

Phytosociology of Spitsbergen

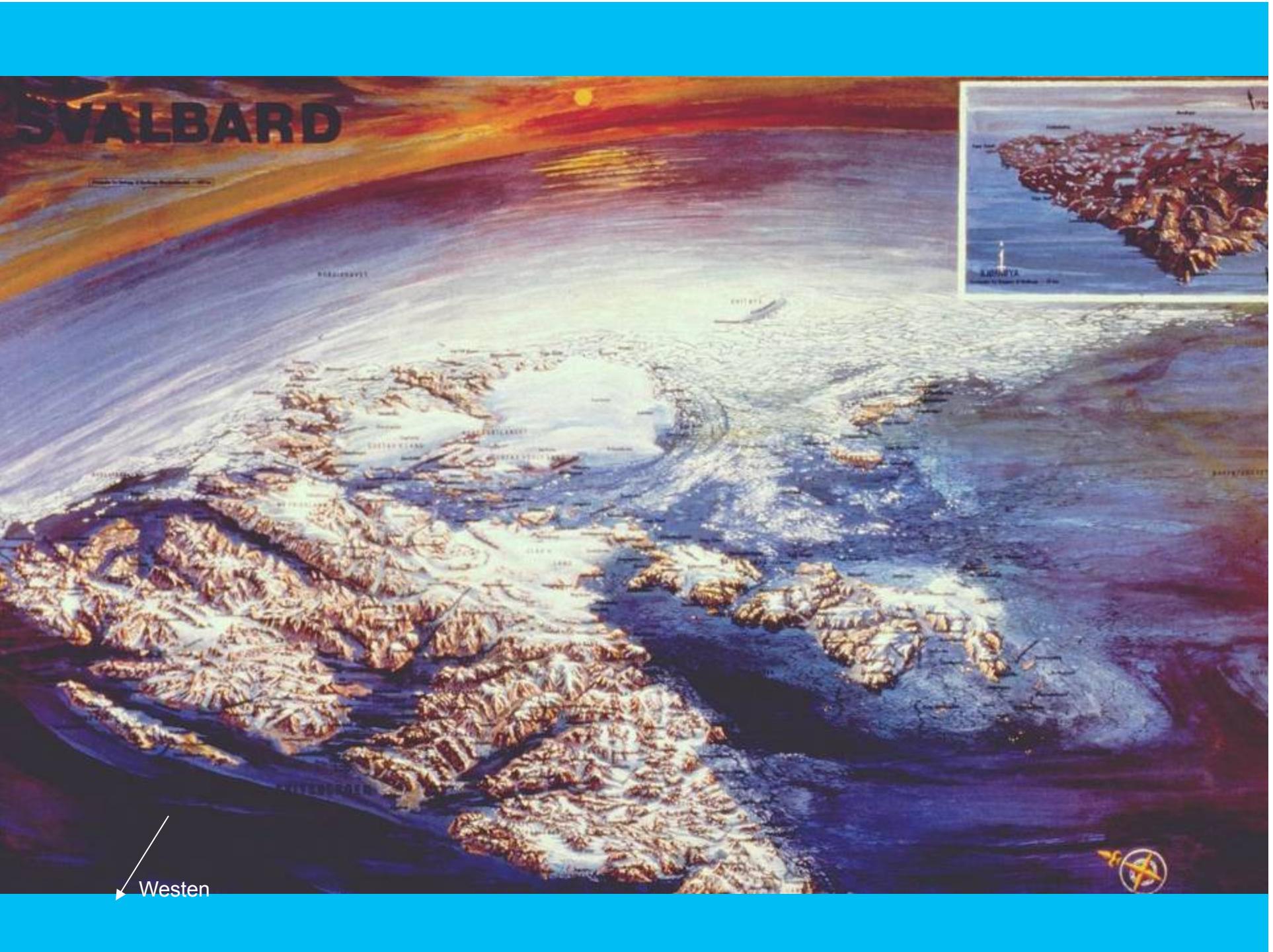
Dietbert Thannheiser
University Hamburg 2013

