaria araucana* (Ødum 1980) the Faroe Isles received approx. 100 seed of each of 14 origins, two from the coastal Cordillera Nahuelbuta, the others from the main Cordillera (Fig. 9.6–7).

The *Nothofagus*-plants were in May-June 1979 partly planted in the nursery, partly planted directly out in some of the old plantations and in the areas recently fenced for new plantations in Havnadalur S of Tórshavn and at the coast E of Klaksvík. In the following years planting was continued in plantations, public gardens and grounds, and plants were sold to private gardenowners. There are today probably more plants of *Nothofagus betuloides* and *N. pumilio* on the Faroe Isles than in the rest of Europe.

The other species are still in the nursery or planted in the arboretum in Hoydalar.

Results with Australasian *Nothofagus* species

The very rare deciduous Tasmanian species, *Nothofagus gunnii* (Hook.f.) Oerst. was on behalf of the two Danish landowners and foresters, Allan Hastrup and Fritz Treschow, who grow plantations in Tasmania, collected as saplings 1980 by the Tasmanian forester F. Walduck, Kingston, and sent to Hørsholm. Here the plants soon died from frost, whereas a few, which were tested in Tórshavn, survived for 3–4 years without producing any strong shoots. As this species is almost unknown in European collections (Bean 1976) it should be tried to obtain it once more. It is the only deciduous Australasian species, and with a foliage resembling that of *N. pumilio*, it illustrates the Eocene land-connection across Antarctica (Steenis 1971, Rahn 1980).

None of the evergreen species from Tasmania and New Zealand have so far grown really well. Particularly did the tree-line composing *N. solandri* var. *cliffortioides* from New Zealand not come up to our expectations. The annual growth is rather weak and is dying somewhat back most years. However, this species as well as the neat, but similarly sensitive and slow-growing *N. menziesii* (N.Z.) and *N. cunninghamii* (Tasmania), might be of interest to keen horticulturists.

Results with South American *Nothofagus* species

The only species not yet tried on the Faroe Isles are the deciduous, North Chilean, very rare *Nothofagus alessandrii* Espinosa and the evergreen *N. nitida* (Phil.) Krass., native to the island of Chiloë and adjacent coasts. The latter, which is closely related to *N. dombeyi*, might be of interest.

Among the big-leaved, deciduous species with northern distribution, the other rare, Chilean species, *N. glauca* (Phil.) Krass., was planted in Hoydalar 1978. The seed was received from the Forestry Commission, UK. The plants did never mature new growth and died back after a few years.

The other two big-leaved, deciduous species widely distributed in Chile and just reaching Argentina in minor areas in the SE of Prov. Neuquén, have become valuable in forestry and landscape-planting in particularly the western parts of the British Isles (Tuley 1980). Small numbers of plants of a series of origins from Argentina and Chile have been tested on the Faroe Isles with no success. The majority of Chilean origins collected 1976 was offered by Forestry Commission, UK. All *N. obliqua* plants are dead or dying back almost to the ground every year. They obviously demand warmer summers and less wet soil-conditions. *N. procera* seem to be slightly better adapted, at least some individuals among the Argentinean plants. According to Tuley (1980) *N. obliqua* and *N. procera* are miserable on acid peat.

