

The Ecology of Some Marine and Maritime Lichens on Rocky Shores of the Faroe Islands

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1. Introduction

This work was undertaken by the present author in May 1986 during a survey of the lichens of the Faroe Islands, in connection with her thesis.

The lichen vegetation of the Faroe Islands has previously been studied only on a few occasions. The most well known of these are Lindsay (1867), Deichmann Branth (1901), Townrow (1960), Degelius (1966), Hansen (1968), and Hansen and Fosaa (1985).

Biologists working with the vegetation on the seashore have been aware of the phenomenon, that the lichens are growing in belts of different colour. These belts show the lichen zonation across the seashore.

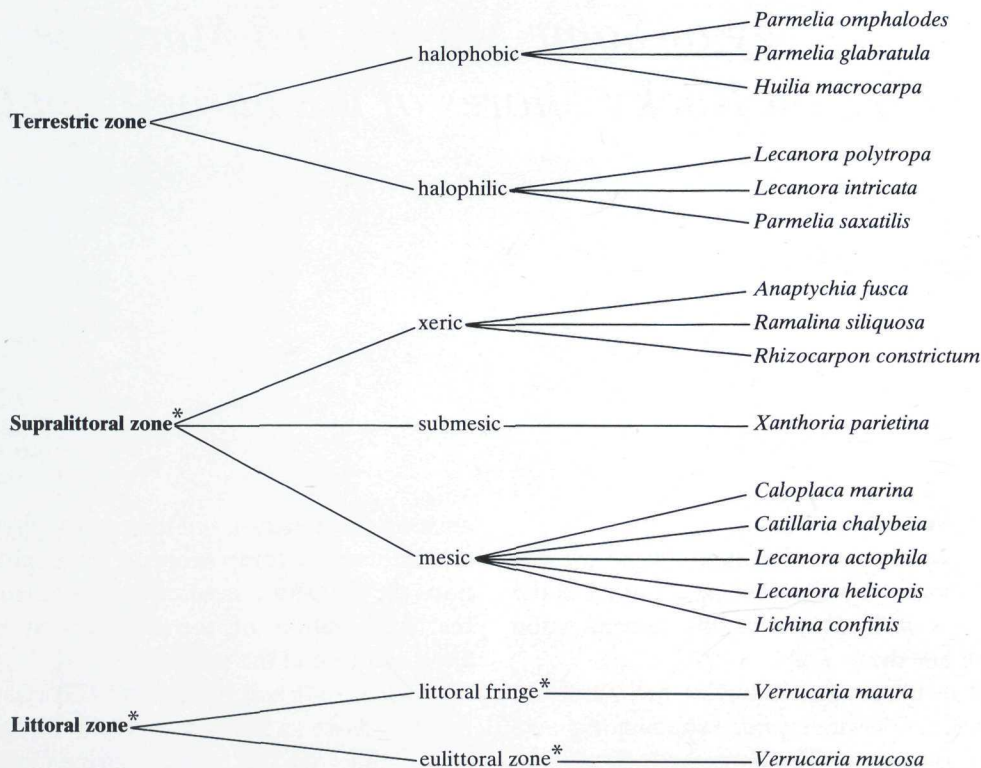
Lewis (1964) and Fletcher (1973) based their seashore zonation studies of the organisms on the seashores. Biologists from the beginning of this century based their studies on low and high tide, but later other discovered that the theoretical borders were not similar to those observed, since it is not only the tide that had influ-

ence on the zonation but also other physical factors. The composition of the populations on one shore is often different from the composition of the populations on another shore at the same level.

Lewis (1964) and Fletcher (1973) classified the shore as follows: —(1) the littorial zone, that is the most marine influenced.—(2) the supralittorale zone, which is rarely submerged by the seawater and is separated in three parts: one mesic-supralittorial zone nearest to the sea, one submesic supralittorial, and one xeric supralittorial zone farthest off water.—(3) the terrestrial region containing halophilic species, that are species which tolerate the seawater and species which do not tolerate the seawater, respectively.

The survey below is a combination of the system of Fletcher (1973) and Lewis (1964). The terms used by Lewis are identified by an asterisk. Fletcher (1973) used by the species listed as an indicator for the zones.

In this paper it will be discussed, whether this classification system applies to the sea-



shore lichens of the Faroe Islands. The following abbreviations will be used for the zones:

Eulittoral zone: e.l.

Littoral fringe: l.f.

Mesic supralittoral zone: m.s.l.

Submesic supralittoral zone: s.s.l.

Xeric supralittoral zone: x.s.l.