Spitzbergen

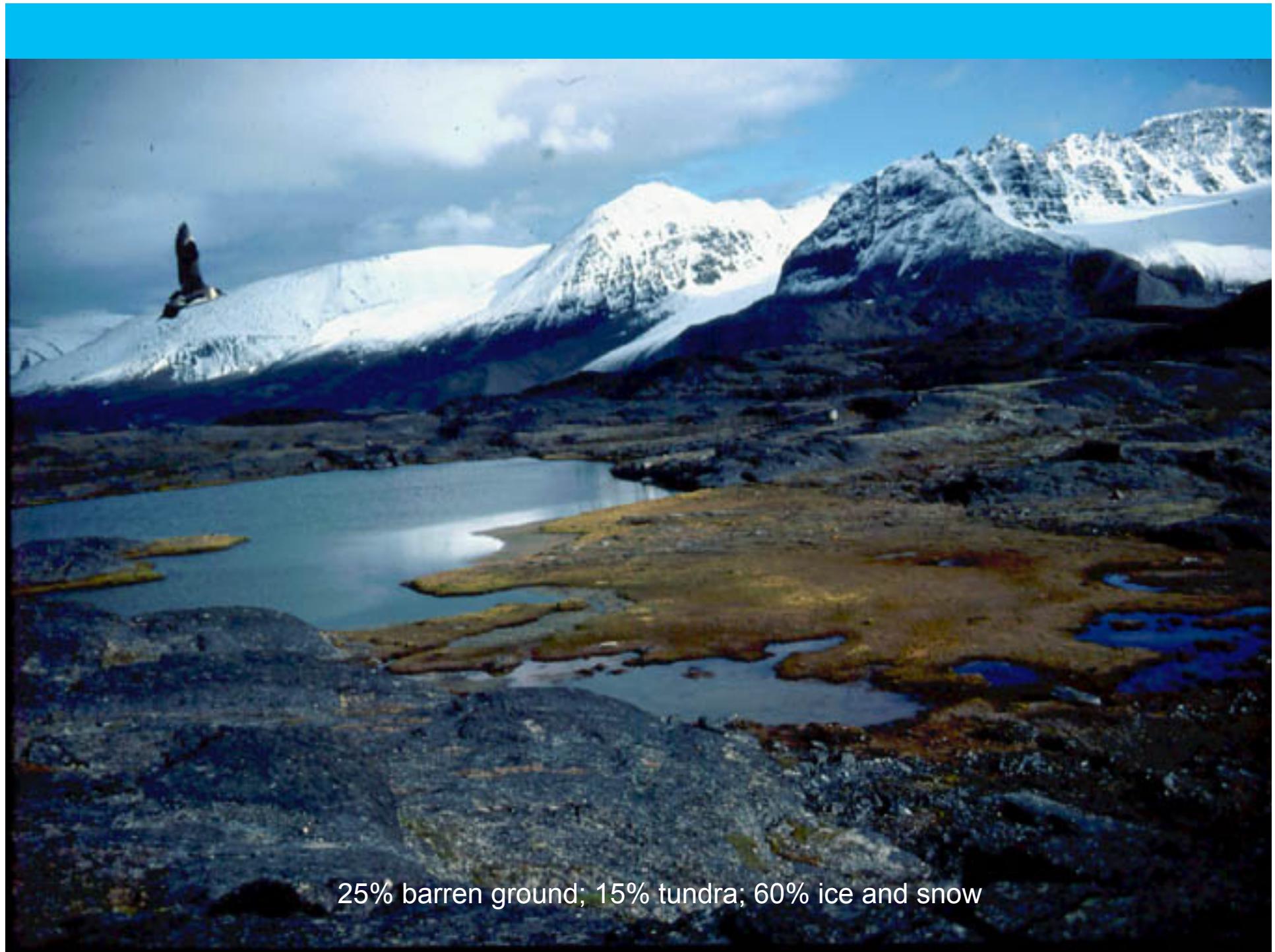
Nordpol

1000 km

1000 km



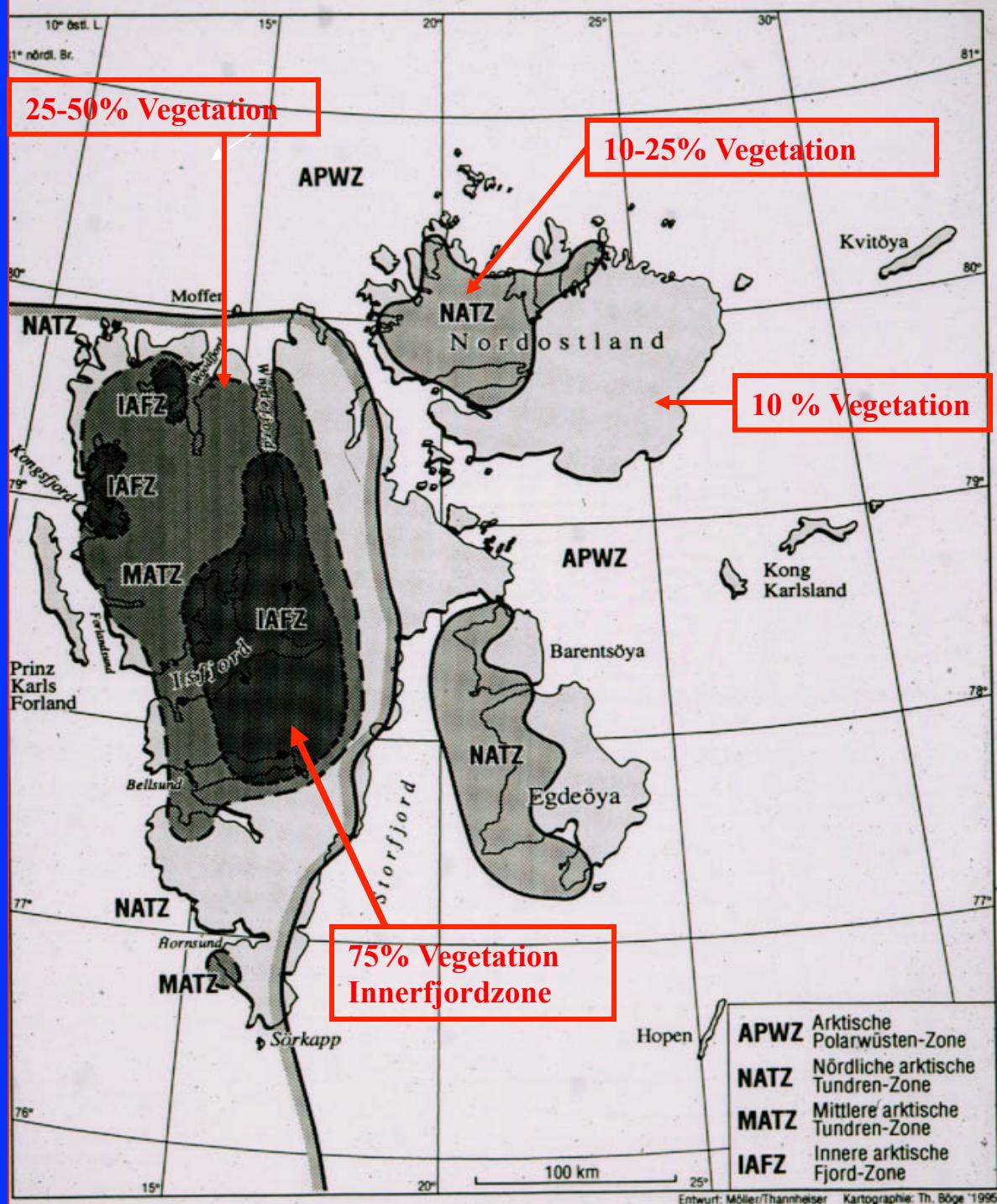
Westen

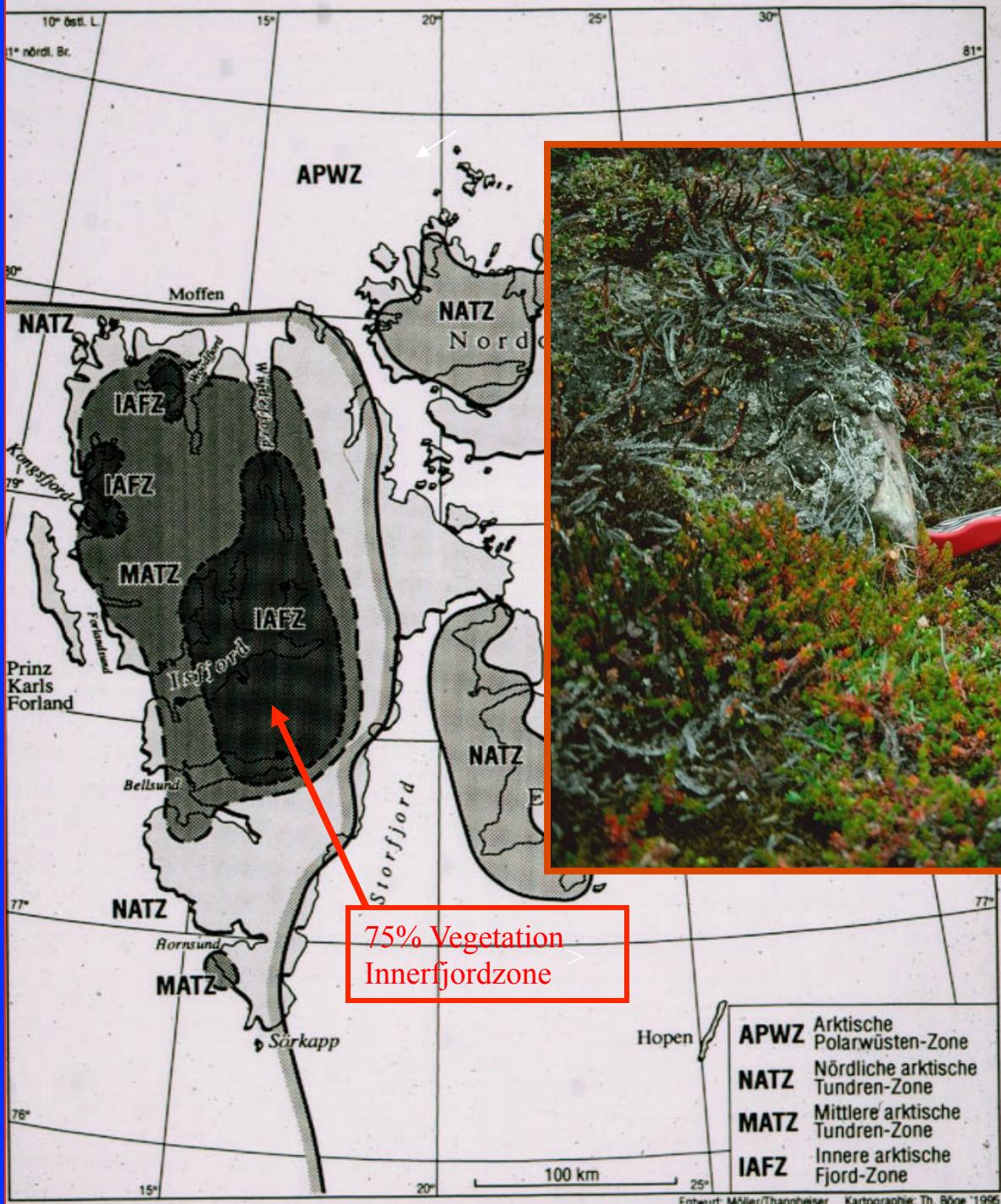