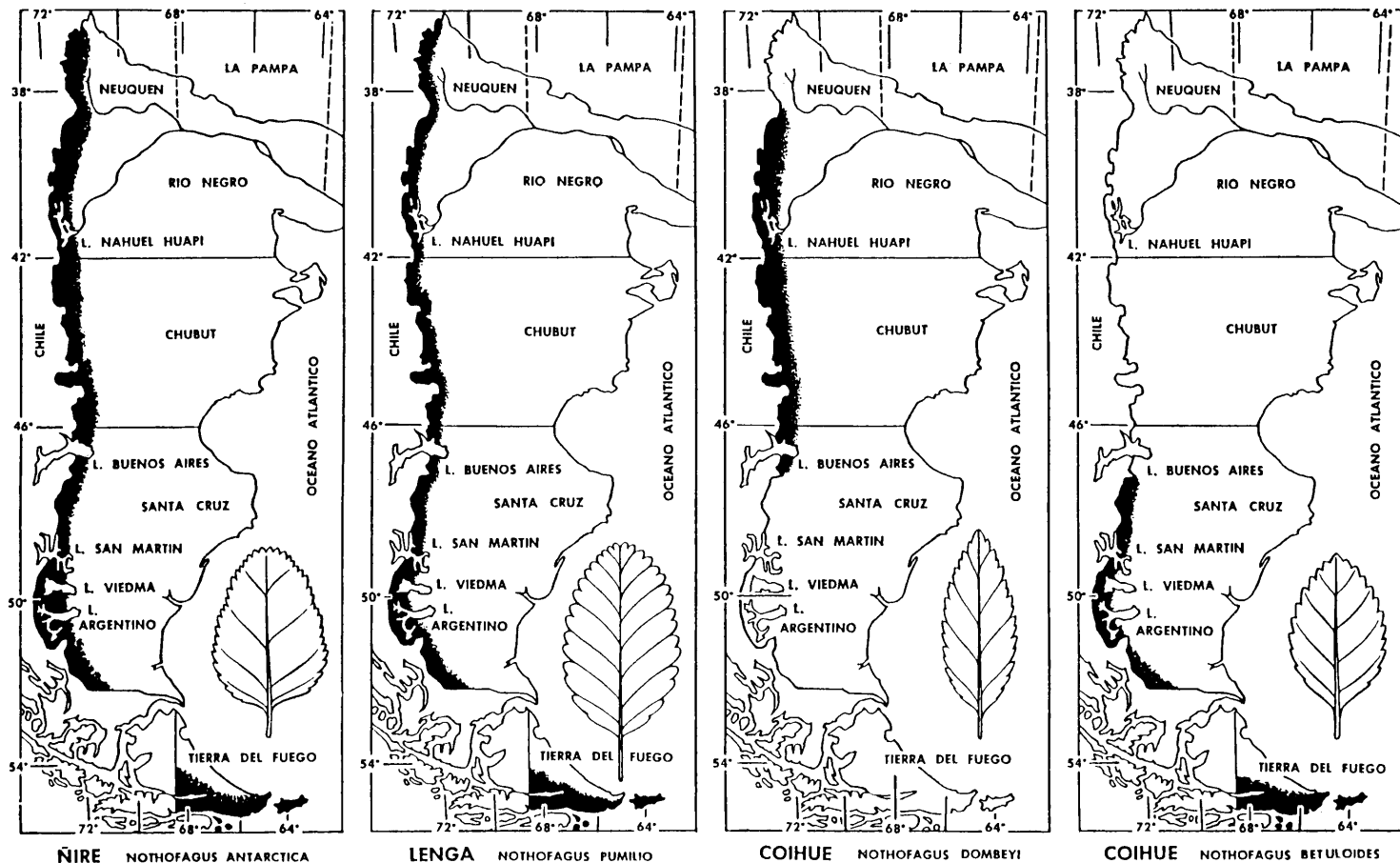
Nothofagus antarctica

The number of plants from the 1975-expedition comprised 15 from Tierra del Fuego (3 localities) and 15 from W of Bariloche (Table 1). There are marked differences between the northern and southern plants. All the *Nothofagus antarctica*-plants tend from the seedling-stage to form a prostrate mat from which the branches ascend, finally developing into leading stems. This tendency is strongest in the northern material. The lenticel-strips on the bark of younger stems and branches are more developed and conspicuous in the northern material, and the leaves are much bigger. The Bariloche-origin resembles rather much the *N. antarctica* in common trade in nurseries and therefore also the plants at the hospital in Tórshavn. The Tierra del Fuego plants shed their rather tiny leaves much earlier than the northern ones (in Hørsholm approx. 6 weeks earlier and with red autumn-colours prevailing), and tips of shoots are in most years well matured. The northern plants grow as vigorously as the southern ones, but with repeated damages of terminal shoots, they are not as beautifully shaped.

Nothofagus antarctica tolerates rather wet as well as dry soils, but is less shade-tolerant than other species. This explains its main distribution in the wild on well-drained soil and bog margins, where the big-growing *Nothofagus*-species cannot compete, and also its ability to form the scrub-forest towards the Patagonian steppe. When planted on the Faroe Islands at 62°N, its demand of a light position has probably increased. Only where exposed to full light, the development of the plants transplanted to other positions in 1980 is satisfactory. Hørsholm No. 640/75, Entre Rios, Tierra del Fuego had in 1986 in a fairly wind-exposed position at Leivur Hansen's house grown to a strong 2.6 m plant with 6.5 cm diam. of the base of the stem (Fig. 9.9). The same origin had in a wind-sheltered position in the highschool plantation in Hoydalar nearby grown to 3.2 m. Others of the southern plants had in 1986 at the museum (641/75) grown to 2.7 m and in Selatrað (642/75) to 3.4 m with 55 cm topshoots and 5 cm diam. at base of stem.

The 560 plants from the 1979-expedition have been planted in several gardens and some other places. A number of plants planted directly out at the plantation on

AREA APROXIMADA DE ALGUNAS ESPECIES CARACTERISTICAS DE LA FLORA ANDINO PATAGONICA



9.8. Tey dökku økini vísa útbreiðsluna í Argentína av teimum umrøddu Nothofagussløgnum.

The dark area shows the Argentinean distribution of the Nothofagus species discussed. Dimitri 1972.

Table 1. Establishment and growth of South American ligneous species planted as 10–30 cm saplings in a nursery in Hoydalar, Tórshavn, April 1976 (Fig. 9.3). They do all originate from the transition zone ranging from temperate rain forest to the Patagonien steppe in Argentina. Hørsholm Arboretum reg. Nos., latitudes and altitudes are added.

Etablering og udvikling af sydamerikanske vedplanter udplantet i planteskole hos Leivur Hansen, Hoydalar, Tórshavn, april 1976.

	Antal planter 1976 (Number of plants 1976)			Antal planter 1977	Antal planter 1979	Gennemsnitl. højdevækst 1977 (Topshoots in average 1977)	Tilstand 1977: + god, (+) ringe, – død (Condition 1977: + good, (+) miserable, – dead)	Maximumhøjde december 1980 (Max. height December 1980)	Maximumhøjde (Max. height)	April 1986 (Efter tynding 1980) (After thinning 1980)	Stammediameter, basis (Diameter of stem at base)	Maximumhøjde november 1987 (Max. height November 1987)
<i>Aristotelia maqui</i>												
608/75 41°05'S, 800 m	3	3	1			31 cm	(+)					
<i>Asteranthera ovata</i>												
638/75 41°02'S, 780 m	3	1				0 cm	(+)					
<i>Azara microphylla</i>												
627/75 41°05'S, 800 m	2	2	1			9 cm	(+)					
<i>Baccharis patagonica</i>												
389/75 54°37'S, 100 m	2	2	2			25 cm	+	40 cm	90 cm			
<i>Berberis ilicifolia</i>												
652/75 54°51'S, 50 m	2	1	1			9 cm	+	100 cm	190 cm	4.0 cm		220 cm
<i>B. linearifolia</i>												
537/75 41°13'S, 1000 m	2	2	2			12 cm	+	140 cm	250 cm			270 cm
<i>B. pearcei</i>												
550/75 41°06'S, 1500 m	1	1	1			0 cm	+	35 cm	80 cm			
<i>Chiliotrichum diffusum</i>												
648/75 54°51'S, 50 m	3	3	3			40 cm	+	120 cm	160 cm			
<i>Chusquea couleou</i>												
614/75 41°05'S, 800 m	1	1	1			40 cm	+	100 cm	320 cm			330 cm
<i>Cynanchum descolei</i>												
473/75 41°05'S, 800 m	1	0					–					
<i>Desfontainea spinosa</i>												
637/75 41°02'S, 780 m	1	1				0 cm	(+)					
<i>Drimys winteri</i>												
649/75 54°51'S, 50 m	2	2	1			4 cm	(+)	35 cm	85 cm	3.2 cm		110 cm
<i>D. w. var. andina</i>												
574/75 40°37'S, 850 m	2	2				2 cm	(+)	30 cm	60 cm			90 cm
<i>Escallonia alpina</i>												
562/75 40°39'S, 1300 m	1	1	1			14 cm	+	30 cm	60 cm			
<i>E. rubra</i>												
410/75 50°20'S, 150 m	4	4	4			40 cm	+	60 cm	130 cm			



