

Terrestrial invertebrates of the Faroe Islands: IV. Slugs and snails (Gastropoda): Checklist, distribution, and habitats

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Solhøy, T. 1981. Terrestrial invertebrates of the Faroe Islands: IV. Slugs and snails (Gastropoda): Checklist, distribution, and habitats. — *Fauna norv. Ser. A*, 2, 14–27.

Surveys in the summers of 1977 (8 locs) and 1978–1979 (111 locs) on 17 islands in the Faroes yielded 20 species (9 slugs and 11 snails) of terrestrial gastropods. *Punctum pygmaeum* Draparnaud was recorded for the first time and the total number of species known from the Faroes is now 20. All Faroese species also occur in neighbouring areas (i.e. Scotland, Orkneys, Shetland, Iceland, and Western Norway) with a few minor exceptions. Many of the species (especially the slugs) have wide distributions and are relatively abundant in the Faroes (10 species were found on ≥ 15 islands and 5 species on 8–13 islands). The remaining exhibit relatively broad habitat niches, though many show an association with man-made habitats and may have been introduced by man. Data on numbers, habitat distribution, and distribution maps for the Faroes are given for all species.

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INTRODUCTION

Biotas of isolated islands are interesting from a number of biogeographical and ecological points of view. During the summers of 1978 and 1979 a Swedish-Norwegian team (S.-A. Bengtson, P.H. Enckell, and the present author) made a survey of the inter- and intra-island distribution of certain taxa of terrestrial invertebrates (Chiefly Coleoptera, Araneae, Mollusca, and Lumbricidae) on the Faroe Islands in the North Atlantic. The present paper, dealing with terrestrial slugs and snails, is one in a series presenting the faunistic results of the study (see also Bengtson & Hauge 1979, Kauri 1980, Bengtson 1981, Enckell & Rundgren *in prep.*, Meidell & Solhøy *in prep.*). The faunistic reports will form the basis for forthcoming ecological papers focusing on various aspects of island ecology. For more information on the project see Bengtson & Hauge (1979).

In this paper species composition, distribution, and habitats of the terrestrial gastropods of the Faroes are described and discussed in relation to the corresponding faunas of neighbouring areas (i.e. Scotland, Orkneys, Shetland, Iceland, and Western Norway).

AREA DESCRIPTION

The Faroes constitute an isolated group of 18 small 1 to 374 km² islands in the North Atlantic Ocean at approx. (62°N and 7°W). They are situated about 300 km NW of Shetland, 450 km SE of Iceland, and 680 km W of Norway, and their total size is about 1400 km²; i.e. almost equal in size to Shetland. The islands consist of Tertiary volcanic basalts. They rise steeply from the sea and in some places the west and north-facing perpendicular cliffs rake several hundred meters above the sea-level. The highest mountain reaches 882 m a.s.l., and much of the area is situated above the 300 m line. The climate is oceanic and e.g. Tórshavn has a mean temperature of the coldest (February) and warmest (August) months of 4.1 and 11.8°C, respectively. The average number of days with rainfall is 260 d yr⁻¹, and the mean annual precipitation about 1600 mm; although there is great local variation within and between islands owing to differences in exposure to the frequent strong winds that prevail most of the year. In winter a permanent snow cover is only present on top of the highest mountains.

The vegetation is much influenced by winds

and extensive sheep grazing, which effectively prevent any formation of woods. Shrubs are scarce in the Faroes. Small plantations with various species of introduced species of conifers, rowan, aspen, poplar, birch, and willow occur in sheltered and fenced-off (to prevent grazing) patches of ground in the vicinity of settlements. From pollen analyses it seems evident that no natural wood formation has occurred in postglacial time (Jóhansen 1975).

The vegetation is dominated by different types of grass heath, which form the bulk of the «outfields»; i.e. the noncultivated areas outside the «infields» (or «homefields»). The outfields are used for sheep grazing and also include some wetlands (marshes, mires, bogs *etc.*) and, on west and south facing slopes, some shrub heaths dominated by *Calluna vulgaris* L. On higher grounds the vegetation becomes more patchy and scarce and fell-fields are found on top of the highest mountains. A rich and luxuriant vegetation is found on rocky walls, shelves on cliffs, and in crevices which are inaccessible to the sheep. The infields comprise the settlements and the cultivated areas surrounding them. The infields are usually fenced-off by stonewalls to exclude sheep grazing in summer, to allow for hay-making and other agricultural activities. The vegetation close to settlements often include various large herbs (e.g. *Angelica*) and ruderate plants, whereas rich grass and herb meadows

dominate on the outskirts of the infields. For more information on the vegetation see Hansen (1966) and Bengtson & Hauge (1979).

MATERIAL AND METHODS

The field-work was conducted 29 June—8 August 1978 (by Bengtson, Enckell, and Solhøy) and 3—16 August 1979 (Bengtson and Solhøy). In addition, the present author collected a few samples in June 1977 (Tab. 1). All 18 islands except the smallest, and the only uninhabited, Litla Dimun, were surveyed. During 1978—1979 we surveyed 111 localities (see Bengtson and Hauge 1979; Fig. 2). The localities were grouped in 9 different habitat types *viz.* A: mountain sites or fell-fields (≥ 250 m a.s.l.), B: dwarf shrub heaths (from sea-level to 3—400 m a.s.l.), C: plantations, D: cliffs, shelves, and crevices, E: lowland bogs, F: grass heaths, G: outskirts of infields, H: infields close to settlements (gardens, around buildings *etc.*), and I: sand dunes (only one locality, and devoid of gastropods). The vegetational characteristics of the habitat types and a comprehensive description of the sites are given by Bengtson & Hauge (1979) and the 8 sites (I—VIII) surveyed in 1977 are described in Tab. 1. On each locality we attempted to employ a standardized sampling program, which included

Table 1. List of localities investigated in 1977. Description of habitat types are given in text and by Bengtson & Hauge (1979).