The Localities Investigated

The localities where the seashore lichens were collected are plotted on fig. 1.

Locality 7, Dalar, is located 1 km south of the village Viðareði, on the island of

Viðoy. The beach is a vertical cliff which rises 30 m above the sealevel. It forms a small slope into the terrestrial region with scattered birdstones in between. The maximum height of the investigations area is 30 m from sealevel. The locality faces east, and is directly exposed to the sea.

Locality 57, Hvítanes, is situated on the island Streymoy. It faces NE and is relatively well protected from the heaviest wind directions. Fig. 2 shows a picture from the locality.

Locality 59, Hoyvík, is located on the island Streymoy 3 km north of Tórshavn. The aspect of the rock surface is S, and it is exposed to the strongest wind directions.

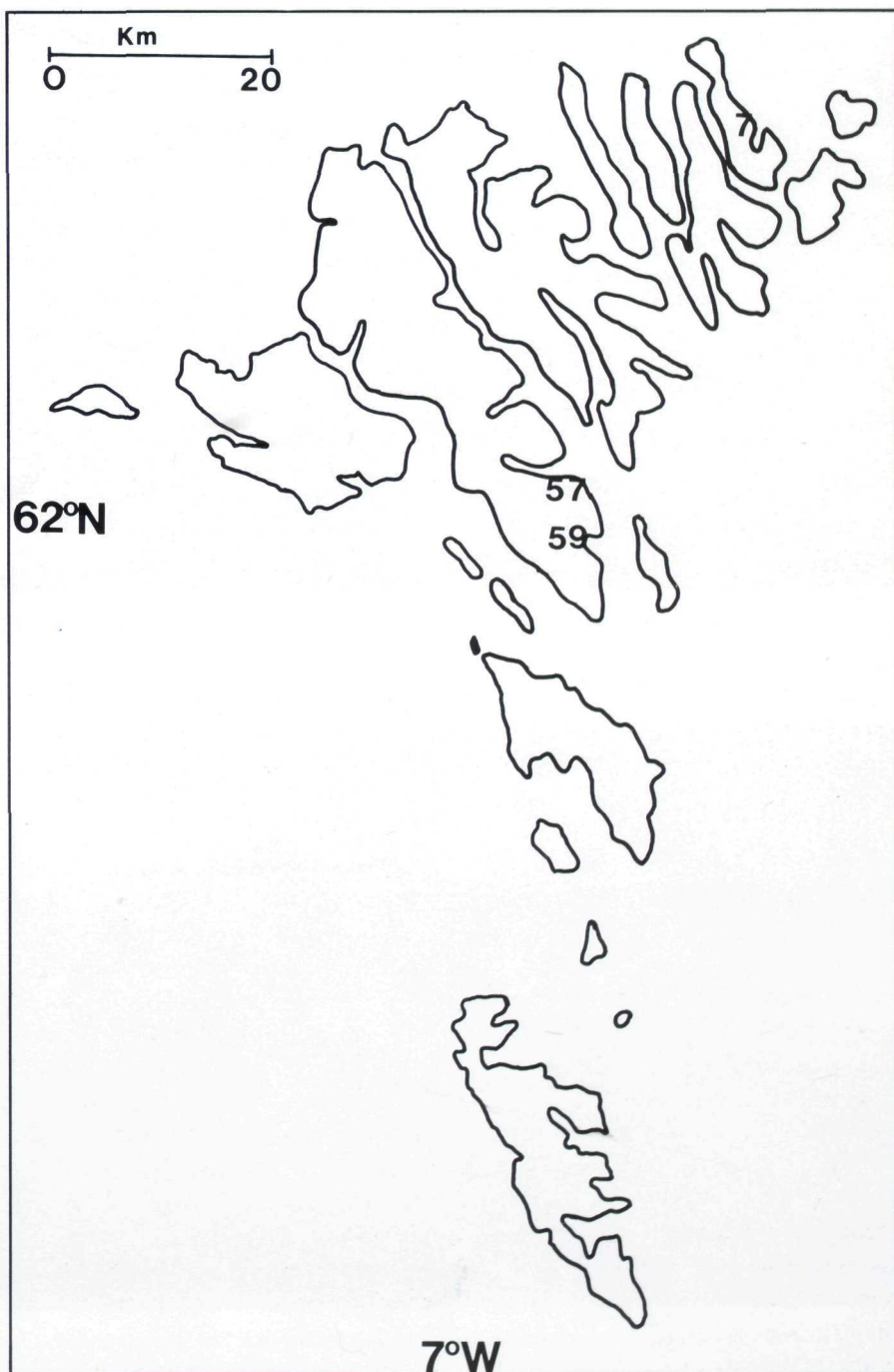




Fig. 2. Loc. 57, Hvítanes. Shows that the site slopes only slightly. The investigated profile is only 5 m above the sealevel.