	Antal planter 1976 (Number of plants 1976)	Antal planter 1977	Antal planter 1979	Gennemsnitl. højdevækst 1977 (Topshoots in average 1977)	Tilstand 1977: + god, (+) ringe, – død (Condition 1977: + good, (+) miserable, – dead)	Maximumhøjde december 1980 (Max. height December 1980)	April 1986 (Efter tynding 1980) (After thinning 1980)			Maximumhøjde november 1987 (Max. height November 1987)
							Maximumhøjde (Max. height)	Stammediameter, basis (Diameter of stem at base)		
<i>E.r.</i>										
571/75 41°04'S, 770 m	3	3	3	25 cm	+	60 cm				
<i>E.r.</i>										
612/75 41°05'S, 800 m	1	1	1	30 cm	+					
<i>E. virgata</i>										
456/75 41°05'S, 800 m	1	1		?	+					
<i>Fitzroya cupressoides</i>										
632/75 41°02'S, 780 m	5	3	1	1 cm	(+)	40 cm	60 cm	1.2 cm		65 cm
<i>Fuchsia magellanica</i>										
539/75 41°05'S, 800 m	2	2	2	40 cm	+					
<i>Lomatia ferruginea</i>										
634/75 41°02'S, 780 m	5	4	4	0 cm	(+)	20 cm				
<i>L. hirsuta</i>										
438/75 39°54'S, 1050 m	3	3		0 cm	(+)					
<i>Maytenus magellanica</i>										
596/75 39°54'S, 900 m	5	5		8 cm	+	60 cm	110 cm	5.0 cm		145 cm
<i>Myrceugenia exsucca</i>										
613/75 41°05'S, 800m	2	2		2 cm	(+)					
<i>Myrtus apiculatus</i>										
609/75 41°05'S, 800 m	15	15		7 cm	(+)					
<i>Nothofagus antarctica</i>										
626/75 41°05'S, 800 m	15	15	15	12 cm	+	120 cm	220 cm			260 cm
<i>N.a.</i>										
640/75 54°10'S, 100 m	9	8	8	24 cm	+	90 cm	230 cm	5.0 cm		285 cm
<i>N.a.</i>										
641/75 54°25'S, 100 m	3	3		35 cm	+		260 cm			
<i>N.a.</i>										
642/75 54°15'S, 150 m	3	3		34 cm	+					275 cm
<i>N. betuloides</i>										
646/75 54°42'S, 300 m	22	19	19	29 cm	+	160 cm	265 cm	7.0 cm		310 cm
<i>N.b.</i>										
647/75 54°51'S, 50 m	10	10	10	22 cm	+	140 cm	230 cm			290 cm
<i>N. dombeyi</i>										
593/75 39°54'S, 900 m	25	21	21	9 cm	(+)	110 cm	160 cm	8.1 cm		210 cm
<i>N.d.</i>										
623/75 41°06'S, 1000 m	15	15	15	17 cm	(+)	110 cm	165 cm			230 cm

	Antal planter 1976 (Number of plants 1976)	Antal planter 1977	Antal planter 1979	Gennemsnit. højdevækst 1977 (Topshoots in average 1977)	Tilstand 1977: + god, (+) ringe, - død (Condition 1977: + good, (+) miserable, - dead)	Maximumhøjde december 1980 (Max. height December 1980)	Maximumhøjde (Max. height)	April 1986 (Efter tynding 1980) (After thinning 1980)	Stammediameter, basis (Diameter of stem at base)	Maximumhøjde november 1987 (Max. height November 1987)
<i>N.obliqua</i>										
583/75 40°07'S, 750 m	5	4		15 cm	(+)	30 cm	dead			
<i>N.procera</i>										
595/75 39°54'S, 900 m	10	9	9	17 cm	(+)	130 cm	160 cm	7.0 cm		270 cm
<i>N.pumilio</i>										
557/75 40°39'S, 1300 m	10	10	10	23 cm	+	140 cm	255 cm			310 cm
<i>N.p.</i>										
577/75 40°10'S, 1700 m	10	10	10	24 cm	+	160 cm	220 cm			250 cm
<i>N.p.</i>										
621/75 41°06'S, 1500 m	10	10	10	27 cm	+	130 cm				325 cm
<i>N.p.</i>										
643/75 54°37'S, 100 m	10	10	10	25 cm	+	125 cm	230 cm	7.0 cm		
<i>Nothofagus p.</i>										
644/75 54°51'S, 50 m	5	5	5	18 cm	+	130 cm	210 cm			290 cm
<i>N.p.</i>										
645/75 54°43'S, 450 m	6	6		24 cm	+	180 cm	340 cm	8.5 cm		400 cm
<i>Pilgerodendron uviferum</i>										
630/75 41°02'S, 780 m	3	2	1	1 cm	(+)	35 cm	70 cm	1.3 cm		85 cm
<i>Podocarpus nubigenus</i>										
628/75 41°02'S, 780 m	10	9	4	1 cm	(+)	25 cm	65 cm	1.5 cm		
<i>Pseudopanax laetevirens</i>										
610/75 41°05'S, 800 m	3	3	1	0 cm	(+)	30 cm	50 cm			
<i>Saxegothaea conspicua</i>										
597/75 39°54'S, 900 m	3	3	3	4 cm	+	40 cm	90 cm			125 cm
<i>S.c.</i>										
631/75 41°02'S, 780 m	3	3		0 cm	(+)					
<i>Schinus patagonica</i>										
617/75 41°05'S, 800 m	1	1		0 cm	(+)					
<i>Weinmannia trichosperma</i>										
531/75 41°02'S, 780 m	3	0			-					

Kunoy in May 1979, had in 1982 adapted well and produced 30 cm annual shoots. In an area designated as future town-park between the navigation school and the harbour in Torshavn a fine-growing group can be seen.



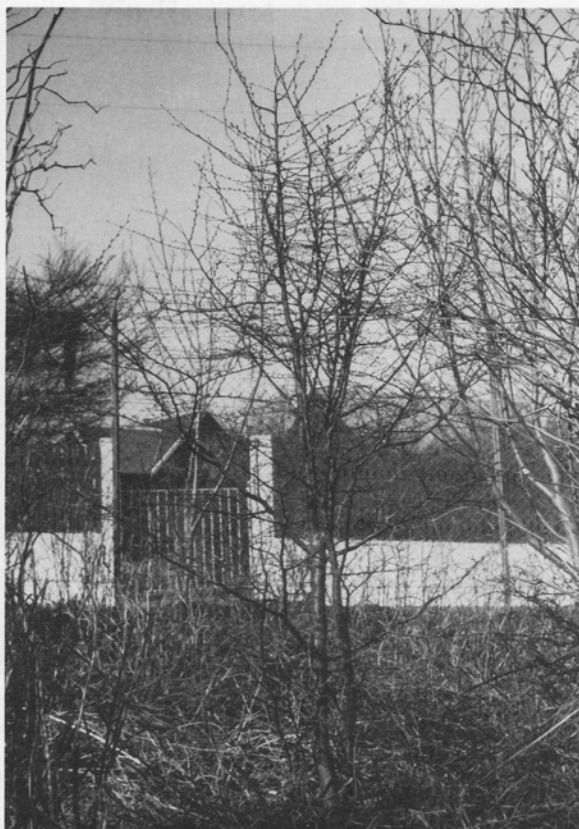
9.9. *Nothofagus antarctica* savnað í 1975. Veksur í urtagarðinum hjá Leivi Hansen í Hoydølum, Tórshavn.

Nothofagus antarctica collected in 1975, growing in Leivur Hansen's garden at Hoydalar, Tórshavn. S.Ø. phot., April 86.