Locality	Island	Habitat	Altitude (m a.s.l.)	Date	Further description
I. Tórshavn	Streymoy	H	50	19 June	Small patches of grassland in eastern parts of the town; sloping SW.
II. Kjalnestangi	Streymoy	G	5	20 June	Small grassfield between sea and main road; facing SE.
III. Saksunardalur	Streymoy	F	40	20 June	Rather wet and patchy grass heath on level ground.
IV. Stallur	Streymoy	A	570	20 June	Steep and slope with grass and mosses; facing E.
V. Streymnes	Streymoy	B	70	21 June	Shrub heath; facing S.
VI. Midalfelli	Eysturoy	A	600	20 June	Steep, stony slope with patches of grass, mosses and herbs, facing S.
VII. Oyndarfjørður	Eysturoy	G	15	21 June	Grass- and wasteland sloping gently SE.
VIII. Heltin	Eysturoy	F	150	21 June	Heavily grazed grassland sloping gently S.

pitfalltrapping, formalin sampling of lumbricids, sifting of foerna, and collecting by hand (see Bengtson & Hauge 1979). In this context only sifting and hand collecting are of interest since very few molluscs were obtained in the pitfall traps or during formalin sampling.

The slugs were almost exclusively collected by hand; the vegetation was inspected, grass tussocks were torn apart, pieces of wood, debris, and stones were turned over *etc.* In the field, the slugs were immediately put into waterfilled jars and left for 8–12 hrs to make them stretch-out and get rid of their slime, before being fixed in 80% ethanol (which was replaced several times during the next 3–4 days). The larger species of snails (e.g. *Oxychilus alliarius*) were also readily obtained by hand collecting. However, in order to collect the smaller species (which were in majority), and to get relatively unbiased samples, it was necessary to sift live vegetation and foerna (*cf.* Waldén 1955, 1969). On each locality we tried to cover as many microhabitats as possible, looking especially for sites rich in litter. The plant and litter material was passed through a sieve with a mesh width of 7 mm, and the sifted material was then brought into the laboratory to be hand-sorted (for slugs) and the arthropods extracted in Tullgren/Berlese funnels. However, since relatively few snails are extracted in funnels the dried material had to be thoroughly examined under a microscope (6x and 12x) in order to obtain snails ≤ 2 mm in diameter. Pilot tests indicated that, by this procedure, we were able to find at least 95% of these small species. As to specimens > 2 mm practically all were found during sorting.

Regrettably we were, for practical reasons (e.g. rain sometimes made sifting almost impossible), not always able to survey each locality with the same degree of thoroughness. Therefore, not all localities have the same «validity» when it comes to a comparison between sites. Our sampling efforts at each locality are indicated in Appendix I given by Bengtson & Hauge (1979). During our field-work in 1978–1979 we failed to obtain reliable samples from the island of Skúvoy, but during the autumn of 1979 the school children of Skúvoy kindly provided us with a large handcollected material.

SYNOPSIS OF THE SPECIES

In the following all terrestrial gastropods known to have been recorded in the Faroes are listed. Some years ago Fog (1972) published a list of the

land and freshwater molluscs of the Faroes. His paper was based on previously published records, and the extensive collections made by H. Lemche in 1925–1926 and J.P. Kryger in 1926. They were part of the Danish collections made in the 1920's, which formed the basis for the publication of «The Zoology of the Faroes» (1928–1972). Fog (1972) listed 22 species, three of which do, however, not seem to belong to the Faroese fauna, for the following reasons: 1. The single specimen of *Limax tenellus* (Müll.) reported from Leynavatn was re-examined by the present author and found to be a very pale specimen of *Limax marginatus* (Müll.), a species previously known from the islands. 2. Two species, *Trichia hispida* (L.) and *Arianta arbustorum* (L.) are reported to have been found (in each case a single specimen) in Tórshavn on two (1867 and 1885) and one (1867) occasion(s), respectively (see Fog 1972). In 1977–1979 we devoted much time in search for them in suitable places in Tórshavn but without any success. Therefore, we doubt that they are still members of the Faroese fauna. Possibly they were once introduced into Tórshavn only to become extinct (*cf.* Fog 1972), or the specimens were collected as empty snails and had been imported as such as commonly occurs (see e.g. Nilsson 1967). It is also possibly that they were erroneously reported as a result of mistaken identity or labels. Anyhow, the presence of *T. hispida* and *A. arbustorum* in the Faroes require confirmation, and in the meantime they should be deleted from the list. Our field-work yielded 20 species, *Punctum pygmaeum* Draparnaud being recorded for the first time in the Faroes. Hence, the total number of terrestrial species of slugs and snails recorded in the Faroes is believed to be 20.

The following annotated list of species emphasises the results from 1978–1979 (Tab. 2) giving the exact localities (locs 1–111; see Bengtson & Hauge 1979: Fig. 2 and Appendix I), islands, and habitat characteristics of each species. The records from 1977 (locs I–VIII) are also given. Previously published information is only briefly summarized (for details Fog's (1972) paper should be consulted). Information on the occurrence in neighbouring areas and the gastropod fauna of these areas are summarized in Tab. 2.

The total material collected in 1978–1979 comprises 1098 snails and 2767 slugs (1977: 30 snails and 151 slugs), all preserved in the collections of the Museum of Zoology, University of Bergen, Norway. All specimens were identified by the present author, except for *Arion distinctus*

Mabille, which were kindly determined by Dr. S.M. Davies, Croydon, Surrey, England.

The Appendix contains the distribution maps of species found in 1977–1979.

FAMILY ARIONIDAE

Arion ater L. Found in 80 localities (locs 2, 3, 4, 5, 6, 7, 10, 13, 14, 17, 19, 22, 25, 27, 28, 29, 30, 32, 33, 34, 35, 36, 38, 39, 40, 41, 42, 43, 44, 45, 46, 50, 51, 52, 55, 56, 57, 58, 59, 60, 61, 62, 65, 67, 68, 69, 70, 74, 75, 76, 78, 79, 81, 82, 84, 86, 87, 88, 89, 90, 92, 93, 94, 97, 98, 99, 100, 101, 104, 105, 106, 107, 109, 110, I, II, III, IV, V, VII, VIII) on all islands except on Stóra Dimun. Previously found in many localities (Fog 1972). Occurs in all types of habitats, but most abun-

dant in infields. Found also in mountain sites such as on Streymoy (loc. IV 570 m a.s.l.) and Svinoy (loc. 78, 400 m a.s.l.). In Western Norway found at 800 m a.s.l. In the Faroes (as in many other areas) the species is highly polymorphic for body colour (see also Fog 1972). The blackish coloured morph predominates in outfield localities whereas the brown and reddish morphs are relatively more common in infield habitats.