25% barren ground; 15% tundra; 60% ice and snow

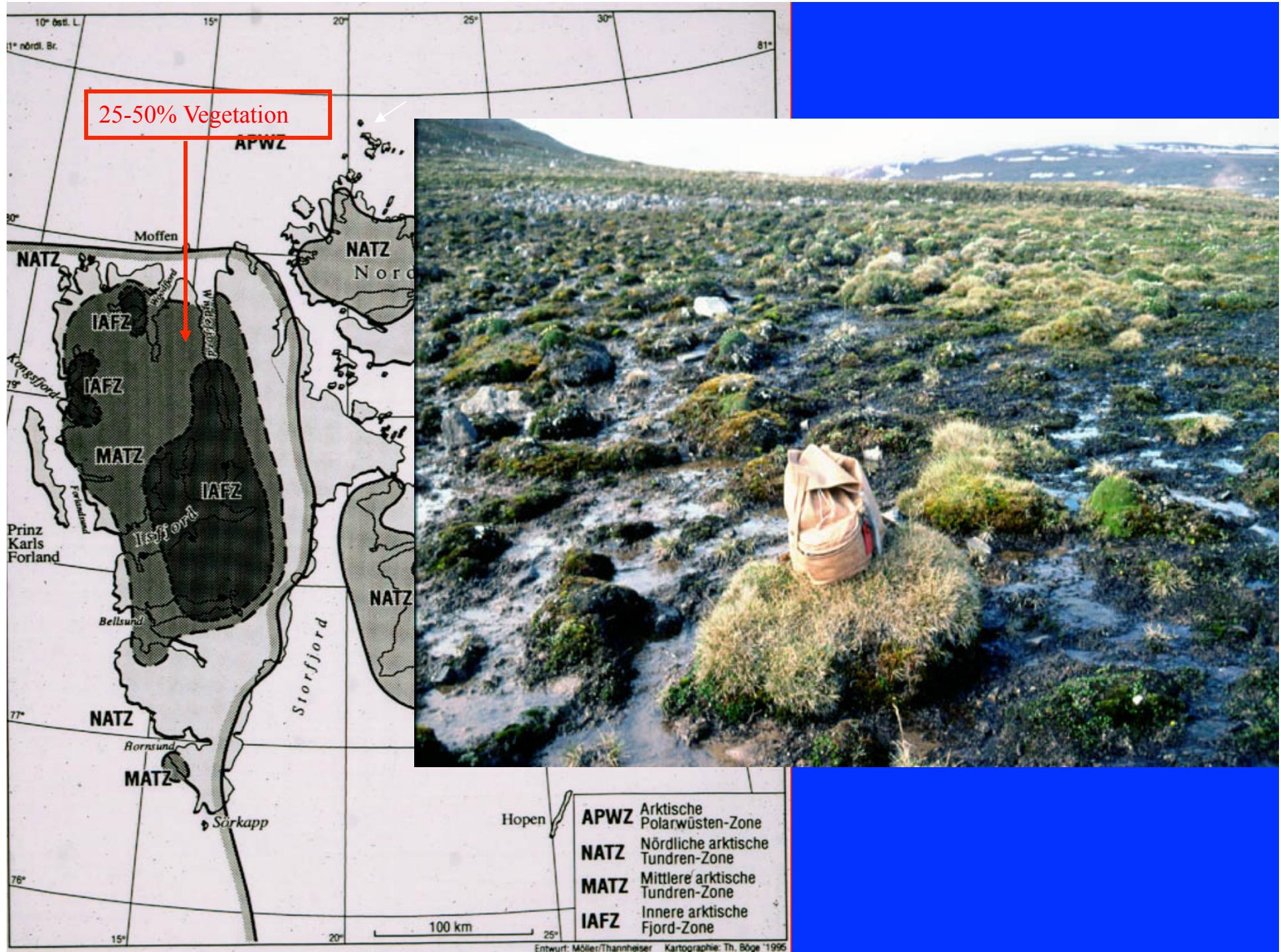
Circumpolar Arctic Vegetation Map

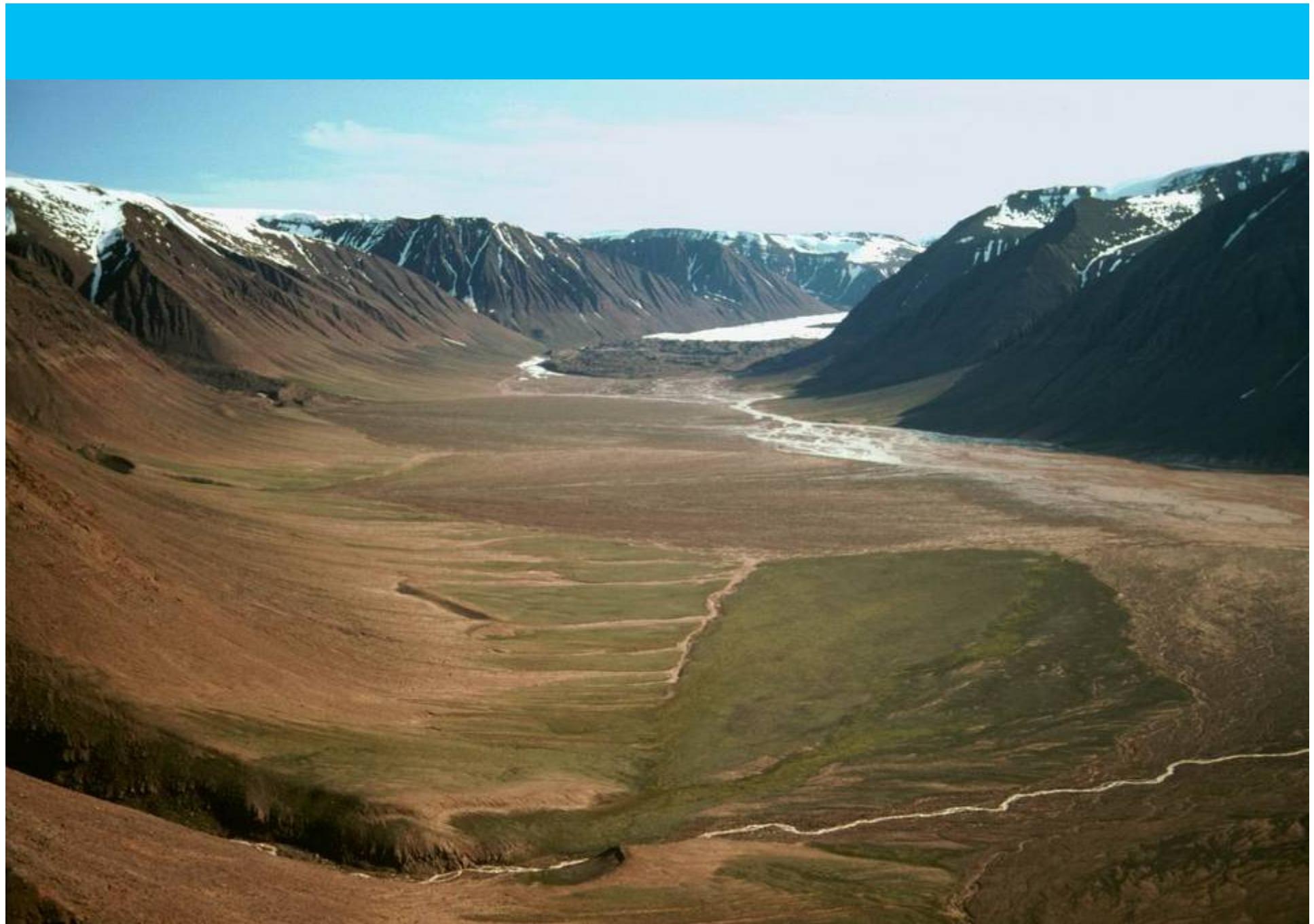






Dryado-Cassiopetum *tetragonae*