Nothofagus pumilio

This is probably the only big-sized deciduous *Nothofagus* that in the future might contribute to the plantations on a larger scale. In Argentina it dominates the upper 5–600 m of the mountain-forests with high precipitation and shifts abruptly from high wood to elfin-wood at tree-line. The 1975-material comprised northern origins, 10 plants of each (557/75, 577/75, 595/75), and 21 plants from 3 localities on Tierra del Fuego (643–645/75). They do not expose a distinct provenance-variation, as observed in *N. antarctica*. They produce more upright stems at an early stage and even though they may be bushy and many-stemmed the first years, they tend to develop a »winning» stem. The northern origins tend to flush too early, especially No.621 from the N-facing slopes of Cerro Lopez at 1500 m alt. (100 m below tree-line). Also the northern origins have somewhat softer tips of terminal shoots than the southern ones and for that reason expose minor cut-backs. In the fall of 1977 G. Schlätzer, who collected *Nothofagus*-seed in Chile and Argentina 1974, sent some plants of his coll. Nos. 97 (Co. Esquel, prov. Chubut, 42°53'S) and 119 (prov. Magellanes, 52°10'S) which have been planted in the Arboretum for comparison (to 1.2 m 1986).

9.10. *Nothofagus pumilio* gróðursett við Náttúrugripasavnið, Tórshavn. *Nothofagus pumilio* planted at the museum, Tórshavn. S.Ø. phot., 86.



Nothofagus pumilio is more exposed to gnawing and nibbling by hares and sheep than *N. betuloides*. We observed that as well when collecting on Tierra del Fuego and therefore chewed their foliage for comparison: *N. pumilio* tasted nice and sweet, almost like cream-caramel, whereas *N. betuloides* has a bitter taste. For that reason plants placed outside central Tórshavn, where hares are frequent, and plants exposed to sheep accidentally coming inside fences, are often damaged. *N. pumilio* appeared to be more sensitive to removal from the nursery to new places in gardens and plantations than *N. antarctica* and *N. betuloides*. Particularly when planted in grass-covered ground it needs one or several seasons to establish and resume fast growth.

This species is now widely distributed in plantations, gardens and public grounds. Of the 1975-plants placed 1980 in a wind-blow in the old plantation, Hoydalar, the southern origin, No. 643 (Lago Fagnano), had in 1987 grown to 3.6 m, and the best northern, No. 557 (Paso Puyehué), to 2.8 m. The winner seems to be No. 645 from near tree-line on Tierra del Fuego (Paso Garibaldi), having grown to 4 m (Table 1) and doing well in e.g. the arboretum.

The 1979-plants (1900) have only been inspected closely in a few places after



9.11. Ungur regnskógur við tí veturgrøna *Nothofagus betuloides* við vegjaðaran á útsýningsskráanum í fjallalendinum í Tierra del Fuego. Leggið merki til fólkið millum tey stóru trøini.

Virgin rain forest of the evergreen *Nothofagus betuloides* along the road side on a SW-facing slope in the mountainous region of Tierra del Fuego. Notice the person flanked by the big trees. S.Ø. phot., 79.

planting-out. Quite a number can be seen in and just at the southern end of Gundadal plantation. About 100 plants were in 1985 planted in a public ground with dense and high grass-cover just south of the museum where no sheep and hardly any hares will come. They measured 1986 50–90 cm with terminal shoots of 20–30 cm. A specimen from the 1975-expedition at the museum was at the same time measured to 3.1 m with up to 70 cm annual shoots and 6.7 cm diam. at stem-base (Fig. 9.10).

In the new plantation-area at Klaksvík (Fig. 9.15), the 1979-plants were planted directly after arrival. They measured in 1986 40–100 cm with tops of 20–60 cm. The average height of 18 plants undamaged by hares was 59 cm. In the new plantation-area in Havnadalur, a similar planting from 1979, some of the plants measured up to 50 cm, and most plants were severely gnawed by hares. Pretty plants can be seen in private gardens.

Nothofagus betuloides

This species and *N. pumilio* are the only and dominant big-sized, forest building trees in the cool rain-forest of SW-Tierra del Fuego (Fig. 9.8). The strong ecocli-

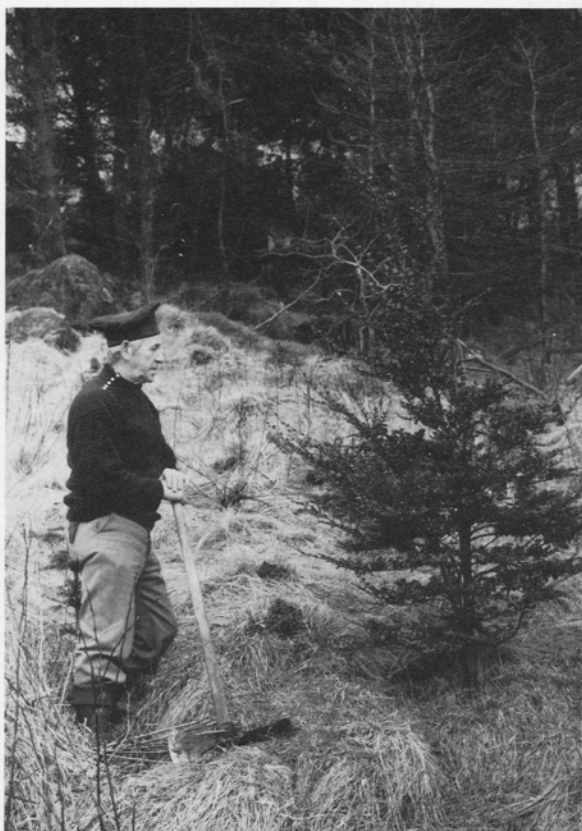
matic- correspondance between Tórshavn and Ushuaia (and other localities with an extreme oceanic climate) is illustrated and discussed by Ødum (1979) and Tuhkanen (1987). To try to introduce a long-living, big-sized, evergreen broadleaved tree on a larger scale was, of course, tempting. *Nothofagus betuloides* and *N. dombeyi* do both get older than e.g. *Fagus sylvatica*, almost twice as old (Fig. 9.11 and 9.17). In England and Ireland both species have so far grown to 25 m tall trees (Mitchell 1974).

The 32 plants dug up on the 1975-expedition adapted fast and grew well in Hoydalar. 22 plants (No. 646/75) originate from a W-facing slope of a mountain (near the E-end of Lago Escondido, 54°42'S, 67°43'W, 300 m alt.), where *N. betuloides* gets closest to tree-line (450–500 m alt., *N. pumilio*) and to the abrupt shift to deciduous forest towards the NE. Further 10 plants (No.647/75) originate from the S-end of Parque Nacional de Tierra del Fuego, W of Ushuaia (54°51'S, 68°30'W, 50 m alt.), where the forest of *N. betuloides* and *N. pumilio* is mixed in the understorey with *Berberis ilicifolia*, *Maytenus disticha*, *Drimys winteri* and locally *Embothrium coccineum* and *Maytenus magellanica*.