Fig. 3. Loc. 59, Hoyvík. Shows that the site slopes only slightly. Accordingly the investigated profile is not more than 7 m above the sealevel.

Table 2

Locality 59, Hoyvík. Aspect : S

Analyse no.	1	2	3	4	5	6	7	8	9	10	11	12	13
<i>Verrucaria maura</i>	6	6	6	5	5	6	3	3	3	5	2	1	
<i>Verrucaria mucosa</i>	4												
<i>Lecanora poliophaea</i>				1		2	5	3	3	3	2		2
<i>Phæophyscia orbicularis</i>				1			3	3	1	1	2		
<i>Lichina confinis</i>				3	3								
<i>Caloplaca marina</i>				1		2							1
<i>Caloplaca thallincola</i>					1								
<i>Microlichen sp. indet.</i>							1	3					
<i>Candelariella vitellina</i>							1	1	1				
<i>Xanthoria parietina</i>								1	2	1	2		2
<i>Ramalina siliquosa</i>								2		2			
<i>Physcia tenella var marina</i>									1		1		
<i>Buellia contops</i>									1		1		
<i>Rinodina subexigua</i>									1	1			
<i>Lecanora actophila</i>									1				
<i>Lecideia auriculata</i>											1		
<i>Anaptychia fusca</i>												3	3
<i>Caloplaca festiva</i>												2	1
<i>Aspicilia caesiocinerea</i>												1	1
<i>Ochrolechia parella</i>												2	
Bare rock						1	1	2					

Seashore lichens were also collected on locality 7, but a quantitative method was not used at this locality. An estimation of the covering was made. Therefore this locality will be mentioned only in the discussion along with the other investigations.

4. Results

Table 1 and 2 show the cover degree (Hult-Sernander index from 1-6) of the species at the two localities.

Table 3 shows in which of the two localities the species occur. The number in the

table tell how often they were found, and which are inevitably marine and maritime.

Fig. 4 and 5 show the dominating species in the different zones. The width of the bars corresponds to a Hult-Sernander index from 1 to 6.

5. The Different Zones

5.1 The eulittoral zone.

Two species only were found in this zone. These are respectively *Verrucaria mucosa* and *V. maura*. *Verrucaria mucosa* can be used as an indicator for this zone. The up-

Table 3

	57	59	e.l	l.f	m.s.l.	s.s.l.	x.s.l.	obl. marin/maritim
<i>Anaptychia fusca</i>	x	x					4	
<i>Aspicilia caesiocinerea</i>	x	x				1	3	
<i>Bacidia</i> sp.	x					1		
<i>Buellia coniops</i>	x	x				4	2	
<i>Caloplaca festiva</i>	x	x					2	
<i>Caloplaca marina</i>	x	x			5	2	1	x
<i>Caloplaca thallincola</i>	x	x			2			x
<i>Candelariella vitellina</i>	x	x			1	6	2	
<i>Lecanora actophila</i>		x				1		x
<i>Lecanora atra</i>	x	x				5	4	
<i>Lecanora muralis</i>	x	x				1	1	
<i>Lecanora poliophaea</i>	x	x			6	7	3	x
<i>Lecidea auriculata</i>		x					1	x
<i>Lecidea confluens</i>	x					1		
<i>Lichina confinis</i>	x	x			5	1		x
<i>Lecidea</i> sp. 1.	x					1	1	
<i>Lecidea</i> sp. 2.	x					1		
<i>Ochrolechia parella</i>	x	x					2	
<i>Ochrolechia tartarea</i>	x					1		
<i>Physcia caesia</i>	x					2		
<i>Physcia dubia</i>	x					1	1	
<i>Physcia tenella</i> var <i>marina</i>	x	x				4		x
<i>Physcia</i> sp.	x					2		
<i>Phaeophyscia orbicularis</i>	x	x			2	5		x
<i>Ramalina siliquosa</i>		x			2	2		
<i>Rinodina subexigua</i>		x				2		x
<i>Verrucaria maura</i>	x	x	3	3	7	6	1	x
<i>Verrucaria mucosa</i>	x	x	3		1			x
<i>Xanthoria candelaria</i>		x					1	
<i>Xanthoria parietina</i>	x	x				7	1	

per border of this zone was placed where *Verrucaria maura* becomes absolute. Fig. 4 and 5 show that this zone was 2 m wide at loc. 57 and only 1 m wide at loc. 59.