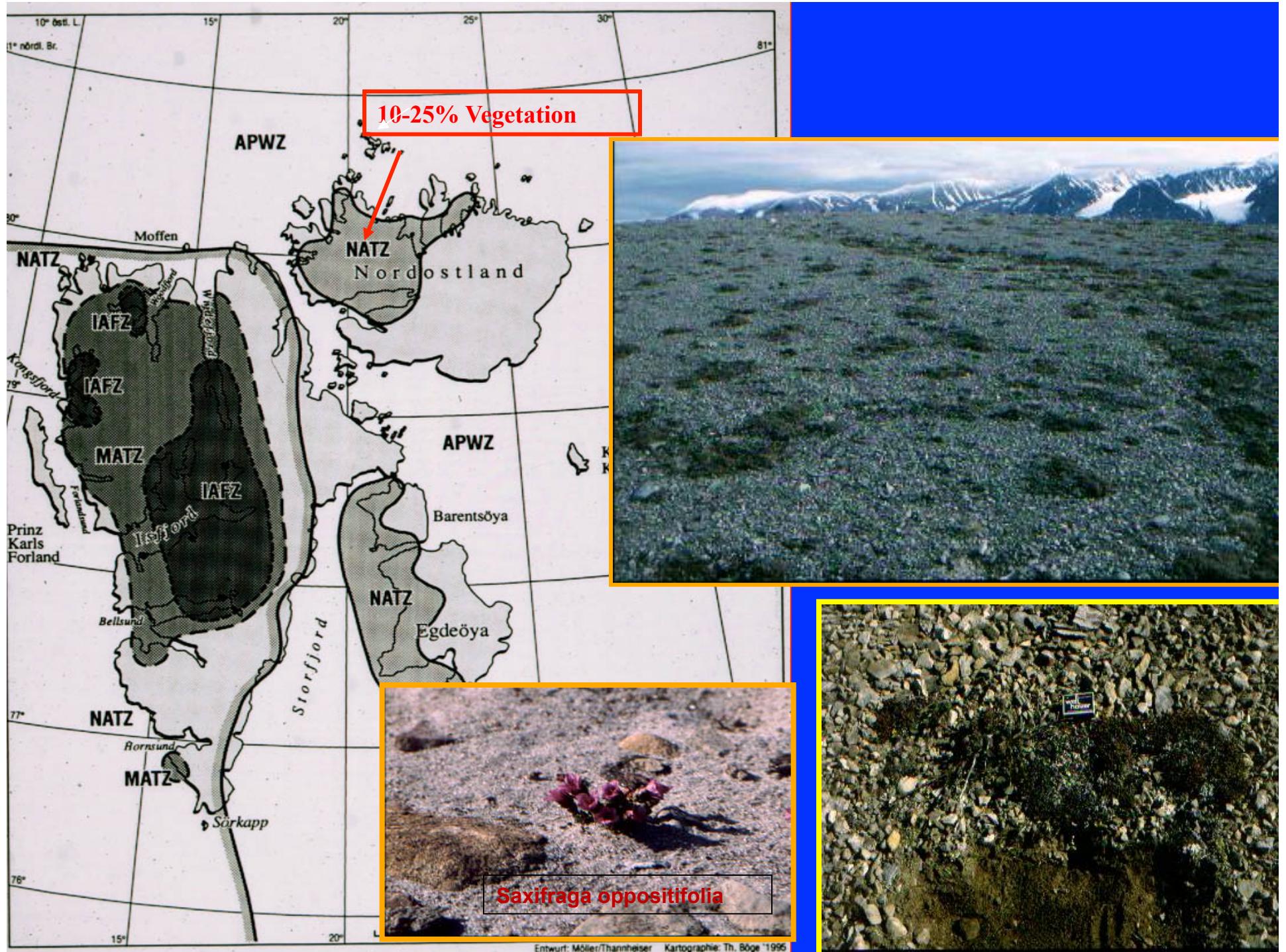




(*Carici rupestris*-*Dryadetum octopetalae* Woodfjord)



Dryadetum minoris Hadac 1946





Puccinellia svalbardensis
(endemisch)