In Hoydalar a slight difference in vigour between these two origins was observed. No. 646 grew a little faster with annual growth being a little thicker and with a bit earlier maturing of tips and terminal buds. However, both origins were considered worth growing, and on the 1979-expedition additional 1.400 plants were introduced from Lago Escondido (No. 13/79), and 2.000 from Ushuaia (No. 119/79). The reason for not adding seed-samples to the samples of living plants was the simple fact that we did not observe any seed at all on the *Nothofagus* species on Tierra del Fuego that year, probably due to spring-frost damage of pollen-quality.

The development in the nursery of 1975-material can be seen from Table 1. In 1980 most plants were transplanted to other sites. Of No. 646 3 trees were placed in a wind-blow i Selatrað plantation. In 1986 they had grown to 2.9 m, 2.8 m, and 1.8 m (sheep-damaged) respectively. The biggest one with 6.0 cm stem-diam. at base and a topshoot 1985 of 45 cm. For comparison some neighbouring trees planted 10 years ago were measured: *Tsuga heterophylla* 3.4 m, 6.5 cm diam., 40 cm top. *Thuja plicata* 2.8 m, 7 cm diam., 30 cm top. *Abies procera* 1.9 m (slow starter), 7 cm diam., 35 cm top. In a wind-blow in the plantation in Hoydalar the biggest specimen (good soil with *Rubus spectabilis*) grew from 1.6 m in 1982 to 2.4 m in 1983 (Fig. 9.12) and 4.5 m in 1987. In 1986 a tree placed at the lake in Gundadal plantation measured 2.8 m with 5.6 cm diam.

Among other positions should be mentioned the trees of No. 646 planted in the gardens around Lærarakúlin along a gradient of increasing wind-exposure: In shelters (Fig. 9.13) 1986: 4, 1 m, two stems with diam. at base 10.5 and 9.2 cm and at bh. 6.4 and 7.0 cm. Next trees: 4.1 m (base-diam. 10.5 cm), 2.6 m (8.0 cm), 1.9 m, and most exposed 1.6 m (6.4 cm). At the museum a tree of No. 646 planted in *Rubus spectabilis*-scrub was 1986 measured to 2.7 m (8.0 cm), and another planted nearby at the occasion of the Nordic Arboretum meeting 1982, 2.0 m (7.0 cm) and 42 cm terminal shoot. For comparison neighbouring 2 m trees had terminal shoots



9.12. *Nothofagus betuloides* í
viðarlundini í Hóydølum.
Nothofagus betuloides in the Hóydalar
plantation. S.Ø. phot., March 84.

of 25–35 cm and diameters as follows: *Picea sitchensis* 6.4 cm, *Pinus contorta* 7.6 cm, and *Betula pubescens* 6.0 cm. A specimen planted in the shade under old *Acer pseudoplatanus* trees in the garden of Rigsombudet is weak and slow-growing, measuring 1.4 m in 1986.

A short hedgerow/shelterbelt at Leivur Hansen's garden consists of 3 specimens No. 646, the biggest measuring 2.7 m in 1986 with 10.5 cm. diam. at base, the others 1.9 and 2.1 m, and 4 specimens of No. 647 measuring 2.1, 2.3, 2.0, and 2.2 m. In this exposed position they develop a bushy, many-stemmed crown. Late developed terminal leaves may turn brown in late winter and early spring, whereas the buds usually remain undamaged.

The 1979-plants are now widespread in plantations and gardens all over the islands. In gardens their development, of course, depend on soil-conditions, exposure to wind and sun, competition from e.g. groundcovering grass the first years, etc. With their dark glossy-green appearance, they are easily spotted, even at a distance and not least in winter. Two easily accessible groups planted in windblows in Gundadal Plantation in 1985 had in 1987 produced up to 35 cm annual shoots (Fig. 9.14).

Telekia speciosa í
urtagarði í Klaksvík.
Telekia speciosa in a
garden in Klaksvík.
Photo T. í Hoyvík, 1986.



Eldri urtagarður,
Varðagøta 20, Tórshavn.
An old style garden,
Varðagøta 20, Tórshavn.
Photo S. Rasmussen,
Aug. 1987.





*Hebe odora í
viðarlundini í Gundadali.
Hebe odora in the
Gundadalur plantation,
Tórshavn. Photo H.
Vedel, June 1985.*



*Berberis ilicifolia úr
Eldlandinum blómandi í
Hoydølum.
Berberis ilicifolia from
Tierra del Fuego
flowering in Hoydalar.
Photo S. Ødum, Apr.
1986.*

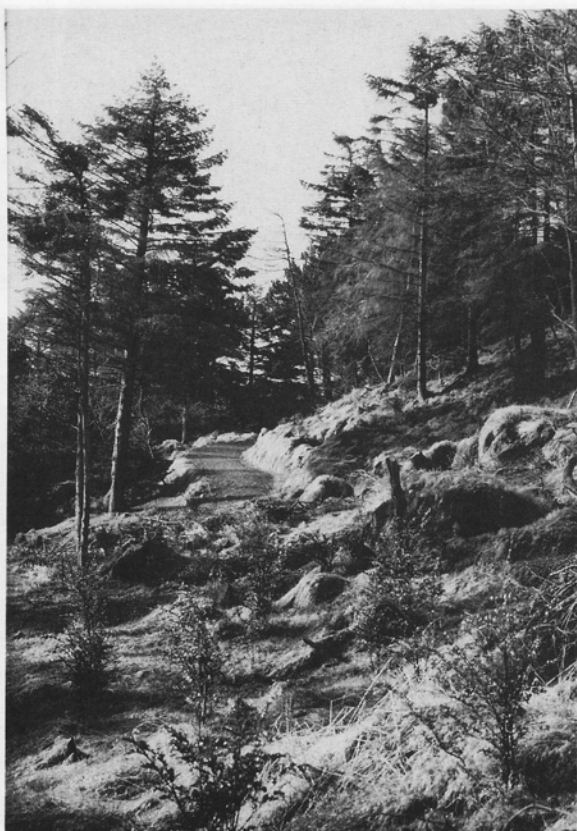
9.13. *Nothofagus betuloides* við
Læraraskúlan.
Nothofagus betuloides
at Læraraskúlin. S.Ø. phot., April 86.



Two plots planted within a couple of years after the arrival of the plants have been compared (No. 113/79):

On a SE-facing slope in Hoydalar among 2–3 m high *Pinus contorta* (origin Annette Island, Alaska), the first planting in this part of the plantation, the *Nothofagus betuloides*-plants were randomly planted in 1980. 15 plants were measured in April 1986: Heights ranging from 73 to 155 cm (3 less than 100 cm, 3 more than 140 cm), average height 1.2 m. Terminal shoots measured from 15–46 cm, average 36 cm. In the mixed stand with the pines and exposed to full light from above, the development of a leading shoot was pronounced in most plants. The leading top-shoots of the pines measured 25–35 cm.