In northern Ireland this zone is dominated by *Verrucaria striatula*, *V. microspora*, *V. mucosa*, and *Arthopyrenia halydites* (Knowel 1913). On Hallands Väderö this zone is dominated by *Arthopyrenia orustensis*, *A. sublittoralis*, *Verrucaris dit-*

marsica, *V. erichenii*, *V. maura* and *V. mucosa* (Almborn 1955).

Verrucaria ditmarsica and *V. ceutocarpa* have been found once in the Faroe Islands (Degelius 1955). *Verrucaria microspora* once by Townrow (1968) and Lynge (1938) found *Arthopyrenia littoralis* on a single locality.

In my investigations *Arthopyrenia halydites* occurs on *Patella vulgaris* on loc. 7.

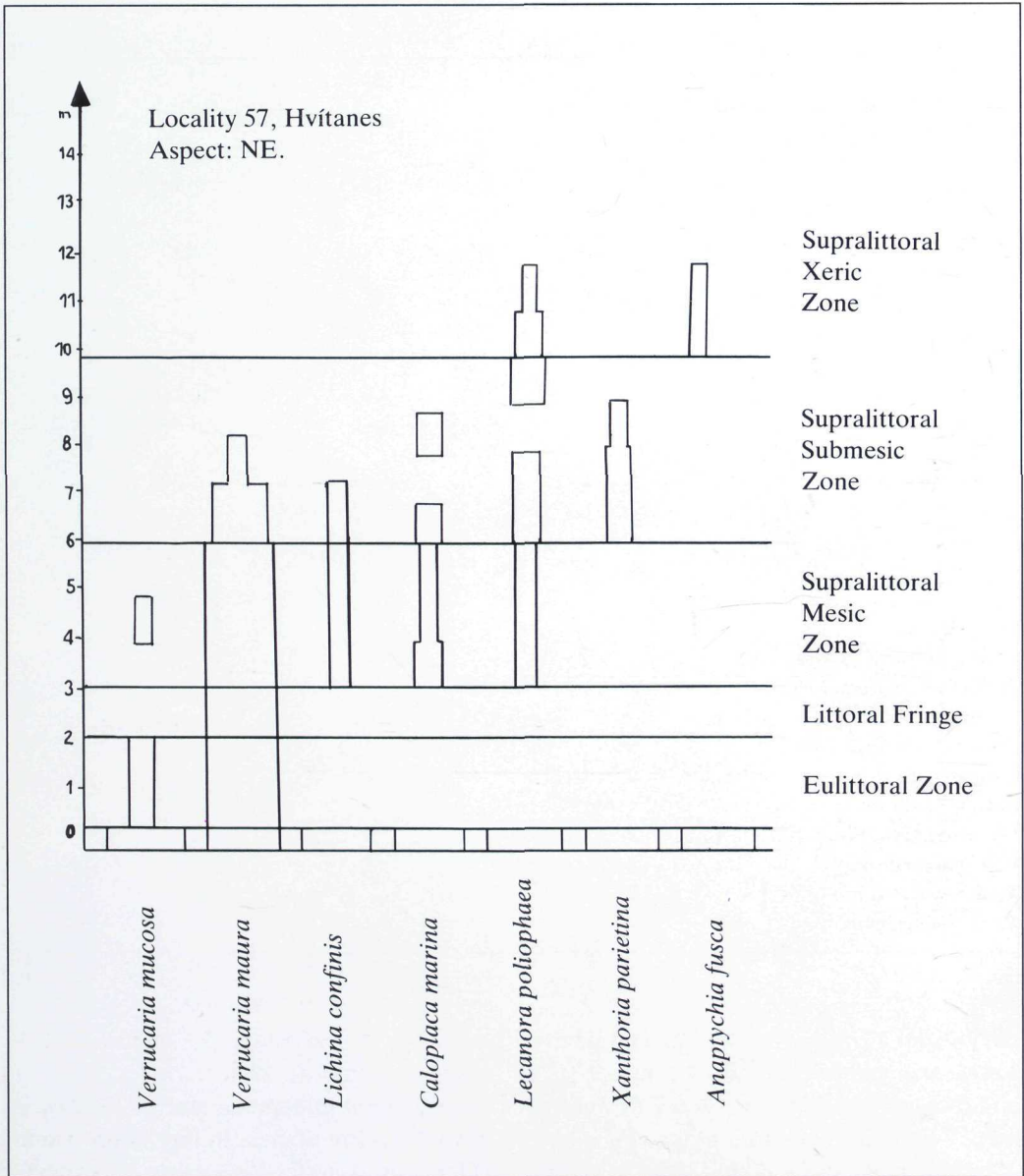


Fig. 4. Vertical distribution of the species dominating in the different zones. The width of the bars corresponds to the Hult-Sernander index from 1 to 6.