Arion distinctus Mabille (= *hortensis* Férussac s.l.). Found in 28 localities (locs 7, 8, 11, 15, 27, 29, 41, 43, 44, 50, 51, 55, 60, 61, 67, 68, 73, 82, 87, 88, 90, 98, 99, 101, 107, 108, 110, I) on Suduroy, Skúvoy, Mykines, Vágar, Hestur, Streymoy, Eysturoy, Kálsoy, Kunoy, Bordoy, and Fugloy. Also found on Sandoy (a few km W of

Table 2. Occurrence of Faroese terrestrial gastropods in neighbouring areas and total number of species (slugs and snails) in these areas. The following sources were used: For Scotland, Orkneys (Kerney 1976, Kerney & Cameron 1979), Shetland (Berry & Johnston 1980), Faroes (present study and Fog 1972), Iceland (Mandahl-Barth 1938, Einarsson 1967), and Western Norway, defined as the counties Rogaland, Hordaland, Sogn og Fjordane, and Møre and Romsdal (Økland 1925, Solhøy 1976 and unpubl. data).

Species	Scotland	Orkneys	Shetland	Faroes	Iceland	Western Norway
Slugs:						
<i>Arion ater</i>	X	X	X	X	X	X
<i>A. distinctus</i>	X	X?	X?	X	X?	X
<i>A. intermedius</i>	X	X	X	X	X	X
<i>A. silvaticus</i>	X	X	X	X	X	X
<i>A. subfuscus</i>	X	X	X	X	X	X
<i>Deroceras agreste</i>	X	—	—	X	X	X
<i>D. laeve</i>	X	X	X	X	X	X
<i>D. reticulatum</i>	X	X	X	X	X	X
<i>Limax marginatus</i>	X	X	X	X	X	X
Snails:						
<i>Aegopinella nitidula</i>	X	X	X	X	—	X
<i>A. pura</i>	X	X	X	X	X	X
<i>Cochlicopa lubrica</i>	X	X	X	X	X	X
<i>Columella aspera</i>	X	X	X	X	X	X
<i>Lauria cylindracea</i>	X	X	X	X	—	X
<i>Nesovitrea hammonis</i>	X	X	X	X	X	X
<i>Oxychilus alliarius</i>	X	X	X	X	X	X
<i>O. cellarius</i>	X	X	X	X	—	X
<i>Punctum pygmaeum</i>	X	X	X	X	X	X
<i>Vitrea contracta</i>	X	X	X	X	X	X
<i>Vitrina pellucida</i>	X	X	X	X	X	X
Total number of species of:						
Slugs	23	19	15	9	11	15
Snails	58	30	26	11	23	47
Total	81	49	41	20	34	62

Sand) but outside our ordinary sampling sites. Previously probably recorded twice (as *A. hortensis*) from Suduroy (see Fog 1972). Recently Davies (1979) has shown that in NW Europe the *A. hortensis* complex consists of three species and that our Faroese specimens (Davies pers.comm.) are identical to *A. distinctus*. Found almost exclusively in infield localities (i.e. < 200 m a.s.l.).

Arion intermedius Normand. Found in 85 localities (locs 2, 3, 4, 5, 6, 7, 8, 10, 12, 13, 14, 17, 18, 19, 20, 22, 23, 25, 27, 28, 29, 32, 33, 34, 35, 36, 39, 41, 42, 43, 44, 45, 46, 48, 49, 50, 51, 52, 53, 54, 56, 57, 58, 59, 60, 61, 62, 63, 65, 67, 69, 70, 74, 75, 79, 80, 81, 82, 84, 86, 87, 90, 91, 92, 93, 95, 96, 97, 98, 99, 100, 101, 102, 103, 105, 106, 107, 108, 110, 111, I, IV, VI, VII) on all islands. Probably the most common species of slug in the Faroes. Found in all kinds of habitats, including bogs and mountain sites (on Eysturoy at loc. VI 600 m a.s.l., on Streymoy at loc. IV 550 m a.s.l., and on Suduroy at loc. 62 350 m a.s.l.), but most abundant in infield localities. The Faroese specimens vary in colour from almost white to very dark.

Arion silvaticus Lohmander. Found in 45 localities (locs 3, 6, 14, 15, 18, 27, 29, 32, 33, 34, 35, 36, 42, 43, 49, 50, 51, 52, 55, 56, 59, 61, 62, 67, 69, 74, 75, 81, 82, 84, 87, 88, 90, 93, 96, 98, 99, 101, 104, 105, 107, 110, I, II, VII) on all islands except on Nólsoy and Stóra Dimun. A common species which is most abundant in infields but also occurs in many of the heath and grassland localities and among rich vegetation on shelves and in crevices. Found also in plantation, but *not* on *Calluna* heath, in mountain sites or above 200 m a.s.l. Fog (1972) lists under the name *Arion fasciatus* s.l. the subspecies *A. f. circumscriptus* Johnston and *A. f. silvaticus* Lohmander from the Faroes. However, most modern workers (e.g. Waldén 1966, Wiktor 1973, Kerney 1976, Solhøy 1976) consider *circumscriptus*, *fasciatus*, and *silvaticus* as three distinct species. The Faroese specimens collected in 1977–79 agree in external morphology and colour with specimens of *A. silvaticus* from Western Norway and Iceland. The present Faroese material show very little variation in body colour. Fog (1972) subdivided his material of *A. fasciatus silvaticus* into «typical» and «atypical» individuals, but until his material has been re-examined it seems reasonable to conclude that, of the three (sub) species mentioned above, *A. silvaticus* is at present known from the Faroes.

