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Raised marine terraces in the Hornsund area (northern part), Spitsbergen *)

ABSTRACT. During the expedition "Spitsbergen 1979/80" the authors prepared a geomorphologic map of the area to the north of Hornsund, between the Torell Glacier and the Treskelen Peninsula. Fifteen raised marine terraces were distinguished. Basing on field morphometric sections, quite a detailed distribution of the terraces at a seaside plain and in side valleys was noted. Also, the previous Polish studies over this part of the Svalbard Archipelago were taken into account. The terraces occur at the following altitudes: 220—230 m, 200—205 m, 180—190 m, 100—115 m, 80—95 m, 70—75 m, 60—65 m, 45—46 m, 40—46 m, 32—35 m, 22—25 m, 16—18 m, 8—12 m, 4.5—6 m and 2 m a.s.l. (Figs. 2—5). The terraces are not evenly distributed and they possess a varying structure. The authors, due to absence of other chronologic evidence but on the ground of a morphologic analysis and radiocarbon data (presented by Birkenmajer and Olsson 1970) suppose that only the lowest terraces have been formed in a postglacial period.

Key words: Arctic, Spitsbergen, raised marine terraces

1. Introduction

In result of studies carried through in summer 1979 in a seaside plain, from several dozen metres to several kilometres wide, the flat levels inclined towards the sea and with numerous rock outcrops were noted. The levels were considered for marine terraces as they compose of rounded gravels and contain a marine fossil fauna. The rock outcrops are the abrasive monadnocks that frequently mask a detailed image of the terraces, especially in their edge zones. Besides, at the terraces, mostly the lowest ones, there are the storm ridges.

Such levels that were locally noted even at several hundred metres above the sea, have been raised in result of isostatic movements i.e. their

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emergence. There are the terraces that occuppy nowadays only a small area (they prove a quick uplifting of the land) and vast plains, expressing the intervals of isostatic stagnation.

The differences in a defining of marine terrace altitudes in various papers are caused mainly by differences between an abrasive and an accumulative part of the same terrace; in many cases they may even reach several metres (Fig. 1). Besides, if a marine terrace was inclined, the values of its altitudes were defined on the basis of various approach as: mean of a terrace, altitudes from the upper part of an edge at the lower terrace to the foot of an edge of the upper terrace or, as accepted also by the authors, the lowest values of the altitues that define an accumulative level of the terrace. Locally, where the terraces of an abrasive type occurred, their lowest values of altitudes were also cited.

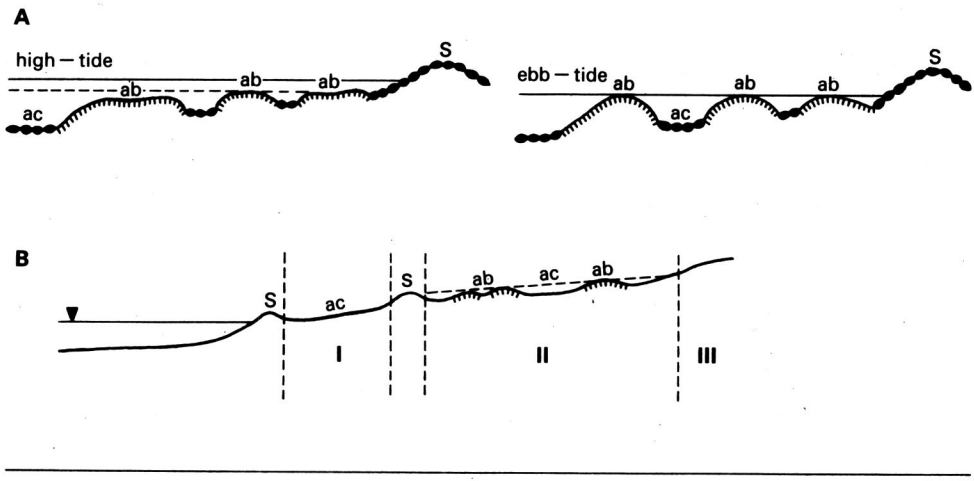


Fig. 1. Differences in interpretation of recent (A) and ancient (B) terrace surface of accumulative and abrasive origin
ac — accumulative level, ab — abrasive level, s — storm ridge; I, II, III — raised marine terraces