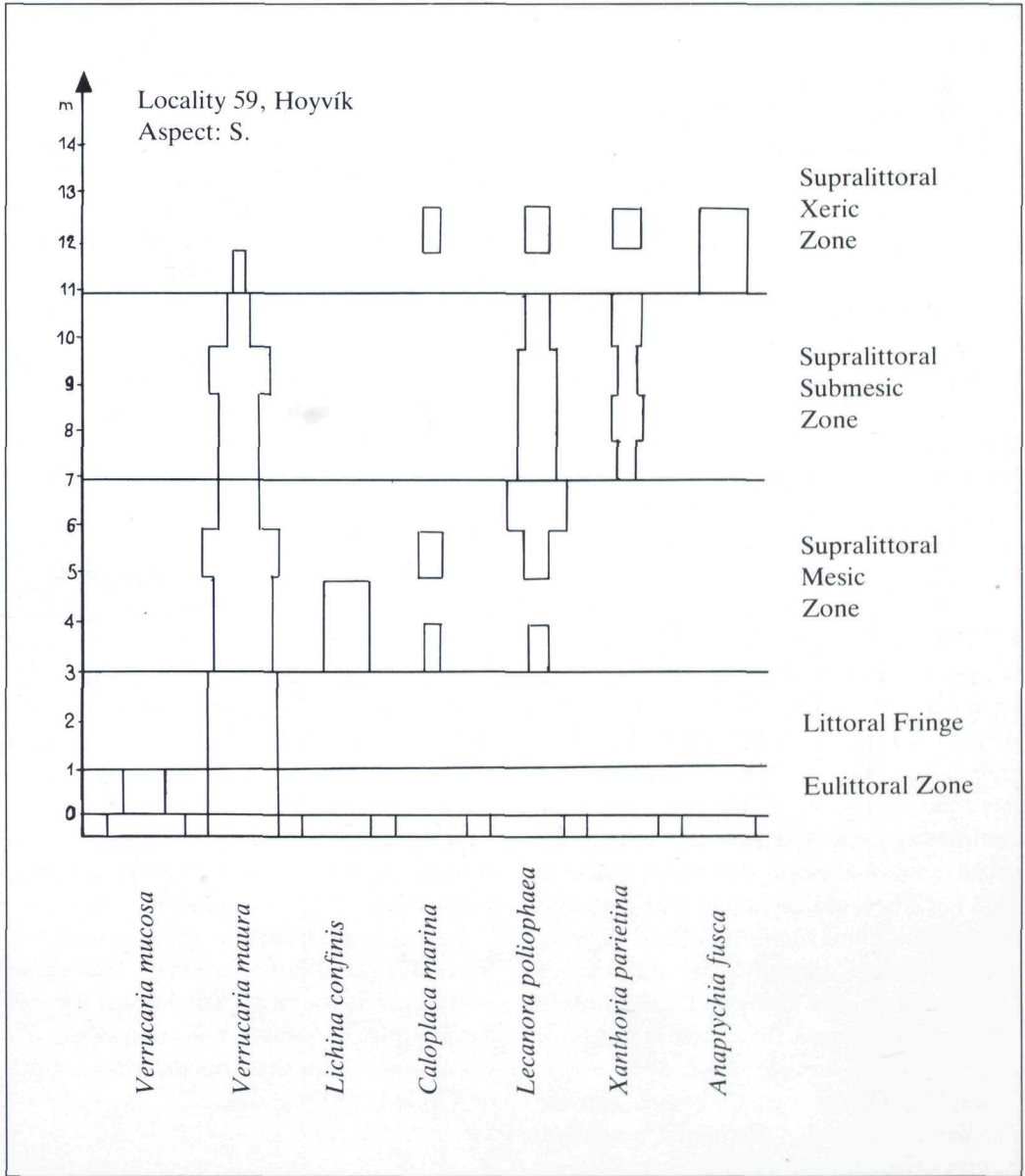


Fig. 5. Vertical distribution of the species dominating in the different zones. The width of the bars corresponds to the Hult-Sernander index from 1 to 6.