On a SW-facing, recently fenced slope of a ravine towards the coast E of Klaksvík, the *Nothofagus*-plants were tried as pioneers, planted in 1979 (Fig. 9.15). In April 1986 their growth was rather bushy with generally more than one leading topshoot, and upper leaves somewhat brown, but buds undamaged. 20 plants were measured to heights from 40 to 100 cm (3 less than 55 cm, 3 more than 90 cm), average height 70 m. Top-shoots measured 20–50 cm. On the SE-facing slope of the ravine the plants were less vigorous (shade in the afternoon – lower temperature –



9.14. Fremst í myndinni sæst *Nothofagus betuloides* í viðarlundinni í Gundadali. *N. betuloides* verður sett niður sum næsta ættarlið á lendi, har trø eru dottin um koll av vindi. In the foreground *Nothofagus betuloides* in the Gundadalur plantation. *N. betuloides* is planted as the second generation on a windblown area. S.Ø. phot., April 86.

sum and max. temps. ?) 13 plants (totally) measured from 20 to 70 cm, average 46 cm.

Nothofagus dombeyi

This big-sized (Fig. 9.16–17) evergreen species is the dominant species of the rain-forest in the valleys and lower altitudes of the Andes, in Argentina particularly from NE-Chubut over westernmost Rio Negro to SW-Neuquén, Fig. 9.8. In Chile its latitudinal range is much wider. In the provinces of Rio Negro and Neuquén its altitudinal limit is very abrupt at approx. 1.000 m, where *N. pumilio* takes over. Of the two collections of plants made in 1975, No. 623 originate from this upper limit on Cerro Lopez, W of Bariloche and very close to the limit of this species towards the East. No. 593/75 was collected further North and at a lower altitude, and a few plants perished after planting out in Hoydalar.

As reflected by its regional and local distribution, *N. dombeyi* requires warmer summers than *N. betuloides*. In Tórshavn it continues to grow in the late summer, and the first many years a major part of the shoots died back every year. The



9.15. Hans Jacob Joensen urtagarðsmaður í Klaksvík í tí nýliga plantaðu viðarlundini. Her verður *Nothofagus betuloides* millum onnur nýtt sum undirgróður.

Hans Jacob Joensen city gardener of Klaksvík in the newly established plantation. Here a.o. Nothofagus betuloides is used as a pioneer tree species. S.Ø. phot., April 86.

plants, however, produced a strong root-system and thick basal stems, and after the planting out of most of them in 1980, they formed broad conal crowns with a dense mosaic of leaves outcompeting the grass beneath. Then some plants, e.g. in a windblow in the plantation in Hoydalar surprisingly started a continuous, almost undamaged vertical growth, the strongest plant of No. 593 from 0.9 m in 1982 to 1.6 m in the spring of 1984, and 3.0 m in the autumn 1987.

Gymnosperms

Araucaria araucana was probably first introduced to the Faroe Isles by Poul Søndergaard who in 1977 took along a few plants grown from the seed harvested in Bergen, Norway, 1972 (Søndergaard 1975). In W-Norway *Araucaria* has grown to rather big specimens as far North as in Ålesund (62°30'N), which means that the light conditions on the Faroe Isles at approx. the same latitude should be no hindrance for growth. Of two specimens placed in the arboretum in Hoydalar 1980, the biggest one started very slowly but is now growing still faster with rather stout shoots (Fig. 9.18).

Several hundred plants are now grown from the seed of the 14 origins collected in



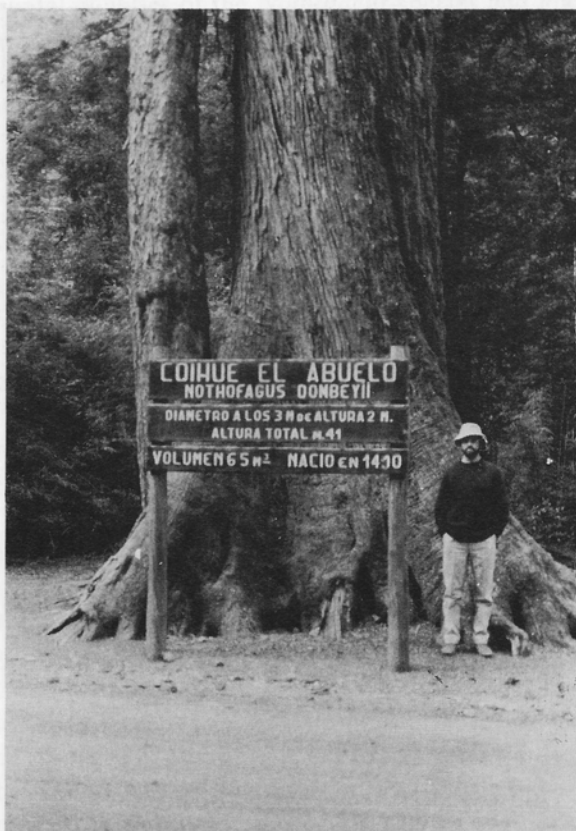
9.16. Regnskógur af *Nothofagus dombeyi*. Undirgróður af *Chusquea couleou* við Nequen. Virgin forest of *Nothofagus dombeyi*. Undergrowth of *Chusquea couleou* at Neuquen. S. Ø. phot., 75.

the wild in Argentina-Chile 1979, see above and map Fig. 9.6. It is too early to observe marked differences in hardiness and adaptation between the various origins. A number of each origin is being planted for comparison in a small valley selected for the purpose just North of the arboretum in Hoydalar, while other plants will be sold to private garden-owners. Planting in well-drained soil is recommended, as *Araucaria* obviously suffers from too moist and peaty soil conditions. In its homeland it is mainly confined to the very well-drained soils, particularly volcanic ashes.

Fitzroya cupressoides, *Pilgerodendron uviferum*, *Podocarpus nubigenus* and *Saxegothaea conspicua* were introduced as small plants or suckers (*Saxegothaea*), dug up in rain-forests at lakes and rivers W and NW of Bariloche. Seed from these species, collected 1975 and 1979, failed to germinate. Of the limited number of plants, only *Saxegothaea* rooted well during the first years, but the remaining specimens of all 4 species appear now to be hardy, but very slow-growing. However, in the nature they are also slow-growing, and being rare and to some extent endangered in the wild (now protected according to the Washington Convention and very rare in cultivation, it might be considered to propagate this material by cuttings for interested garden-owners on the islands.