Arion subfuscus Draparnaud. Found in 60 localities (locs 3, 6, 8, 11, 17, 18, 19, 20, 22, 24,

25, 27, 29, 32, 34, 36, 40, 41, 43, 44, 46, 50, 51, 52, 55, 56, 62, 65, 67, 68, 69, 70, 73, 74, 79, 82, 84, 87, 88, 89, 90, 92, 93, 94, 95, 96, 97, 99, 101, 104, 105, 106, 107, 110, I, II, IV, VI, VII, VIII) on all islands except on Stóra Dimun. A widely distributed and euryoecious species, but abundant in a few localities only. Like the other *Arion*-species more common in infields than outfields. Also found in plantations and mountain sites (loc. VII at 600 m a.s.l., loc. IV 550 m a.s.l., and loc. 40 at 400 m a.s.l.).

FAMILY LIMACIDAE

Deroceras agreste L. Found in 33 localities (locs 3, 11, 17, 19, 25, 29, 32, 33, 42, 50, 51, 52, 58, 59, 60, 62, 67, 70, 73, 75, 79, 82, 84, 87, 94, 95, 96, 97, 98, 101, 104, 111, I) on all islands except on Skúvoy. Nowhere abundant except below pieces of wood in the ruins of an old boat house on Svinoy (loc. 79); but found in about half of the infield and one-fifth of the outfield localities. However, the outfield localities are all but one (loc. 79) situated close to infields and the species should therefore be regarded as an infield species. It is probably also confined to lowland areas (i.e. < 200 m a.s.l.), although in Western Norway it is found up to 800 m a.s.l. The relatively low densities observed in the Faroes may be due to the insufficient seasonal coverage of our collection. In Scandinavia the species is known to be most abundant in autumn (Waldén 1969). The Faroese specimens show little variation in body colour and all are of the creamy-coloured type.

Deroceras laeve Müller. Found in 14 localities (locs 22, 27, 34, 40, 51, 59, 62, 67, 79, 100, I, IV, VII, VIII) on Suduroy, Sandoy, Skúvoy, Vággar, Nólsoy, Streymoy, Eysturoy, and Svinoy. Previously found in about 6 localities on 3 islands (Fog 1972). Apparently the most rare slug in the Faroes; only 24 specimens were collected. In Scandinavia and England known as a hygrophilic species. In the Faroes found in infield grassland, outfield grass heath, and in mountain sites (loc. IV at 570 m a.s.l., loc. 40 at 400 m a.s.l.). On Hardangervidda, Western Norway, it occurs up to 1220 m a.s.l. All Faroese specimens have a dark brown colour.

Deroceras reticulatum Müller. Found in 60 localities (locs 3, 4, 8, 11, 13, 14, 15, 17, 25, 27, 29, 32, 33, 34, 35, 36, 39, 40, 41, 43, 44, 48, 49, 51, 52, 54, 55, 56, 58, 59, 62, 64, 67, 68, 70, 73, 74, 75, 81, 82, 87, 90, 91, 93, 94, 95, 96, 97, 98, 99, 100, 101, 103, 104, 107, 110, 111, I, II, VII)

in all islands. Like *D. agreste* mostly confined to infields but also found on outfield grassland (though usually close to infields) and rock shelves. One specimen found among *Calluna* (loc. 13) and also found in plantations but not in mountain sites (though at loc. 40 at 400 m a.s.l.). Faroese specimens vary a great deal in the distribution and intensity of the brown or grey markings on the body, but probably not more than in other regions (e.g. Western Norway, Iceland, and the British Isles).

Limax marginatus Müller. Found in 78 localities (locs 3, 4, 6, 7, 8, 10, 13, 17, 19, 20, 22, 24, 25, 27, 28, 29, 32, 34, 36, 39, 40, 41, 43, 44, 45, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 59, 60, 61, 62, 64, 65, 67, 69, 70, 73, 74, 76, 77, 79, 81, 82, 84, 86, 87, 88, 90, 91, 92, 93, 94, 95, 97, 98, 99, 100, 101, 102, 104, 105, 106, 107, 108, 109, 110, 111, II, IV, VI) on all islands. A very common and often abundant species occurring in all kinds of habitats and also common in grass- and heathlands. Appears to be rather common also in mountain sites (e.g. loc. VI at 600 m a.s.l., loc. IV at 570 m a.s.l. and loc. 77 at 460 m a.s.l.). The body colour is highly variable from very pale grey to dark brown, and with either faint or well developed mantle and body bands.

Snails (in alphabetic order)

Aegopinella nitidula Draparnaud. Found in 2 localities (loc. 56 among rich herbage on moist cliff and loc. 61 on rich grass meadow near walls of a graveyard) on Suduroy. Previously reported from one locality each on Suduroy, Sandoy, and Streymoy (Fog 1972). Apparently rare in the Faroes and possibly confined to sites which are not grazed.

Aegopinella pura Alder. Found in 5 localities (locs 22, 52, 56, 59, 87) on Suduroy, Nólsoy, and Kunoy. Previously found once (1 ind.) on Streymoy (Fog 1972). The previous record is from a non-grazed rock shelf and the same is true for 3 of our present findings, the two others are from sloping grassfields. The data suggest that the species is rare in the Faroes and sensitive to grazing. In Scandinavia and on the British Isles the species is dimorphic for shell colour; white and brown. In the Faroes (as in Iceland) only the brown form is found.

Cochlicopa lubrica Müller. Found in 3 localities; on Suduroy (loc. 62 on sloping rich grass-herb meadow) and on Sandoy (loc. 32 among rich herbage near small brook and loc. 33 on grass and herb meadow along ditches). Previously found once on Suduroy and Sandoy (Fog

1972), and is apparently a local and rare species which is only found in infield sites.