5.2 Littoral fringe.

Verrucaria maura is the only species occurring in this zone and is here used as an indicator for the zone. The upper border corresponds to the lower limit of *Lichina confinis* and *Caloplaca marina*, and on shaded places of *Caloplaca thallincola*. Table 1 and 2 show that the zone is 1 m wide at loc. 59.

In northern Ireland *Lichina pygmaea*, *L. confinis*, and *Verrucaria maura* constitute three distinct zones. *Lichina confinis* is making the uppermost belt, *Verrucaria maura* the middle and *Lichina pygmaea* the lowermost belt. While *Lichina confinis* is common in the Faroe Islands, *Lichina pygmaea* is only found once here.

5.3 The mesic supralittoral zone.

It appears from table 1 and 2 that *Verrucaria maura* is still dominating in this zone. At loc. 59 *Lichina confinis* shows some degree of dominance in the lowermost part of this zone, but at loc. 57 this species are less dominating, but widespread through the entire zone. *Lecanora poliophea* invades at both localities and gives the zone a greyish colour. *Caliplaca thallincola*, and *C. marina* are found sporadically. At loc. 59 *Phaeophyscia orbicularis* and *Candelariella vitellina* were found. The zone is 3 m wide at loc. 57 and 4 m wide at loc. 59.

Fletcher (1973) uses *Caloplaca marina*, *Catillaria chalybeia*, *Lecanora actophila*, *L. helicopsis*, and *Lichina confinis* as indicator for the zones. *Chatillaria chalybeia* and *Lecanora helicopsis* were not found in my investigations, but they were collected once in the Faroe Islands by Degelius (1955). *Lecanora helicopsis* does not occur

in the m.s.l. zone, but sparsely in s.s.l. zone at loc. 59.

Lecanora poliophea is just as abundantly distributed here as in the s.s.l. Accordingly it will not be used as an indicator. Baldursdóttir (1985) found the same distributional pattern for this species in Iceland. So it is most appropriate to use *Caloplaca marina* and *Lichina confinis* as indicators.

5.4 The submesic supralittoral zone.

Lecanora poliophea is still dominant in this zone, and *Verrucaria maura* is abundantly distributed here, especially at loc. 59 (see fig. 4 and 5).

The foliose *Xanthoria parietina* obtains a relatively constant distribution here, is used as an indicator. Other foliose lichens that invade this zone are *Physcia tenella var marina*, *Physcia caesia*, *Physcia sp.*, and *Phaeophyscia orbicularis*. The last mentioned species is especially dominating at loc. 59 but is more sparse at loc. 57.

Of other species that were found in this zone, but not in the m.s.l. zones, the following can be mentioned: *Lecanora atra*, *Buellia coniops*, and *Candelariella vitellina*.

Lecanora actophila is very sparse at loc. 59, and was not found at loc. 57. *Ramalina siliquosa* was found occasionally at loc. 59, but it was not found in this zone at loc. 57. Fig. 4 and 5 show that this zone has a width of 4 m at both localities.

5.5 The xeric supralittoral zone.

Anaptychia fusca is the only new lichen at both localities. For the first time *Caloplaca festiva* invades loc. 57 in this zone, but at loc. 59 it invaded an area further away



Fig. 6. Shows the m.s.l. zone from loc. 59. The darker colors are due to *Verrucaria maura*, and the lighter spots are *Lecanora Poliophaea*.



Fig. 7. Shows a birdstone with *ornitocrophilus* lichens.

from the shore. *Aspicilia caesiocinera* invaded at loc. 59 for the first time here, but at loc. 57 it was also found in the m.s.l. zone.

In addition to *Anaptychia fusca*, Fletcher (1973) *Rhizocarpon constrictum*, *Lecanora atra*, and *Ramalina siliquosa* as an indicator. In the Faroe Islands *Lecanora atra* is equally dominating in both the s.m.l. and the x.s.l. zone. *Ramalina siliquosa* was found in the m.s.l. zone at loc. 59, but not in the x.s.l. zone. *Rhizocarpon constrictum* has never been reported in the Faroe Islands.

The zones are 2 m wide in both localities, and the only usable indicator here is *Anaptychia fusca*.

5.6 The terrestrial region.

On the terrestrial region the seashore zonation stops, and the terrestrial lichen species become dominating. The first phanerograms which invade are *Armeria maritima*, *Festuca rubra*, and *Cochlearia officinalis*.