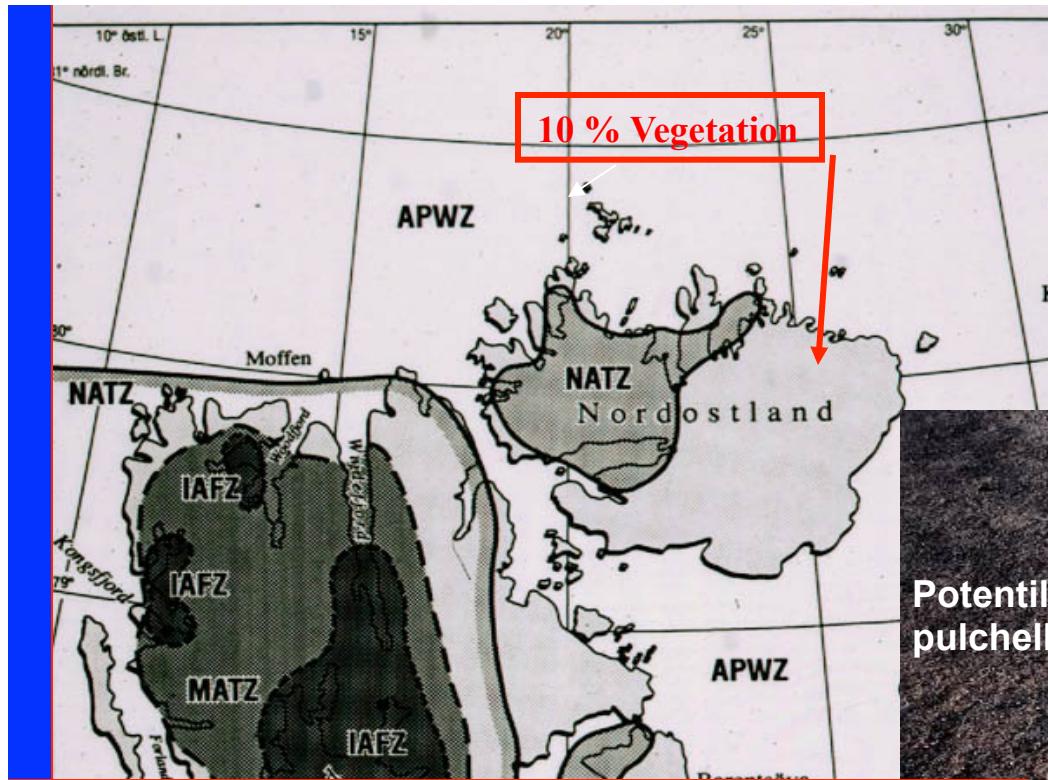


Caricetum subspathaceae



**Puccinellietum
phryganodis**



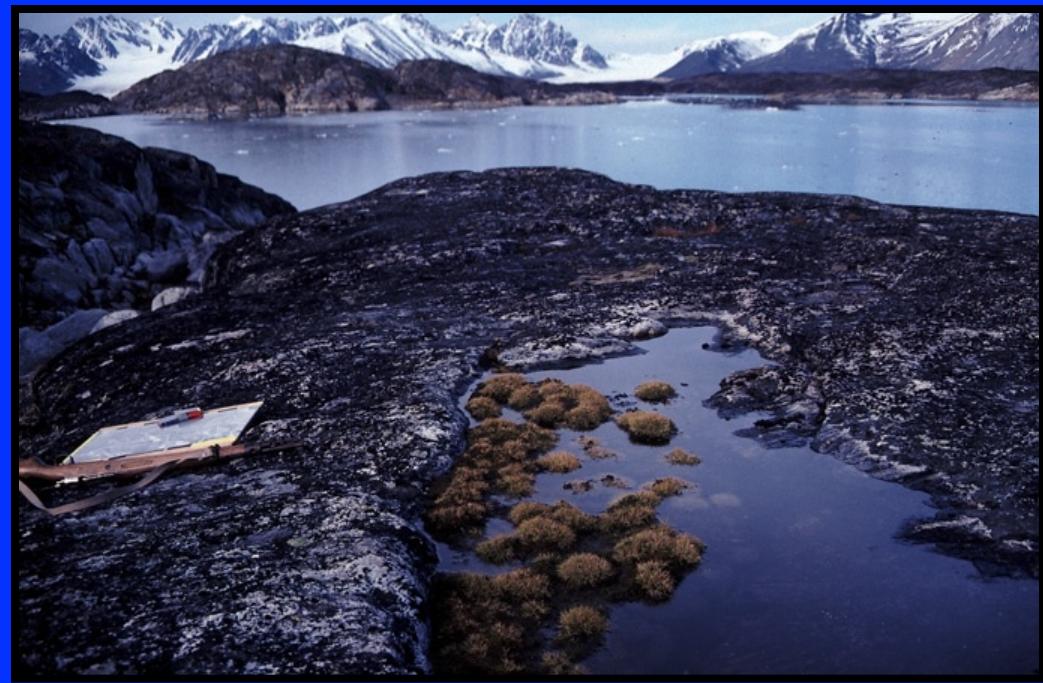


Potentilletum
pulchellae



Papaveretum dahliani

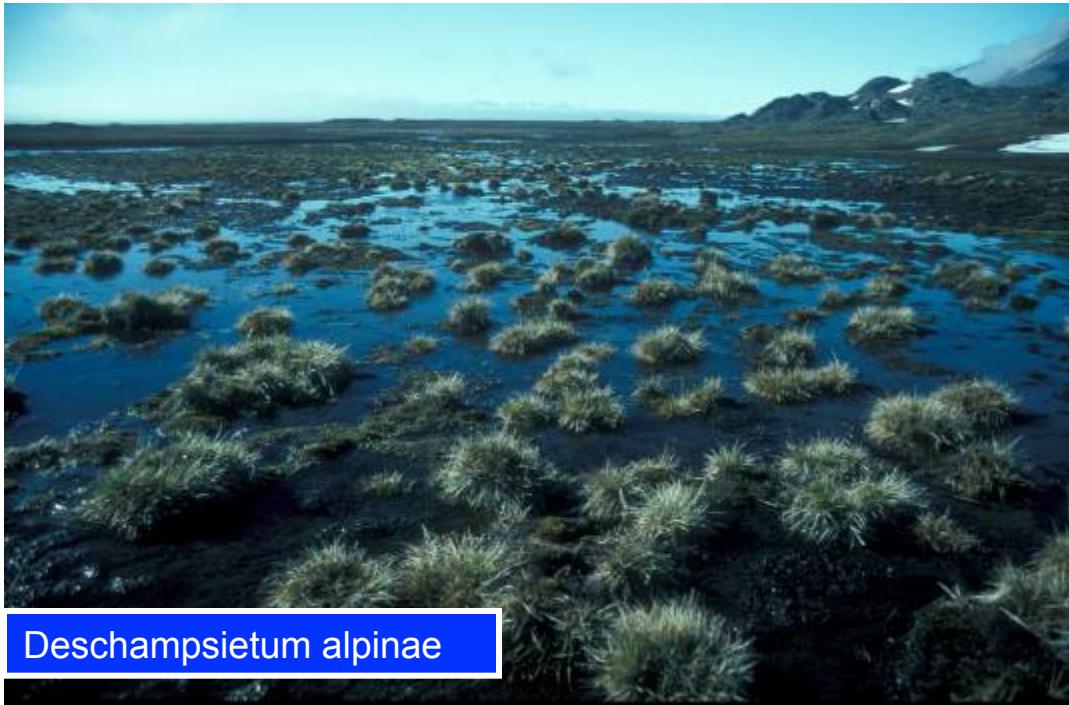




Caricetum ursinae



Mertensietum maritimae

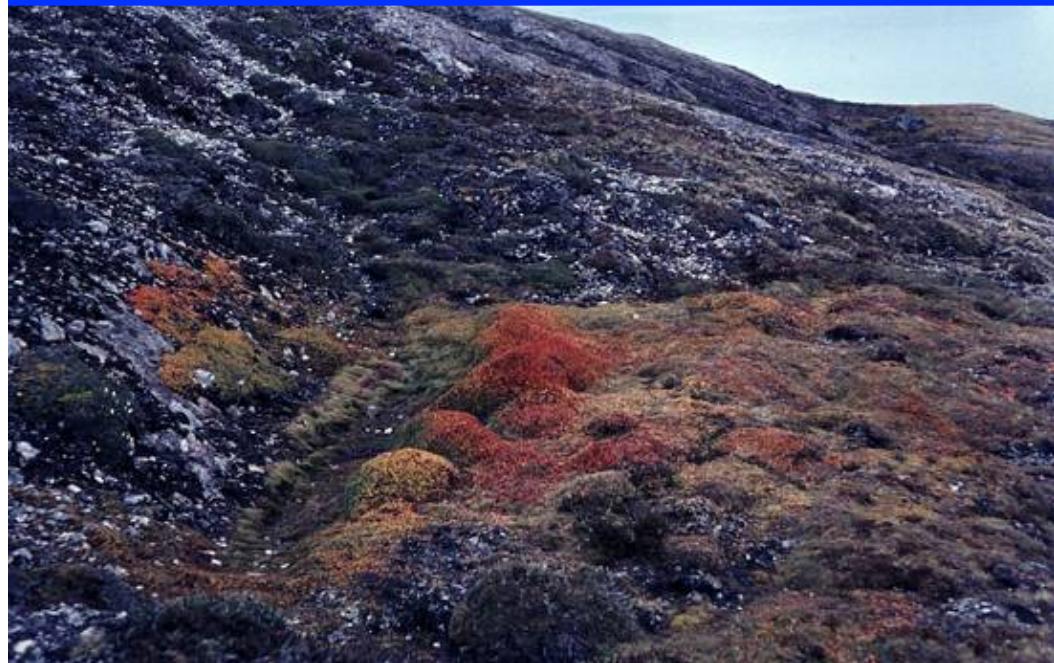


Phippsietum algidae-concinnae





Tomenthypnetum involuti

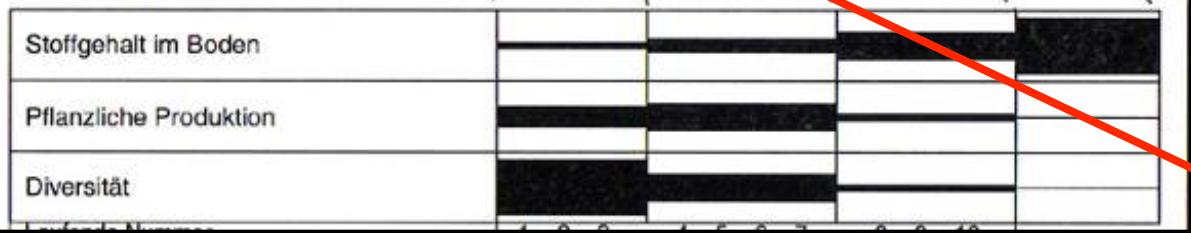
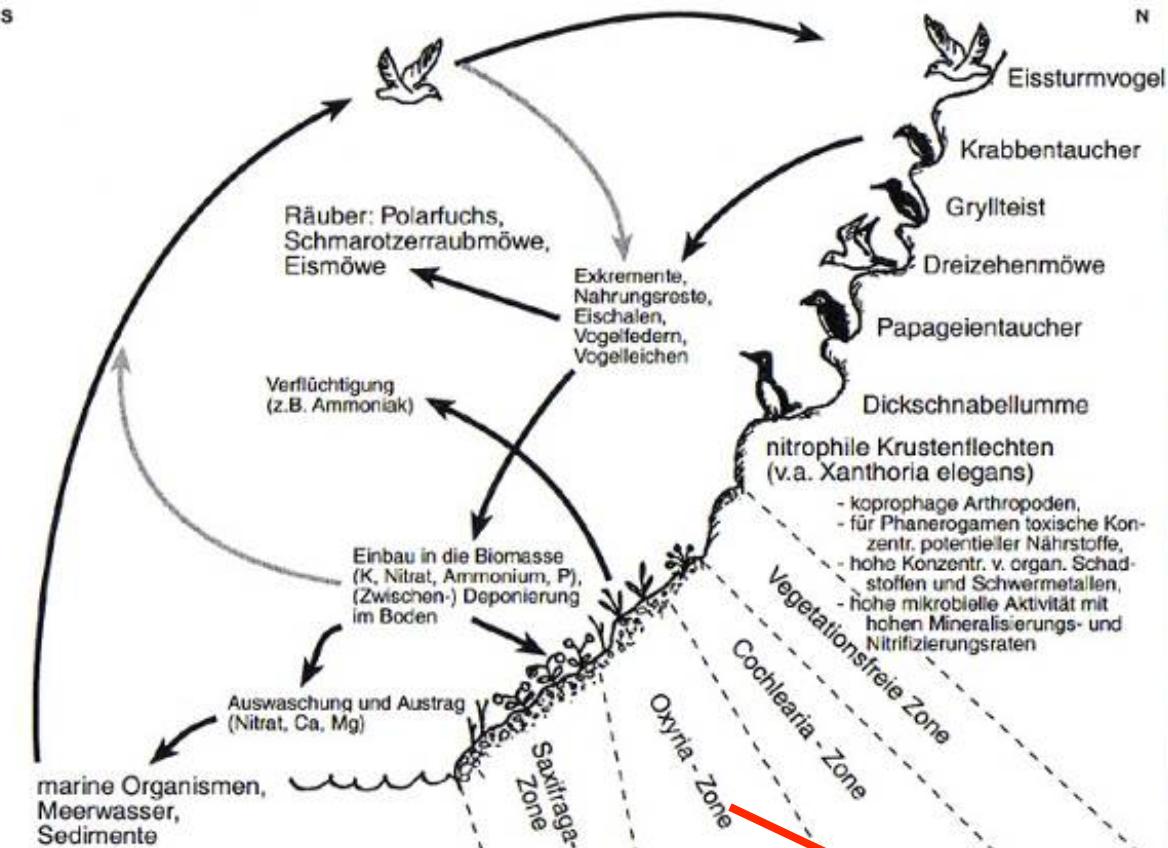


Salicetum polaris



***Koenigia islandica* = only one Therophyt (annual)**

S



Cerastio-Saxifragion cernuae



Phytosociological references from arctic Norway 2013

Svalbard archipelago including Bjørnøya and Jan Mayen

from Lennart Nilsen (Tromsö) and Dietbert Thannheiser (Hamburg/Münster)

Aarrestad, P. A., Bakkestuen, V., Hassel, K., Stabbetorp, O. E. & Wilmann, B. (2010.): Establishment of a vegetation monitoring field in Endalen, Svalbard 2009. Norwegian Institute for Nature Research 579.