9.17. *S. Ødum framman fyri einari sjónskari N. dombeyi í Puerto Blero.*

S. Ødum in front of an outstanding specimen of N. dombeyi in Puerto Blero.



Other broadleaved

A number of species have adapted well and expose qualities such as evergreen or wintergreen leaves, proliferous flowering and in some cases interesting fruits. Some of them are easily propagated by cuttings or seed and have already for a number of years been widely planted in Faroese gardens, e.g. *Embothrium coccineum*, *Buddleia globosa* (Fig. 9.19), *Fuchsia magellanica*, and *Chilodactylus diffusum*. Other ones of ornamental value deserving multiplication are e.g. *Berberis linearifolia*, *B. ilicifolia*, *B. darwinii*, *Azara lanceolata*, *Baccharis patagonica*, *Chusquea couleou*, *Drimys winteri*, and *D.w.* var. *andina*, *Escallonia alpina*, *Lomatia ferruginea*, *Maytenus magellanica*, *Ovidia andina*, and *Ribes cucullatum*. The arboretum in Hoydalar, where these and other species are now currently planted (Fig. 9.20), will in the future probably stimulate the public interest in growing the new species and produce the material for reproduction.

Survival, adaptation and growth among the first, introduced plants can be seen in table 1. In table 2 all the South American species tried until now have been listed with indication of survival and development in relation to geographical and ecologi-



9.18. *Araucaria araucana* á gróðurstøðini í Hoyðolum. 9 ára gomul.
Araucaria araucana in the arboretum in Hoydalar. 9 years old.
 S.Ø. phot., April 86.

cal background. With *Maytenus disticha* as the only exception, all the material of high latitudinal origin has adapted well in the Faroe Isles. Among the species and origins from further North, species from lower altitudes of the less humid transition-zone demand warmer summers and/or less moist soil-conditions. *Schinus patagonica* and *Fabiana imbricata*, which in the wild are restricted to warm sites and well-drained soils, have all perished, while *Austrocedrus* is extremely slow-growing with weak roots. *Aristotelia maqui* and *Maytenus boaria* do not mature their shoots. Species such as *Embothrium coccineum* and *Lomatia hirsuta* require in the Faroe Isles full exposure to light and really well-drained soil.

Quite a number of species restricted to the northern rainforests, where average temp. for the warmest month is 22°C (Dimitri 1972), do not tolerate the cool Faroese summer, e.g. *Desfontainea spinosa*, *Myrtus apiculatus*, *Myrceugenia exsucca*, *Azara microphylla*, *Guevina avellana*, and *Weinmannia*. Interesting exceptions are here *Azara lanceolata*, *Chusquea couleou*, and to some extent *Lomatia ferruginea* and *Nothofagus dombeyi*. Others, when established, demand a warmer summer to produce a faster growth, e.g. the conifers *Pilgerodendron* and *Fitzroya*.



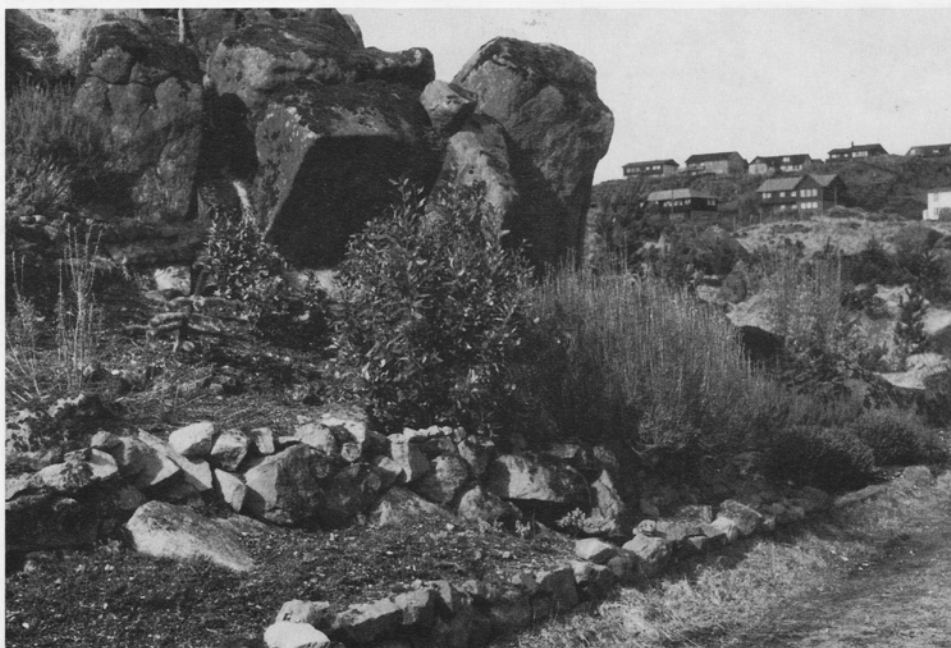
9.19. Ein stórvaksin Buddleia globosa í urtagarðinum á Føroya Læraraskúla saman við Andrias Højgaard.

A vigorously growing Buddleia globosa in the garden at Føroya Læraraskúli together with Andrias Højgaard. S.Ø. phot. June 86.

Various phenological observations

Contrary to many of the Northern Hemisphere species in cultivation on the Faroe Isles, most of the species from South America and New Zealand are adapted to formation and development of flower-buds and flowers in cool seasons. Proliferous flowering occurs regularly in most species from a young age, see the inventory in this volume. Species such as *Berberis ilicifolia* and *B. linearifolia* flower in April with temperatures around zero without exposing damages. An interesting observation is that of *Buddleia globosa* being dioecious and pollinated by flies.

It was interesting to observe the response to change of season among the living plants being transplanted from autumn to spring. In the year of transplanting, all deciduous species remained dormant until June-July when they produced their new growth. Many of the evergreen species produced little or no growth at all the year of transfer. Particularly the many plants of *Nothofagus betuloides* were observed closely. The vast majority of the plants remained unchanged with buds closed until the following May. Very few plants produced a new growth in August-October, while some other plants produced annual shoots from a limited number of buds



9.20. Útsýnið yfir ein av teimum fyrst plantaðu þórtunum í træagardinum í Hoydølum. Leggið serliga til merkis *Embothrium* í miðjuni og *Chiliodrimum* til høgru fyri miðjuna.

A view of one of the first planted parts in the Arboretum at Hoydalar. Notice especially *Embothrium* in the middle and *Chiliodrimum* centre right. S.Ø. phot., March 84.

with the remaining buds still being dormant. The following summer these plants grew from as well the old as the new buds.

The evergreen *Nothofagus betuloides* and *N. dombeyi* tend to develop thicker stems and branches than the deciduous *N. pumilio* and *N. antarctica*. This phenomenon may be a result of a prolonged growth period for the evergreen species, which are able to benefit from CO₂-assimilation particularly during the spring and early summer (Karlsson & Nordell, 1988). Many of the other evergreens from the Southern Hemisphere may be similarly successful in the extreme oceanic climate as a result of a favourable annual carbon budget.