Columella aspera Waldén. Found in 20 localities (locs 6, 13, 16, 22, 33, 34, 36, 42, 45, 52, 56, 59, 65, 76, 80, 85, 88, 93, 95, 98) on Suduroy, Sandoy, Koltur, Hestur, Vágur, Nólsoy, Streymoy, Eysturoy, Kalsoy, Kunoy, Vidoy, and Svi-noy. Previously only found 3 times in and around Tórshavn (Fog 1972). Found in several different habitats but only rarely in villages and old infields. Most frequent on *Calluna* heaths and among rich vegetation on shelves and in crevices. Also recorded from the outskirts of infields and on one outfield grass heath, though definitely absent from the most heavily grazed fields.

Lauria cylindracea Da Costa. Found in one locality (loc. 59) at Frodba on Suduroy (19 specimens), which is also the only locality given by Fog (1972). Our specimens were collected on an ungrazed rockshelf.

Nesovitrea hammonis Ström. Found in 20 localities (locs 6, 18, 27, 32, 33, 42, 43, 44, 46, 51, 52, 62, 83, 85, 87, 90, 92, 93, 98, VII) on Suduroy, Sandoy, Hestur, Streymoy, Eysturoy, Kalsoy, Kunoy, and Vidoy. Previously only recorded from a sandhill locality on Sandoy (Fog 1972). Most common on the outskirts of settlements but also found near settlements and in a few outfield grassland/heath localities (though few individuals) and in one plantation. Mainly an infield species and possibly a recent newcomer because of the relatively large number of localities found by us compared with previously published data.

Oxychilus alliarius Miller. Found in 61 localities (locs 1, 3, 4, 5, 6, 7, 13, 18, 22, 26, 27, 28, 32, 33, 35, 36, 40, 41, 42, 43, 46, 47, 51, 52, 55, 56, 59, 61, 62, 65, 67, 71, 73, 76, 78, 79, 80, 81, 84, 85, 87, 88, 90, 91, 93, 94, 95, 97, 98, 99, 100, 101, 104, 105, 106, 107, 108, 111, I, IV, VII) on all islands. Widely distributed in the Faroes and occurs in a variety of habitats; found in about 70% of the infield sites and 50% of the outfield grass/heathlands but also common in plantations and in mountain sites (e.g. loc. IV at 550 m a.s.l.).

Oxychilus cellarius Müller. Found in two localities: on Vágur (loc. 11 among grass and herbage (wasteland) on sand near shore) and on Streymoy (loc. 41 among rich herbage in wasteland near shore). Previously recorded twice: in Tórshavn and in Klaksvik on Bordoy (Fog 1972). The species is clearly synantrophic in the Faroes.

Punctum pygmaeum Draparnaud. Found in 34 localities (locs 6, 7, 14, 18, 22, 27, 28, 32, 33,

36, 42, 47, 52, 56, 62, 65, 66, 74, 80, 83, 84, 85, 87, 88, 90, 91, 92, 93, 95, 98, 101, 105, 106, 107) on all islands except on Skúvoy and Stóra Dimun. Not previously recorded from the Faroes, but because of its small size (h: 0.9 and b: 1.7 mm) it may easily have been overlooked. Most frequent, and sometimes even very abundant, on the outskirts of settlements and on shelves and in crevices. Usually in places with rich vegetation but also found on *Calluna* heaths and in plantations.

Vitrea contracta Westerlund. Found in 23 localities (locs 22, 27, 32, 33, 41, 43, 52, 59, 62, 65, 67, 71, 76, 83, 84, 87, 90, 93, 94, 98, 106, 107, VII) on all islands except on Skúvoy, Stóra Dimun, Mykines, and Vidoy. Previously only recorded once outside Tórshavn (Fog 1972). Most common on the outskirts of settlements and on rock shelves and more seldom found close to the settlements. Only twice recorded from outfield localities.

Vitrina pellucida Müller. Found in 40 localities (locs 3, 6, 7, 8, 9, 11, 18, 19, 22, 27, 28, 32, 35, 40, 41, 43, 52, 55, 58, 59, 62, 66, 71, 73, 77, 83, 84, 85, 87, 91, 94, 97, 99, 101, 105, 106, 107, 111, IV, VI) on all islands. Usually found in infield localities and on cliffs, shelves and crevices and only in relatively few outfield sites. Also found in one plantation (loc. 85 on Kalsoy) and in three mountain sites (locs IV, VI, and 75 on Streymoy, Eysturoy, and Svinoy, respectively), where it ascends to 4–500 m a.s.l. On Hardangervidda in Western Norway it is the most common snail between 1000 and 1400 m a.s.l.

DISCUSSION

Comparison with neighbouring areas

Fog (1972) listed 22 species of terrestrial gastropods from the Faroes, 19 of which were also recorded by us in 1978–1979. Our survey added one new species (*Punctum pygmaeum*) to the Faroese list, but since 3 species on Fog's list are doubtful and in need of confirmation (see introduction to the Synopsis) the present total number of species recorded from the islands is 20. The number of species is low compared with neighbouring areas (Tab. 2); Scotland and Western Norway have 3–4 times as many species as the Faroes. Also the islands of Orkneys, Shetland, and Iceland have about twice the number found in the Faroes (49, 41, and 34, respectively). The relatively low number of species in the Faroes may be a consequence of several factors, notably (a) their isolated position in relation to potential source areas (though Iceland is even more remo-

te), (b) their low habitat diversity (e.g. no woods and few shrubs), acid soils, and a lack of calcareous rocks, and (c) the fact that the Faroes were colonized by man much later than the British Isles and Western Norway. Many of the North Atlantic island species of gastropods are likely to have been dispersed by man (see below).

The species composition of the gastropod fauna of the Faroes is very similar to that of the neighbouring areas (Tab. 3). In fact, 16 of the species also occur in all adjacent areas (i.e. Scotland, Orkneys, Shetland, Iceland, and Western Norway); assuming that *Arion hortensis* agg. reported from Orkneys, Shetland and Iceland includes *A. distinctus* (Davies 1979). The only «gaps» in Tab. 3 are the curious absence of *Deroceras agreste* in Orkneys and Shetland, and the absence of *Aegopinella nitidula*, *Lauria cylindracea*, and *Oxychilus cellarius* in Iceland. Some of these gaps may, of course, be due to insufficient collecting.