The colour of the first part of this zone is greyish white, which is due to the dominance of *Lecanora atra*, *Ochrolechia parvella* and *O. tartarea*. Among these we find *Anaptychia fusca*, small thalli of *Caloplaca marina* and *C. thallincola*, larger thalli of *Caloplaca festiva* and *Aspicilia caesiocinera*, until the terrestrial species become dominating. Among the terrestrial species which were found, *Parmelia glabratula*, *P. sulcata*, *P. omphalodes*, *Lecanora muralis*, *L. intricata*, *L. polytropha*, and *Lecidea confluens* can be mentioned.

The terrestrial species are those that have their main distribution in the inland

area, and they can be categorized as halophilic and halophobic respectively. The halophilic species are those which tolerate the seawater, e.g. *Caloplaca festiva*, *Parmelia saxatilis*, *P. sulcata*, and *Ramalina subfarinacea*. The halophobic species often live in crevices and thus are protected from the seawater. *Parmelia omphalodes* and *Huilia macrocarpa* belong to this group.

6. The Influence of Guano.

The composition of the seashore lichens is affected by the rich seabirdlife of the Faroe Islands. This is illustrated in tab. 4. Most of the dominating species are ornitocoprophilous and a smaller part is ornitocoprophobic. Typical birdtops on the seashore are dominated by following species: *Xanthoria parietina*, *X. candelaria*, *Anaptychia fusca*, *Physcia caesia*, and *Candelariella vitellina*. On the vertical sides on such birdstones we often find *Ramalina siliquosa* and other *Ramalina* species, that are a little to moderate ornitocoprophilous.

The e.l. and l.f. zone are both dominated by ornitocoprophobic species such as *Verrucaria maura*, *V. mucosa* *Caloplaca marina*, and *C. thallincola*. As these zones are submerged regularly by the seawater, these two zones are not the ideal landing places for seabirds.

The m.s.l. and the s.s.l. zone has a greyish character. The grey colour is due to the ornitocoprophilous lichen *Lechanora poliophaea*. In other places in Northern Europe this belt is dominated by the less ornitocoprophilous species *Lecanora helicopsis* and *L. actophila*. These two species seem to be rare in the Faroe Islands. At loc. 59 the

		Ornitochrophobic communities		Ornitochrophilic communities	
				Moderately affected	Heavily affected
xeric zone	Ornitocrophobic communities	<i>Lecanora atra</i> <i>Ramalina siliquosa</i>		<i>Ramalina siliquosa</i> <i>Anaptychia fusca</i>	<i>Xanthoria parietina</i> <i>Physcia caesia</i> <i>Anaptychia fusca</i> <i>Candelariella vitellina</i> <i>Xanthoria candelaria</i>
sub-mesic zone		<i>Lecanora actophila</i>		<i>Buellia coniops</i>	<i>Xanthoria parietina</i> <i>Candelariella vitellina</i> <i>Lecanora politophaea</i> <i>Phaeophyscia orbicularis</i>
mesic zone					<i>Lecanora politophaea</i>
littoral zone	littoral fringe	<i>Verrucaria maura</i>			
		<i>Verrucaria mucosa</i>			
	eulittoral zone				

Tab. 4. The Guano affection across the zones.

ornitocoprophilous species *Phaeophyscia orbicularis* seems to have a certain degree of dominance in both these zones.

Almborn (1955) and Fletcher (1978) used the ornitocoprophobic species *Rhizocarpon constrictum* as an indicator for the x.s.l. zone. In places where the influence of guano becomes greater this species disappears and more ornitocoprophilous species such as *Anaptychia fusca* become dominating.

Other ornitocoprophilous species which are found in the localities but not mentioned in tab. 4 are *Aspicilia caesiocinerea*, *Physcia tenella var marina*, *Lecanora muralis*, and *Parmelia sulcata*.

7. Discussion

The profiles investigated show that the seashore zonation, which is seen in Northern Europe also occurs in the Faroe Islands. The main difference is that the seashores of the Faroe Islands are poorer in number of species, and therefore lack some characteristic species.

The e.l. zone is 1 and 2 m respectively wide in the two investigated localities and is dominated by *Verrucaria maura* and *V. mucosa* that were the only species which were found. On loc. 7 *Arthopyrenia halodytes* was found growing on *Patella vulgaris*.

Almborn (1955) found *Verrucaria microspora*, *V. ditmarsica*, *V. erichsenii* to be dominating on Halland Väderö, and Knowel (1913) found *Verrucaria mucosa*, *V. microspora*, *V. striatula*, and *Arthopyrenia halodytes* to be dominating on the sea-

shores in the northern Ireland. *Verrucaria striatula*, *V. microspora*, *V. ditmarsica*, and *V. ceutocarpa* are only found once in the Faroe Islands, and appear to be rare here.