The small leaves and very slender twigs of the *Nothofagus* species are obviously characters enabling them to tolerate quite strong winds without being damaged.

Conclusions

Many species of trees and shrubs from the cool temperate forests of southernmost South America can grow on the Faroe Isles, particularly when originating from Tierra del Fuego and from near tree-line further North. The possibilities are far from being exhausted. The results so far suggest further experiments with species

Table 2. The South American trees and shrubs tested so far with the results related to their natural distribution as observed in Argentina. The dotted lines indicate that the species is common in the zone, and the other signs indicate from which zone and with which result the plants originate: + well adapted, (+) rather well adapted, maybe slow-growing and/or occasionally slightly damaged, (-) dying regularly back, - dead. *Pernettya mucronata* of unknown origin is perfectly hardy and to be found in all zones. *Alnus jorullensis* and *Polylepis australis* from near tree-line in subtropical NW-Argentina have been tried and are dead.

Species	dry			humid		
	high lat. high alt.	high lat. low alt.	high lat. low alt.	low lat. high alt.	low lat. low alt.	low lat. low alt.
<i>Araucaria araucana</i>				..(+)..	..(+)..	(+)
<i>Aristotelia maqui</i>					..(-)..	(-)
<i>Asteranthera ovata</i>						..-..
<i>Austrocedrus chilensis</i>					..(-)..	
<i>Azara lanceolata</i>						..+..
<i>A. microphylla</i>						(-)
<i>Baccharis magellanica</i>	+..
<i>B. patagonica</i>			..+..
<i>Berberis buxifolia</i>	+..
<i>B. darwinii</i>					..+..
<i>B. empetrifolia</i>		+
<i>B. ilicifolia</i>			+			
<i>B. linearifolia</i>						..+..
<i>B. montana</i>				..+..		
<i>B. pearcei</i>				..+..		
<i>Buddleia globosa</i>						+
<i>Chiliodendron diffusum</i>	+..+..
<i>Chusquea couleou</i>						..+..
<i>Cynanchum descolei</i>						-
<i>Desfontainea spinosa</i>						..-..
<i>Drimys winteri</i>			..+..		
<i>D. w. var. andina</i>					+
<i>Embothrium coccineum</i>		..+..	..+..		..+..	..+..
<i>Escallonia alpina</i>				+		
<i>E. rubra</i>			+			..(+)..
<i>E. virgata</i>					..+..
<i>Fabiana imbricata</i>					..-..	
<i>Fitzroya cupressoides</i>						(+)
<i>Fuchsia magellanica</i>						..+(+)..
<i>Guevina avellana</i>						-
<i>Hydrangea integerrima</i>						..-..
<i>Lomatia ferruginea</i>						..+(+)..
<i>L. hirsuta</i>					..+(+)..	
<i>Maytenus boaria</i>					..(-)..
<i>M. disticha</i>			..(+)..		
<i>M. magellanica</i>			+			..+..
<i>Myrceugenia exsucca</i>						..-..
<i>Myrtus apiculatus</i>						..-..
<i>Nothofagus antarctica</i>		..+..	..+..+..
<i>N. betuloides</i>	+		..+..			
<i>N. dombeyi</i>						..(+)..
<i>N. glauca (from Chile)</i>						-
<i>N. obliqua</i>						(-)
<i>N. procera</i>						(-)(+)
<i>N. pumilio</i>	..+..		+	..+..		



Species	dry			humid		
	high lat. high alt.	high lat. low alt.	high lat. low alt.	low lat. high alt.	low lat. low alt.	low lat. low alt.
<i>Ovidia andina</i>					+
<i>Pilgerodendron uviferum</i>						(+)
<i>Podocarpus nubigenus</i>						(+)
<i>Pseudopanax laetevirens</i>						..(-).. ..
<i>Ribes cucullatum</i>				..+..		
<i>R. magellanicum</i>					+
<i>Saxegothaea conspicua</i>						(+)+
<i>Schinus patagonica</i>					..-..	
<i>Weinmannia trichosperma</i>						-

and origins, not least from the southern Chilean archipelago, which is too sparsely represented in the trials.

The extremely high percentage of survival and adaptation in the material of transferred saplings of *Nothofagus* spp. from Tierra del Fuego indicate a gain from the »screening« of material having already managed to germinate and establish in stressed situations. Furthermore the results underline the probable gain from collecting in extreme oceanic marginal areas in the wild for Faroese conditions. Material of the same species already in cultivation in the British Isles originate in most cases from populations adapted to less cool climates in Central S-Chile (Morley 1979). Nevertheless, additional imports from British nurseries of species and cultivars might be considered.

In the material now in cultivation, the work with selection and propagation of superior individuals has already been initiated and deserves promotion. Vegetative propagation of any of the *Nothofagus*-species has not yet been tried on the Faroe Isles. In Hørsholm cuttings of *N. antarctica* are, however, easily rooted. According to Hogrebe (1973) *N. dombeyi* is more difficult in that respect, and that will probably also be the case with the closely related *N. betuloides*.

Not only the vegetative propagation is favoured by the general high humidity. Obviously most of the species, particularly the evergreens, are not only intolerant to frost and desiccation in the winter but also to a low humidity in the growing season. Twigs and leaves are more »fat« and shiny on the same species and origins when growing in Tórshavn, in comparison with the development in Hørsholm and the East of England and Scotland.

All of the better adapted species and origins of South Hemisphere trees and shrubs are probably a gain for the horticulture on the Faroe Isles. To what extent the three Tierra del Fuego species of *Nothofagus* will contribute to forestry on the Faroe Isles in the future can hardly be evaluated after only a decade. Being well adapted to the climatic and, on drained soils, the edaphic conditions, they tend to be of interest as stabilizing elements in and around plantations, in pure stands or in mixture with the conifers, which they obviously can follow in growth rate. The small plantations next to or surrounded by growing towns serve as public parks,

and in that respect the ornamental qualities of the *Nothofagus*-species and maybe some of the shrubs and smaller trees are conspicuous. In a distant future *Nothofagus*-wood might be used for various purposes, but much sooner the growing trees may yield cutted branches for decoration, particularly *Nothofagus betuloides*.

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Føroyskt úrtak

Møguleikarnir at planta trø og runnar úr sunnara og kaldara parti av Suðuramerika eru kannaðir við royndum. Í 1975 og 1979 vórðu tvær innsavningarferðir gjørdar til Patagonia og til Eldlandið. Hetta var norrønt samstarv. Ein hópur av ymiskum plantusløgum varð innsavnaður. Úrslitini hava verið serstakliga góð, tá tað snýr seg um tey sunnastu sløgini av *Nothofagus antarctica*, *N. betuloides* og *N. pumilio*. 6500 plantur vórðu fluttar beinleiðis úr Eldlandinum til Føroya í 1979.

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