Distribution within the Faroes

Most (ca. 75%) of the species have a wide distribution within the Faroes. The following 10 species were found on at least 15 islands: *Arion ater*, *A. intermedius*, *A. silvaticus*, *A. subfuscus*, *Deroceras agreste*, *D. reticulatum*, *Limax marginatus*, *Oxychilus alliarius*, *Punctum pygmaeum*, and *Vitrina pellucida*. All of these were also recorded in a large number of localities (33–85; mean: 58 locs). Five more species (*viz.* *Arion distinctus*, *Deroceras laeve*, *Columella aspera*, *Nesovitrea hammonis*, and *Vitrea contracta*) are also widely distributed and were recorded in 8–13 islands. The remaining 5 species (*Aegopinella nitidula*, *A. pura*, *Cochlicopa lubrica*, *Lauria cylindracea*, and *Oxychilus cellarius*) were only found on 1 to 3 islands each, and in few localities (≤ 5). It is noteworthy that the «rare» species are all snails. The reason for this may be specific habitat requirements and tendency to be associated with human settlements (see below). The snails were found in on average 19.1 locs/species¹ compared with 53.3 for the slugs.

Habitat distribution

It is difficult to obtain reliable estimates of density (and relative abundance) of natural populations of terrestrial gastropods. Tab. 3 gives the total number of localities in each type of habitat for all species collected in 1978–1979. However, Tabs. 4 & 5 summarize attempts to use

Table 3. List of terrestrial slugs and snails collected 1977–1979 in the Faroes. The table gives: number of islands (n = 17), number of localities (n = 119), total number of individuals, and number of localities in different habitats. The abbreviations for habitats are: (A) mountain sites (n = 6), (B) dwarf shrub heath (n = 11), (C) plantations (n = 4), (D) cliffs, shelves, and crevices (n = 3 (+ partly 5 others)), (E) lowland bogs (n = 3), (F) grass heaths (n = 33), (G) infields: outskirts (n = 36), (H) infield: settlements (n = 22). For further information concerning the habitats see text and Bengtson & Hauge (1979: Appendix I).

Species	Number of			Habitat (no. of locs)							
	islands	locs	inds	A	B	C	D	E	F	G	H
Slugs:											
<i>Arion ater</i> L.	16	80	448	2	10	3	2	2	15	23	16
<i>A. distinctus</i> Mabile	12	28	139	—	2	2	—	—	1	8	14
<i>A. intermedius</i> Normand	17	85	468	3	6	2	4	1	24	30	15
<i>A. silvaticus</i> Lohmander	15	45	318	1	1	2	1	—	2	26	12
<i>A. subfuscus</i> Draparnaud	16	60	203	3	3	3	2	—	11	21	17
<i>Deroceras agreste</i> L.	16	33	113	—	—	1	—	—	5	16	11
<i>D. laeve</i> Müller	8	14	24	2	—	1	1	—	3	6	1
<i>D. reticulatum</i> Müller	17	60	505	1	1	3	2	—	10	22	21
<i>Limax marginatus</i> Müller	17	78	500	4	7	2	3	—	22	20	19
Snails:											
<i>Aegopinella nitidula</i> Draparnaud	1	2	12	—	—	—	1	—	—	1	—
<i>A. pura</i> Alder	3	5	35	—	—	—	3	—	—	1	1
<i>Cochlicopa lubrica</i> Müller	2	3	12	—	—	—	—	—	—	2	1
<i>Columella aspera</i> Waldén	12	20	135	1	6	1	4	—	—	6	2
<i>Lauria cylindracea</i> Da Costa	1	1	19	—	—	—	1	—	—	—	—
<i>Nesovitrea hammonis</i> Strøm	8	20	40	—	—	2	—	—	1	12	5
<i>Oxychilus alliarius</i> Müller	17	61	341	2	5	2	7	—	9	20	16
<i>O. cellarius</i> Müller	2	2	14	—	—	—	—	—	—	—	2
<i>Punctum pygmaeum</i> Draparnaud	15	34	187	—	3	1	6	—	3	14	7
<i>Vitrea contracta</i> Westerlund	13	23	96	—	2	—	4	—	1	9	7
<i>Vitrina pellucida</i> Müller	17	40	237	3	1	1	6	—	4	13	12

«semi-quantitative» data to demonstrate habitat distribution. For snails, only those localities (n = 58) where sifting of the foerna was performed could be used. For slugs, only localities (n = 72) which were comparatively thoroughly surveyed and where handcollecting was intensive have been used. Because of this, snails and slugs are treated separately and not all habitats are included in Tabs 4 & 5. Mountain sites (habitat A), plantations (C), and bogs (E) were either too few in numbers or too heterogeneous to be tabulated, and therefore only the qualitative characteristics are given below.

Tabs 3, 4 & 5 show that, in general, slugs have wider amplitudes with regard to habitat than do snails. Broad-niched species of slugs are *A. ater*, *A. intermedius*, *L. marginatus*, *A. subfuscus*, and *D. reticulatum*; though the two latter have slightly lower relative abundance than the others. Many slugs also have a high constancy in several habitats. Slugs with a relatively narrow habitat niche are *A. distinctus* and *D. laeve*; neither of which is very common. Among the

snails, *C. aspera*, *O. alliarius*, *P. pygmaeum*, *Vitrea contracta*, and *Vitrina pellucida* exhibit the broadest and highest relative abundance and, for some of them (especially *O. alliarius*), constancies are also high. Several snails have a restricted habitat distribution and local occurrence (see also following chapter).

The different habitats (A–H) are characterized by the following species composition:

(A) Mountain sites (250–600 m a.s.l.) supported 7 species viz. *A. ater*, *A. subfuscus*, *A. intermedius*, *D. laeve*, *L. marginatus*, *V. pellucida*, and *O. alliarius*.