Barkman, J.J. (1987): Preliminary investigations on the texture of high arctic tundra vegetation. -In: A.H.L. Huiskes, C.W.P.M. Blom and J. Rozema (eds.): Vegetation between land and sea, S.120-132, Junk, Dordrecht/ Boston/Lancaster.

Brattbakk, I. (1979): Strandeng på Svalbard. – Hovedfagsoppgave. Universitet Trondheim.

Brattbakk, J. (1983): Lavrik morenevegetasjon på Brøggerhalvøya, Svalbard. - In: Baadsvik, K. og Rønning, O.J. (red.) Fagmøte i vegetasjonsøkologi på Kongsvoll 7.-8.3.83. Kgl. Norske Vidensk. Selsk. Mus. Rapp., Bot. ser. 1983-7: 11-16.

Brossard, T., S. Deruelle, P.L. Nimis and P. Petit (1984): An interdisciplinary approach to vegetation mapping on lichen-dominated systems in high-arctic environment, Ny Ålesund (Svalbard). - Phytocoenologia 12(4):433-45

Dahle, O. (1983): Snøleiepreget vegetasjon på Reinsdyrflya, Svalbard. Fagmøte i vegetasjonsøkologi på Kongsvoll 7-8 mars 1983, ed. by K. Baadsvik & O.I. Rønning, 17-32. Trondheim: Det Kongelige Norske Videnskabers Selskab, Museet. University of Trondheim.

Dierßen, K. (1992): Zur Synsystematik nordeuropäischer Vegetationstypen. – Ber.d.Reinh-Tüxen-Ges. 4:191-226

Dubiel, E. & M. Olech (1992): Ornithocoprophilous plant communities on the southern slope of Ariekammen (Hornsund region, Spitsbergen). Landscape, life world and man in high Arctic, ed. by K.W. Opalinski & R.Z. Klekowski, 167-175. Warszawa: Institute of Ecology, Polish Academy of Science.

Dubiel, E. and M. Olech (1990): Plant communities of NW Sörkapp land (Spitsbergen). - Zesz. Nauk. UJ. Prace Bot. 21:35-73.

Elvebakk, A. (1979) Plantesosiologi og –fenologi I eit arktisk område: Stuphallet, Brøggerhalvøya, Svalbard. – Hovedfagsoppgave. Universitet Trondheim

Elvebakk, A. (1994): A survey of plant associations and alliances from Svalbard. - J.Veg.Sci 5:791-802.

Engelskjøn, T. (1987). "Eco-geographical relations of the Bjørnøya vascular flora, Svalbard." Polar Research 5(1): 79-127.

Eurola S. (1968): Über die Fjeldheidevegetation in den Gebieten von Isfjorden und Hornsund in Westspitzbergen. - Aquilo, Ser. Botanica 7:1-56, Oulu.

Eurola, S. (1971): The middle arctic mire vegetation in Spitsbergen. - Acta Agralia Fennica 123:87-107.

Eurola,S. (1971) b: Die vegetation eine sturzhalde (Sveagruva, Spitsbergen). Aquilo Ser. Bot. 10.8-28.

Eurola, S. & Hakala, A. V. K. (1977): The bird cliff vegetation of Svalbard. Aquilo Ser.Bot. 15.1-18.

Gucknacka-Fiedor, W. & B. Noryskiewicz (1982): The vegetation of Kaffiøyra, Oscar II Land, NW Spitsbergen. – Acta Univ.Nicolai Copernici, Ser Geogr. 16-203-238

- Hadac, E. (1946):** The Plant-Communities of Sassen Quarter, Vestspitsbergen. - *Studia botanica Cechica* 7:127-164.
- Hadac, E. (1989):** Notes on plant communities of Spitsbergen. - *Folia Geobotanica et Phytotaxonomica* 24(2):131-169.
- Hartmann, H. (1980):** Beitrag zur Kenntnis der Pflanzengesellschaften Spitzbergens. - *Phytocoenologia* 8(1):65-147.
- Heinemeyer, H. D. & A. J. van Dijk (2004):** Rosenbergdal, green valley in the barren land of Edgeøya, Spitsbergen. Permanence in diversity. Netherlands Ecological research on Edgeøya Spitsbergen, ed. by N. Boschman & L. Hacquebord, 45-69.
- Hermansen, J.E. (1979):** Vegetasjonsökologi i et arktisk område, Brøggerhalvøya, Svalbard. – Hovedfagsoppgave. Universitet Trondheim
- Herstad, P (1981):** Vegetasjon og produksjonsforhold i Børterdalen, Svalbard. – Hovedfagsoppgave. Universitet Trondheim.
- Hjelmstad, R. (1981):** Flora- og vegetatsjonsundersøkelser på Barentsøya. – MAB i Norge – Svalbardprosjektet, rapport 8:1-46
- Hofmann, W. (1969):** Das Puccinellietum phryganodis in Südost-Spitzbergen. - *Mitt. flor. soz. Arbgemein., N.F.* 14:224-230.
- Kapfer, J., R. Virtanen & J-A. Grytnes (2012):** Changes in arctic vegetation on Jan Mayen Island over 19 and 80 years. *Journal of Vegetation Science* 23:771-81. Lid, J. (1964). The flora of Jan Mayen. Norsk Polarinstutts Skrifter. Oslo, Norsk Polarinstuttt. 130: 108.
- Kobayashi, K., H. Kashiwidani and H. Deguchi (1990):** Vegetation of Behemanflya in Spitsbergen. - In: T. Tasumi (ed.): The Japanese Scientific Expeditions to Svalbard 1983-1988, S. 29-70, Tokyo.
- Koroleva, N. E. (1995):** Early stages of plant recovery on tracked vehicle paths in High Arctic (Waest Coast of Vestspitsbergen). - *Polarforschung* 64(1):19-25, 1994.
- Kuper, J.H. and J.W.A. van Rijn van Alkemade (1972):** Elements of the arctic system on Edgeøya (Spitsbergen 1972). - Report Nature conservation Dep. 124:1-24.
- Lid, J. (1967):** Synedria of twenty vascular plants from Svalbard. - *Bot.Jahrb.* 86:481-493.
- Lid, J. (1964):** The flora of Jan Mayen. Norsk Polarinstutts Skrifter Nr. 130: Norsk Polarinstuttt.
- Lund, N. (1979):** Luzula-mark på Svalbard. En vegetatsjonsökologisk undersökelse i Adventdalen og på Brøggerhalvøya.- Hovedfagsoppgave. Universitet Trondheim.
- Möller, I. (2000):** Pflanzensoziologische und vegetationsökologische Studien in Nordwestspitzbergen.
Mitteilungen der Geographischen Gesellschaft in Hamburg 90:1-226
- Möller, I., & D. Thannheiser (1997):** Eine Vegetationsoase im unteren Mimerdalen am Billefjord,
Zentral-Spitzbergen. - *Polarforschung* 65(2):65-70.
- Möller, I., D. Thannheiser & C. Wüthrich (1998):** Eine pflanzensoziologische und vegetationsökologische
Fallstudie in Westspitzbergen. *Geoökodynamik* 19:1-18.
- Möller, I., C.Wüthrich & D.Thannheiser (2001):** Changes of plant community patterns, phytomass and
carbon balance in High Arctic Tundra Ecosysetms under climate of increasing cloudiness. – Tasks
for vegetation science 35:225-242