Verrucaria maura is the only species occurring in l.f., and thalli of *Caloplaca marina*, *C. thallincola*, and *Lichina confinis* constitute the upper border of the zone.

Lichina confinis and *Caloplaca marina* are here used as indicators for m.s.l. zone.

The ornitocoprophilous species *Lecanora poliophaea* are widespread in this zone, but since it is equally abundant in the s.s.l. zone it is not used as an indicator. This same phenomenon is seen in Iceland (Baldursdóttir 1985) and on Moskenesoya (Degelius 1938).

It can be discussed whether it is appropriate to talk about a mesic and submesic supralittoral zone in the Faroe Islands, because of the uniform dominance of *Lecanora poliophaea* in both zones. But at a level 7 respectively 8 m away from the sea level, the foliose *Xanthoria parietina* invades and is relatively constant throughout the zone. Besides *Xanthoria parietina*, there is also an invasion of several other foliose species at this level on the seashore. It is on the basis of these foliose lichens that the supralittoral zone of the Faroe Islands can be divided in one mesic and one submesic supralittoral zone.

Anaptychia fusca, *Ramalina siliquosa*, and *Rhizocarpon constrictum* are used as indicators for x.s.l. most places in northern Europe. As *Anaptychia fusca* is the only new lichen in this zone it is used as an indicator here.

Ramalina siliquosa was only found on the vertical surfaces and only sporadically

on the horizontal surfaces. This species was not found in so great abundance that it could be used as an indicator, by this sampling method, on the localities investigated.

7. Conclusions

The seashore zonation found by Fletcher (1973) and Lewis (1964), was also found in the Faroe Islands. Following indicators are usable:

Xeric supralittoral zone: *Anaptychia fusca*

Submesic supralittoral zone: *Xanthoria parietina*

Mesic supralittoral zone: *Caloplaca marina* and *Lichina confinis*

Littoral fringe: *Verrucaria maura*

Eulittoral Zone: *Verrucaria mucosa*

As the seashore is strongly influenced by guano, the lichen communities are dominated by ornitocopeophilous lichens, while the ornitocoprophobic species were not found. Almborn (1955), Søchting & Gjelstrup (1985) and other Scandinavian lichenologists treat the m.s.l. and s.s.l. zone as one zone, but as *Xantoria parietina* together with other foliose lichens invades here, it is on the basis of these foliose lichens that we divide the supralittoral zone of the Faroe Islands in a mesic supralittoral zone and a submesic supralittoral zone.

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Úrtak

Í tíðarskeiðinum mai 1986 vórðu gjørdar kanningar av skónavøkstrinum á klettunum niðri í fjøruni.

Eins og aðrastaðni í Norðureuropa (Degelius 1938, Sheard 1938, and Fletcher 1973a,b) vaksa skónir í fjøruni í Føroyum í rondum, soleiðis at tær, ið tola sjógv, vaksa niðast móti sjónum, og hinar, ið eru meira viðkvæmar, vaksa longri burtur frá sjónum.

Niðast móti sjónum finst ein svørt rond, ið er sermerkt av *Verrucaria maura* og øðrum *Verrucaria*-sløgum. Oman fyrri hana

er ein gul rond, ið er sermerkt av *Caloplaca marina*, *C. thallincola* og *Xanthoria patietina*. Henda gula rondin kann hava eitt meira ella minni gráligt eyðkenni av skónini *Lecanora poliophea*. Síðan kemur ein gráhvít rond, ið er sermerkt av sløgnum *Lecanora atra* og *Ramalina siliquosa*. Her vaksa eisini skónir, ið hava høvuðsútbreiðslu inni í landinum, og gerast tær meiri og minni valdandi, jú longri vit fara burtur frá sjónum, meðan tær maritimu skónirnar gerast meira sjáldsamar.

Tann størsti og týðiligasti munurin á skónavøkstrinum á klettum í Føroyum og

aðrastaðni í Norðureuropa er, at í Føroyum finnast nógv færri sløg. Soleiðis eru fleiri sløg ikki í Føroyum, ið eru vanlig aðrastaðni.

Hyggja vit eftir, hvørji sløg eru vanlig á gróti í Føroyum, síggja vit, at hetta eru skónir, ið vaksa best, har fuglur skvettir (ornitocoprofilar skónir), her kann nevast *Lecanora poliophea*. *Lecanora actophila* og *Rhizocarpon constrictum*, ið vaksa best, har fuglurin ikki skvettir (ornitocoprofobar skónir), eru vanligar aðrastaðni í Norðureuropa, men eru sjáldsamar ella finnast ikki í Føroyum.