(B) Dwarf shrub heaths (with *Calluna*) contained a total of 11 species (Tabs 4 & 5), where *A. ater* dominated (relative abundance was 48%) among the slugs, followed by *L. marginatus* (28%), and *A. intermedius* (18%). The dominant snails were *C. aspera* (72%) and *O. alliarius* (13%).

(C) Plantations were surveyed in 4 places, and 12 species were found including all 5 species of *Arion*, *D. reticulatum*, *L. marginatus*, *C. aspera*,

Table 4. Relative abundance (percent of total number of individuals in pooled samples) and constancy (percent of locs investigated) of slugs in some habitats in the Faroes. The habitats (A—H) are described in the text and listed in Tab. 3. Habitats B, D, F, G and H were used to calculate relative abundance and constancy, but only localities which were «semiquantitatively» properly surveyed are included (cf. Tab. 3). For habitats A, C and E only presence (x) or absence (—) is given.

Species	Habitat No. of locs	Relative abundance								Constancy				
		A	B	C	D	E	F	G	H	B	D	F	G	H
			8		5		19	22	18	8	5	19	22	18
<i>Arion ater</i>		x	48	x	24	x	17	14	16	100	80	68	82	72
<i>A. distinctus</i>		—	1	x	—	—	—	4	10	13	—	—	32	78
<i>A. intermedius</i>		x	18	x	21	x	29	24	14	63	80	95	96	78
<i>A. silvaticus</i>		—	—	x	11	—	7	13	7	—	20	21	82	56
<i>A. subfuscus</i>		x	4	x	6	—	7	8	7	38	40	47	59	67
<i>Deroceras agreste</i>		—	—	—	5	—	7	3	3	—	20	32	50	50
<i>D. laeve</i>		x	—	—	3	—	1	1	—	—	40	5	9	—
<i>D. reticulatum</i>		—	1	x	11	—	5	16	28	13	40	37	91	89
<i>Limax marginatus</i>		x	28	x	19	—	26	18	15	63	100	84	59	83
No. of individuals		—	82	—	63	—	316	614	580					

N. hammonis, *O. alliarius*, *P. pygmaeum*, and *V. pellucida*. The plantations are very heterogeneous with regard to vegetation and past history.

(D) Cliffs, shelves, and crevices constitute an interesting type of habitat because they are inaccessible to sheep and therefore have a rich herb and grass vegetation. A total of 16 species was found, the most abundant of the slugs being *A. ater* (24%), *A. intermedius* (21%), *L. marginatus* (19%), followed by *A. silvaticus* and *D. reticulatum* (both 11%). Among the snails *V. pellucida* (33%) and *O. alliarius* (21%) were the dominants. *L. cylindracea* was only recorded in this habitat (relative abundance 11% and constancy 20%), and the two *Aegopinella*-species were also typical for rock sites (Tab. 5).

(E) Lowland bogs were insufficiently surveyed and only the two slugs *A. ater* and *A. intermedius* were found (though also the limnic snails *Lymnaea peregra* (Müll.) and *L. truncatula* (Müll)).

(F) Outfield grass heaths supported a total of 14 species. The most abundant slugs were *A. intermedius* (29%), *L. marginatus* (26%), and *A. ater* (17%); high constancies were also exhibited by *A. subfuscus*, *D. reticulatum*, and *D. agreste*. The snails were dominated by *O. alliarius* (43%), *C. aspera* (25%), and *P. pygmaeum* (20%).

(G) Infields on the outskirts of settlements contained the highest total number of species (18 or 90% of the fauna) of all habitats, with *A. intermedius* as the most abundant slug (though

only 24% relative abundance) followed by *L. marginatus*, *D. reticulatum* and *A. ater*, all with a relative abundance between 13 and 18% (Tab. 4). Most of the slugs showed a high constancy. Among the snails *P. pygmaeum* (28%) and *O. alliarius* (22%) were most abundant closely followed by *V. contracta* (19%) and *V. pellucida* (15%), all showing high constancies, as did *N. hammonis* (Tab. 5).

(H) Infields in close vicinity of settlements contained 16 species. The most abundant slug was *D. reticulatum* (28%) followed by *A. ater*, *A. intermedius*, and *A. distinctus* (10–16% each). All slugs (but *D. laeve* which was absent) showed high constancies. The most abundant snail was *V. pellucida* (50%) followed by *O. alliarius* (16%) and *P. pygmaeum* (15%). *O. cellarius*, which is rare in the Faroes, was only found in this habitat.

Absolute densities cannot be calculated from our data. However, the number of individuals per sample (a similar amount of foena was sifted each time) and field observations give some ideas about densities, especially when comparing habitats. Among the snails the highest density was observed (i.e. suggested by the above-mentioned «method») in *L. cylindracea*, which is consistent with data from Western Norway (Solhøy unpubl.). The lowest density was observed in *N. hammonis*. Four species (viz. *C. lubrica*, *N. hammonis*, *P. pygmaeum*, and *V. contracta*) appeared to have their peak in infields, and 3 species (viz. *A. nitidula*, *A. pura*, and *V.*

Table 5. Relative abundance and constancy of terrestrial snails in some habitats in the Faroes. For habitat symbols and choice of localities see Tab. 3 and the text.

Species	Habit No. of locs	Relative abundance								Constancy				
		A	B	C	D	E	F	G	H	B	D	F	G	H
			8		5		15	17	13	8	5	15	17	13
<i>Aegopinella nitidula</i>	—	—	—	—	6	—	—	<	—	—	20	—	6	—
<i>A. pura</i>	—	—	—	—	9	—	—	1	—	60	—	6	—	—
<i>Cochlicopa lubrica</i>	—	—	—	—	—	—	—	1	5	—	—	—	12	8
<i>Columella aspera</i>	—	71	x	7	—	25	6	1	50	60	27	24	8	8
<i>Lauria cylindracea</i>	—	—	—	—	11	—	—	—	—	20	—	—	—	—
<i>Nesovitrea hammonis</i>	—	—	x	—	—	5	7	3	—	—	27	48	23	—
<i>Oxychilus alliarius</i>	x	13	x	21	—	43	22	16	50	100	40	82	61	—
<i>O. cellarius</i>	—	—	—	—	—	—	—	8	—	—	—	—	—	15
<i>Punctum pygmaeum</i>	—	8	x	8	—	20	28	15	25	60	40	59	31	—
<i>Vitrea contracta</i>	—	7	—	4	—	4	19	3	25	40	7	41	15	—
<i>Vitrina pellucida</i>	x	2	x	33	—	3	15	50	13	80	14	59	62	—
No. of individuals	—	61	—	181	—	120	256	185	—	—	—	—	—	—