- Nilsen, L., T. Brossard, D. Joly & A. Elvebakk (1999):** Mapping and analysing arctic vegetation; evaluating a method coupling numerical classification of vegetation data with SPOT satellite data in a probability model. International Journal of Remote Sensing 20:2947-2977.
- Nilsen, L., T. Brossard & D. Joly (1999b):** Mapping plant communities in a local Arctic landscape applying a scanned infrared aerial photograph in a geographical information system. International Journal of Remote Sensing 20:463-480.
- Nilsen, L. (1992):** Phytosociological and remote sensing studies of changes in vegetation pattern on a glacier forefield at Uversøyra, north-west Spitsbergen: Master thesis, University of Tromsø.
- Philippi, G. (1973):** Moosflora und Moosvegetation des Freeman-Sund-Gebietes (Südost-Spitzbergen). - Ergebni. Staufferland-Exped. 1959/67, 7:1-83.
- Polunin, N. (1945):** "Plant life in Kongsfjord, West Spitsbergen." Journal of Ecology 33(1): 82-108.
- Prach, K. & G. Rachlewicz (2012):** Succession of vascular plants in front of retreating glaciers in central Spitsbergen. Polish Polar Research 33:319-28.
- Prach, K., J. Klimešová, J. Košnar, O. Redcenko & M. Hais (2012b):** Variability of contemporary vegetation around Petuniabukta, central Spitsbergen. Polish Polar Research 33:383-94.
- Rønning, O.I. (1965):** Studies in Dryadion of Svalbard. - Norsk Polarinst. Skr. 134:1-52.
- Rønning, O. I. (1959):** The vascular flora of Bear Island. Acta Borealia. Tromsø, Tromsø Museum.
- Thannheiser, D. (1975):** Beobachtungen zur Küstenvegetation auf dem westlichen kanadischen Arktis- Archipel- ein Beitrag zur Soziologie und Verbreitung von Puccinellion phryganodis in der Arktis. - Polarforschung 45(1):1-16.
- Thannheiser, D. (1976):** Ufer- und Sumpfvegetation auf dem westlichen kanadischen Arktis-Archipel und Spitzbergen. - Polarforschung 46 (2):71-82.
- Thannheiser, D. & W. Hofmann (1977):** Pflanzengesellschaften am Meerestrand im Kongs- und Krossfjord (West-Spitzbergen). – Documents phytosociologiques N.F.I:297-303
- Thannheiser, D. (1992):** Vegetationskartierung auf der Germaniahalvöya. – Stuttg. Geogr. Studien 117:141-160
- Thannheiser, D. (1994):** Vegetationsgeographisch-synsoziologische Untersuchungen am Liefdefjord (NW-Spitzbergen). – Z.Gemorph N.F.Suppl.Bd. 97:205-214
- Thannheiser, D. (1995):** Eine landschaftsökologische Fallstudie auf der Insel Store Måkeøy am Liefdefjord(Nordwest-Spitzbergen). - Norden 10:19-35.
- Thannheiser, D., M.Haacks & C. Wüthrich (2001):** Vegetationsökologische Untersuchungen im unteren Sasselalen (Spitzbergen).- Geoöko 22:117-139
- Thannheiser, D. & C.Wüthrich (1999):** Flora und Vegetation am St. Jonsfjord (Spitzbergen) unter besonderer Berücksichtigung der onithogenen Tundra. – Norden 13:291-301.
- Vanderpuye, A.W., Elvebakk, A. & Nilsen, L. (2002):** Plant communities along environmental gradients of high-arctic mires in sassendal, Svalbard. – Journ. Of Vegetation Sci. 13:875-884.
- Virtanen, R. & S. Eurola (1997):** Middle oroboreal vegetation in Finland and middle-northern arctic vegetation on Svalbard. In Acta Phytogeographic Suecica (ed.) S.V. Sällskapet. Uppsala: Opulus Press AB.
- Virtanen, R. J., P.A. Lundberg & L. Oksanen (1996):** Topographic and altitudinal patterns in plant communities on European arctic islands. Polar Biology 17:95-113.
- Wegener, C., M. Hansen & L.B. Jacobsen (1992):** Vegetatsjonsovervåkning på Svalbard 1991. Effekter av reinbeite ved Kongsfjorden, Svalbard. – Norsk Polarinst., Medd. 121: 1-30
- Wollesen, D. (1997):** Landschaftsökologische Vergleichsstudie zur nordeuropäischen Tundra (NWSpitzbergen/N-Schweden). - Giessener Geogr. Schr. 74,1- 216 .

Phytosociological relevés from Svalbard archipelago including Björnöya and Jan Mayen

(2013)

from Lennart Nilsen (Tromsö) and Dietbert Thannheiser (Hamburg/Münster)

Authors	Location	Publ.	Not publ.	Relevé size m ²	Envir. data	Digital data	Map	Notes
Arrestad, P.A. et al. (2010)	Endalen, Spitsbergen		50	0.25	Yes	Yes		Monitoring of permanent plots. Incl. mosses and lichen
Barkman, J.J. (1987)	Edgeøya	14						
Brattbakk, I. (1973)		538					Yes	
Brattbakk, I. (1983)	Brøggerhalvøya, Spitsbergen	25					Yes	
Brossard, T. et al. (1984)	Brøggerhalvøya, Spitsbergen	70		1.0	No			
Dahle, O. (1983)	Reinsdyrflya, Spitsbergen	107		1.0	Yes			
Dierßen, K. (1990)	Kongsfjord, Liefdefjord,		100					
Dubiel, E. & M.Olech (1990)	Sørkapp, Spitsbergen	258						
Dubiel, E. & M. Olech (1992)	Hornsund, Spitsbergen	27					Yes	
Elvebakk, A. (1979)	Brøggerhalvøya	140		1,0				
Engelskjøn, T. (1987)	Bjørnøya							
Eurola, S. (1968)	Hornsund, Spitsbergen	58		25.0				
Eurola, S. (1971)	Reindalen, Spitsbergen	11		1.0				
Eurola, S. (1971)b	Sveagruva, Van Mijenfjorden,	20		1.0				
Eurola, S. & A. Hakala (1977)		29			Yes			

Gugnacka-Fiedir, W. & B. Noryskiewicz (1982)		?					
Hadač, E. (1960)		75					
Hadač, E. (1989)	Isfjorden, Van Meijen-fjorden, Spitsbergen	95		1.0	Yes		
Hartmann, H. (1980)		47 20*					*const.tab.
Heinemeijer, H. D. & A. J. van Dijk (2004)	Rosenbergdalen, Edgeøya	119		1.0	No	Yes	
Hjelmstad, R. (1981)		26					
Hermansen, J.E. (1979)	Bröggerhalvöya	75		1.0			
Herstad, P. ((1981)	Bölterdalen	?					
Hofmann, W. (1967)	Edgeöya, Barentsöya		200				
Hofmann, W. (1969)	Barents- and Edgeöya	13					
Kapfer, J. (2012)	Jan Mayen	200		1.0	Yes	Yes	
Kobayashi, K. Et al. (1990)	Bohemansflya, Isjord, Spitsbergen	56		1.0	Yes		
Koroleva N. (1995)	Westspitsbergen	8					
Kuper, J.H. et al. (1972)		48					
Lid, J. (1967)	Spitsbergen	200					
Lid, J. (1964)	Jan Mayen	327		1.0	No		
Lund, N. (1979)	Bröggerhalvöya	135		1.0		Yes	
Möller, I. (2000)	Northwest-Spitsbergen	580					
Möller, I. & D. Thannheiser (1997)	Billefjord	149					const.tab.
Möller, I. & D. Thannheiser (1998)	Westspitsbergen	284					const.tab.
Möller, I. et al. (2001)	Eidembukt	106					const.tab.
Möller, I. & D. Thannheiser 2003	Woodfjord	40					const.tab.

Nilsen, L. et al. (1999)	Brøggerhalvøya, Spitsbergen	266		100.0	Yes	Yes	Yes	
Nilsen, L. et al. (1999b)	Midre Lovénbreen, Spitsbergen	200		0.25	Yes	Yes	Yes	
Nilsen, L. (1992)	Uversøyra, Spitsbergen		222	1.0	Yes	Yes	Yes	
Phillippi, G. (1973)	Barents- and Edgeöya	187					Yes	
Prach, K. & G. Rachlewicz (2012)	Petuniabukta, Ragnarbreen	60		25.0	No	Yes		
Prach, K. et al. (2012)	Petuniabukta, Ragnarbreen	53			Yes	Yes	Yes	
Rønning, O.I. (1965)	Spitsbergen	193		1.0	Yes			
Schuhwerk, F. (1991)	Liefdefjord, Spitsbergen		50					lichens
Thannheiser (1969)	Kongs- and Krossfjord		80					
Thannheiser, D. (1975)		18						constancy
Thannheiser, D. (1976)		4						
Thannheiser, D. & W. Hofmann (1977)	Kongs- and Krossfjord	21						
Thannheiser, D. (1994)	Liefdefjord	150						
Thannheiser, D. (1995)	Liefdefjord	1						const.tab.
Thannheiser, D. & C. Wüthrich (1999)	St. Johnsfjord	2						const.tab.
Thannheiser, D. et al. (2001)	Sassendal	20						const.tab.
Vanderpuye A.W. et al. (2002)	Sassendalen, Spitsbergen	7				Yes		constancy
Virtanen, R. & S. Eurola (1997)	Kjellstrømdalen, Agardbukta, Spitsbergen	56		25.0	No			Relevé size 5 x 5 m,
Virtanen, R. et al. (1996)	Jan Mayen			0.64				Relevé size 0.8 x 0.8 m
Wegener, C., M. Hansen & L.B. Jacobsen (1991)	Kongsfjord	?						
Wollesen, D. 1997	Liefdefjord	120						
Sum of published and unpublished relevés	:	5964						

**Syntaxonomical survey of Spitsbergen by Dietbert Thannheiser
2013**

Cl.: **Juncetea maritimi Br.-Bl. 1931**

Ord.: **Glauco-Puccinellietalia Beeft. & Westh. 1968**

All.: **Puccinellion phryganodis Hadač 1946**

Ass.: **Puccinellietum phryganodis Hadač 1946**

Ass.: **Caricetum subspathaceae Hadač 1946**

Ass.: **Caricetum ursinae Hadač 1946**

Cl.: **Honckenyo peploides-Elymetea arenarii Tx. 1966**

Ord.: **Honckenyo peploides-Elymetalia arenarii Tx. 1966 em. Géhu &
Tx. ap. Géhu 1975**

All.: **Honckenyo peploides-Elymion (Galiano 1959) Tx. 1966
(= Agropyron-Rumicion Nordh. 1940)**

Ass.: **Mertensietum maritimae (Nordh. 1940) Thannh. 1981**

Cl.: Thlaspietea rotundifolii Br.-Bl., Emb. & Mol. 1947 C

Ord.: Thlaspietalia rotundifolii Br.-Bl. ap. Br.-Bl. et Jenny 1926

All.: Papaverion dahliani Hofm. 1968 ex Daniëls 2013

(=Arenarion norvegicae Nordh. 1935)

Ass.:Puccinellietum angustatae Möller 2000

Ass.:Potentilletum pulchellae Möller 2000

Ass.:Papaveretum dahliani Hofm. 1968

Saxifraga oppositifolia-com.

Ord.: Androsacetalia alpinae Br.-Bl. ap. Br.-Bl. & Jenny 1926

All.: Cerastio-Saxifragion cernuae Hartm. 1980].

(= Saxifrago stellaris-Oxyrion digynae Gjærev. 1950

Luzulion arcuatae 1936 all.prov.Elvebakk 1985)

Ranunculo-Oxyrion Nordh. 1936

Ass.:Deschampsietum alpinae (Samuelsson 1913) Nordh. 1943

Ass.:(Anthelio-) Luzuletum arcuatae Nordh. 1928

Ass.:Sphaerophoro-Racomitrietum lanuginosi (Hadač 1946) Hofm. 1968

Ass.:Oxyrio-Trisetetum spicati (Hadač 1946) 1989

Racomitrium canescens com.

Festuca rubra ssp. arctica com.

Puccinellia angustata ssp. palibinii com.

Brachythecium turgidum-Festuca rubra ssp. arctica com.

Festuca baffinensis com.

Cochlearia groenlandica com.

Oxyria digyna com.

Saxifraga cernua com.

Poa arctica ssp. caespitans com.

Brachythecium turgidum-Poa pratensis ssp. alpigena com.

Cl.: Montio-Cardaminetea Br.-Bl. & Tx. 1943 ex Klika & Hadač 1944

Cl.: Montio-Cardaminetalia (Br.-Bl. 1925) Pawl., Sokl. & Wall. 1928

All.: Cardamino nymanii-Saxifragion foliolosae Hadač 1989

(= Cardamino-Montion Br.-Bl. 1926)

Ass: Drepanoclado-Ranunculetum hyperborei Hadač 1989

Ass.: Calliergono-Bryetum cryophili Hofm. 1968

Alopecurus alpinus-Aulacomium palustre-com.

Saxifraga-Philonotis tomentella-com.

Cl.: Salicetea herbaceae Br.-Bl., Emb. & Mol. 1947

Ord.: Salicetalia herbaceae Br.-Bl. ap.

All.: Saxifrago-Ranunculion nivalis Nordh. 1943 em. Dierßen 1984

[= Drepanoclado-Poion alpinae Hadač 1946, Saxifrago oppositifolio-Oxyrion digynae Gjærev. 1956 p.p., Salicion polaris Du Rietz 1942 n.n., Ranunculo-Oxyrion Nordh. 1936 p.p.] Br.-Bl. & Jenny 1926

Ass.: Phippsietum algidae-concinnae Nordh. 1943

Ass.: Salicetum polaris Gjærev. 1950

Ass.: Cerastio regelii-Poetum alpinae Dierßen 1992

Salix reticulata-com.

Ranunculus pygmaeus-com.

SubAll.: Luzulenion arcticae (Nordh. 1936) Gjærev. 1950

[= Luzulion nivalis Nordh. 1936, Ranunculo-Oxyrion Nordh. 1936 p.p.]

Ass.: Tomenthypnetum involuti Hadač 1946

Luzula arctica-com.

Cl.: Scheuchzerio-Caricetea nigrae (Nordh. 1936) Tx. 1937

[= Caricetea limosae Malmer 1968, Tofieldietea Malmer 1968]l

Eriophorum angustifolium ssp. triste-com.

Ord.: Scheuchzerietalia palustris Nordh. 1936

[= "Apiculatetalia" Du Rietz 1954]

All.:Caricion lasiocarpae Van den Berghen ap. Lebrun & al. 1949

[= Eriophorion gracilis Prsg. ap. Oberd. 1957]

Ass.: Arctophiletum fulvae (Lambert 1968) Thannh. 1976

Ass.: Caricetum stantis Barrett & Krajina 1972

Pleuropogon sabinei-com.

Ord.: Caricetalia nigrae (Koch 1926) Nordh. 1936 em. Br.-Bl. 1949

All.:Caricion nigrae Koch 1926 em. Klika 1934

[= Caricion canescenti-goodenowii Nordh. 1936; incl. Eriophorion scheuchzeri Hadač 1939, Drepanocladion exannulati Krajina 1933, Sphagn(et)o-Tomenthynion Dahl 1956]

Ass.: Drepanocladio-Ranunculetum hyperborei Hadač 1989

Ass.: Bryo-Dupontietum pelligerae (Hadač 1946) 1989

Ass.: Calliergono-Caricetum saxatilis (Nordh. 1928) Dierßen 1982

Carex lachenalii-com.

Ord.: Caricetalia davallianae Br.-Bl. 1949

[= Tofieldietalia Prsg. ap. Oberd. 1949, Drepanocladio-Caricetalia Succow 1974]

All.:Caricion atrofusco-saxatilis Nordh. 1943

Carex parallelia-com.

Carex maritima-com.

Carex capillaris-com.

Cl.: **Carici rupestris-Kobresietea bellardii** Ohba 1974

Ord.: **Kobresio-Dryadetalia (Br.-Bl. 1948)** Ohba 1974

All.: **Caricion nardinae Nordh.** 1935

[= *Elynon bellardii* Nordh. 1936, *Kobresio-Dryadion* Nordh. 1936]

Ass.: **Caricetum nardinae Nordh.** 1935

Ass.: **Carici rupestris-Dryadetum octopetalae Rønning** 1965

Ass.: **Dryadetum minoris Hadač** 1946

Ass.: **Dryado-Cassiopetum tetragonae (Fries 1913)** Hadač 1946

Cl.: **Nardo-Callunetea Prsg.** 1949

[= *Calluno-Ulicetea* Br.-Bl. & Tx. 1943]

Ord.**Nardetalia strictae Oberd.** 1949 ex Prsg. 1949

All.: **Nardo-Caricion bigelowii Nordh. (1936)** 1943

(incl. *Deschampsio-Anthoxanthion* Du Rietz 1942)

Ass.: **Cetrarietum delisei (Resvoll-Holmen 1920)** Dahl 1956

Cl.: **Cetrario-Loiseleurietea Suz.-Tok. & Umez** 1964

Ord.: **Cetrario-Loiseleurietalia Suz.-Tok. & Umez** 1964

All.: **Loiseleurio-Diapension (Br.-Bl., Siss. & Vlg. 1939)** Daniëls 1982

Empetrum nigrum ssp. *hermaphroditum-com.*