pellucida) on ungrazed rock shelves. *C. aspera* seemed to have its highest density on *Calluna* heath (as commonly found to be true also for Western Norway) and on outfield grass heath. *O. alliarius* had peak densities on rock shelves and in grass heath. The total density of snails was clearly highest on the rock shelves, almost twice and four times as high as in infields and grass heaths, respectively. As to the slugs it is to be noted that the «infield species» *A. distinctus*, *A. silvaticus*, and *D. agreste* (and to some extent *D. reticulatum*) sometimes occurred in surprisingly high densities in outfield localities. Possibly some of these outfield sites are situated so close to infields that they do not represent outfield proper. Taking this into account, the following species show peak densities in infields: *A. distinctus*, *D. agreste*, and *D. reticulatum*. For the other species of slugs, our observations did not indicate any marked differences, in density between habitats; *D. laeve* and *A. subfuscus* always seemed to occur in relatively low densities.

Dispersal

The Faroes have not been connected with surrounding areas in Postglacial time and there is no indication of any glacial refugia where parts of the fauna might have survived the latest glaciation. Hence, the present terrestrial gastropod fauna must, in all probability, have colonized the islands in Postglacial time. The occurrence of Faroes species in neighbouring areas does not suggest from where they came. All species occur

both in Western Norway and in the northern parts of the British Isles. Little is known about the means of long-distance dispersal of terrestrial gastropods. The main ways of dispersal seem to be by winds, attached to birds, and by man (for a review see Peake 1978). Although transport by drifting wood has been suggested many times (e.g. by Fog (1972) to account for *L. cylindracea* in the Faroes) this seems less likely and e.g. Valovirta (1973, 1977) maintains that, among islands off the coast of Finland in the Baltic, most terrestrial gastropods are only able to bridge small distances by drifting in water.

The present distribution of the species within the Faroes may possibly offer some suggestions as to how they got there. A group of 6 species (viz. *A. distinctus*, *A. silvaticus*, *D. agreste*, *D. reticulatus*, and *N. hammonis*) are nearly always found in close association with human settlement. When they occur in outfield sites it is usually in places close to infields. In the British Isles and Western Norway all these species (except *N. hammonis*) are synanthropic. *V. contracta* is also usually found in infields, though also on rock with rich vegetation. Another group of 5 species (*A. nitidula*, *A. pura*, *C. lubrica*, *L. cylindracea*, and *O. cellarius*) are all relatively rare in the Faroes and only found in 1–6 localities each. *O. cellarius* is synanthropic in Western Norway and probably also in the British Isles. In the same areas *A. nitidula* and *A. pura* are mostly confined to deciduous woods, *L. cylindracea* is common on calcareous grassland and cliffs, while *C. lubrica* occurs both in woods, on grass-

land and on herb meadows. Because of their association with settlements, it may be argued that all the above-mentioned 11 species (i.e. 55% of the terrestrial gastropod fauna), arrived to the islands through dispersal by man. However, it is also possible that they (or at least some of them) reached the islands by other means and successfully colonized and exploited already existing man-made habitats.

Small species, like *P. pygmaeum* and *C. aspera*, seem well suited for aerial dispersal. The two species are found in most of the islands, and *P. pygmaeum* occurs both in infields and outfields, whereas *C. aspera* is more common in outfields. It seems unlikely that these small species have reached such wide distributions and also established themselves in outfields had they been entirely dependent on man for their dispersal. *V. pellucida* is known to readily adhere to birds (Rees 1965), and could have arrived to the Faroes in this way.

The remaining 6 species (*A. ater*, *A. intermedius*, *A. subfuscus*, *D. laeve*, *L. marginatus*, and *O. alliarius*) all have geographic or habitat distributions which preclude any wellfounded suggestions regarding their colonization of the Faroes.

In conclusion, it seems that a large portion (perhaps > 50%) of the terrestrial gastropods may have reached the Faroes through human activities. Trading between the British Isles, and especially Western Norway, and the Faroes has been extensive and many species occur on most islands with sizable and old settlements.

ACKNOWLEDGEMENTS

The data, which provide the basis for this paper, were collected in the field by the present author, Professor S.-A. Bengtson, Bergen and Dr. P.H. Enckell, Lund, Sweden, as part of a joint ecological project supported by grants from the Norwegian Research Council for the Science and Humanities (to S.-A. Bengtson) and the Nordic Council for Ecology (to the present author).

Dr. Dorete Bloch Danielsen and Mr. J.K. Bærentsen, Tórshavn, assisted in various ways during the field work. We are also grateful to Stöðisútbúgvingin (Academia Færoensis) for providing laboratory facilities and the Royal Danish Navy for helicopter support to reach some of the sampling sites.

The school children of Skúvoy did a marvelous job in collecting slugs autumn 1979.

I also appreciate the help of Dr. S. Davies,

Surrey, England, in determining the *Arion distinctus* specimens.

Thanks are also due to Dr. Jørgen Knudsen, Zoological Museum, Copenhagen for loan of material.

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APPENDIX

Maps showing the distribution of 20 species of snails and slugs (Gastropoda) recorded in 1977—1979 in the Faroes. Black circles denote records from the present study, stars refer to previously published records (from Fog 1972). Previous records have been entered on the maps only when they markedly supplement our data. For information on position of, sampling efforts at, and vegetation of localities surveyed 1978—1979 see Bengtson & Hauge (1979: Fig. 2 and Appendix I), and for 1977 Tab. 1 in present study. The distribution maps are presented in the same order as the species appear in the synopsis.