2. Previous studies

The studies over marine terraces of Spitsbergen seasides have been started at the end of the first decade of this century. Particularly they dealt with north-western and middle Spitsbergen — Bockfjorden, Kongfjorden and Isfjorden (Natkont, G. de Geer, Hoel, Holtedahl — after Szupryczyński 1968). Also in the twenties to the forties of this century the next papers on marine terraces in those parts of Spitsbergen have been published. Only Werenskiold (1952—53 — after Szupryczyński 1968) noted the altitudes of marine terraces at Sörkapp up to 334 m a.s.l. Up to now the latter value is the highest noted altitude at which a marine terrace was found in Svalbard Archipelago.

Birkenmajer (1958, 1960), Jahn (1959 a, b) and Szupryczyński (1968)

Table I

Raised marine terraces in the northern part of the Hornsund area (altitudes in metres asl)

Area	After Jahn (1959 a, 1959 b)			After Birkenmajer (1960) detailed			After Birkenmajer (1960) standard	After Karczewski, Kostrzewski and Marks (1981)		
Vimsa — Elveflya				2.5 17	3—4 24—25	6—8 32		2 16—18	4.5—6 22—25	8—12
Kvartsittsletta	5 24	11—12 32	16—17 40	38—40	45	65	2—5.5	4.5—6 22—25	8—12 32—35	16—18 40—46
Skjerstranda-Ralstranda	1.5—4 25	7—10 32	15—16.8	4 10	Worcesterpynten: 5.6—6.2 27	8.8	5.5—7.5	4.5—6 32—35	8—12	16—18
Bratteggdalen	75	113—115	132				7.5—8.8	80—95 200—205	100—115	180—190
Steinvikdalen	135	205	230				10—15	180	200—205	220—230
Gangpasset								80—95		
Nameless valley in Rotjesfjellet							13—16	100—115		220—230
Revdalen	7.5 24 46	10 32 65	17 40	4 25—27	7.5 40	8.5—20	25—27	4.5—6 40—46 70—75	8—12 45—46 100—115	22—25 60—65 180—190
Fuglebergsletta	17 45	25 62	32	2—5.5 10—15	5.5—7 13—16	7.5—8 26—27	about 40	4.5—6	8—12	22—25
Bogstranda	16.7—17 39	24.7 52.5	32 65.8	13—15 28 44—46	19—20 30—31.5	21.5—22 36—38		2 22—25	3—6 32—35	8—12 40—46
Hyrneodden	2 24	9.5 38	18	8.5—9	16.5—18			8—12	22—25	32—35
Treskelen	2.5 15—19	8.8—13.5 38		9.5—10 30—33	18—20	22—25		2 16—18 60—65	4.5—6 22—25 100—115	8—12 40—46

were the ones who published their opinions on the marine terraces in the Hornsund area.

Birkenmajer (1960), due to highly differentiated altitudes of marine terraces in small fragments of the area, proposed a standard scheme: about 40 m, 25—27 m, 13—16 m, 10—15 m, 7.5—8.8 m, 5.5—7.5 m and 2—5.5 m a.s.l. Jahn (1959 a) mentioned the following values for the Hornsund area: 230 m, 205 m, 135 m, 100 m, 75 m, 65 m, 45 m, 38—41 m, 32 m, 25 m, 16—17 m, 7—13 m and 2—4 m a.s.l. Szupryczyński (1968) while presenting a relief evolution of Spitsbergen shores during Quaternary, cited chronologicly the scientists that had dealt among others with raised marine terraces in various parts of the archipelago.

Table I presents the data of Birkenmajer (1960) and Jahn (1959 a, 1959 b) as well as a proposal of the authors.

3. Arrangement of marine terraces

Basing on field morphometric sections prepared with a use of an altimeter), quite a detailed image of morphology of raised marine terraces was prepared for the area between the Torell Glacier and the Treskelen Peninsula. So, the studied area included the northern part of a seashore of Hornsund.

A system of 15 raised marino terraces was distinguished at the following altitudes: 220—230 m, 200—205 m, 180—190 m, 100—115 m, 80—95 m, 70—75 m, 60—65 m, 45—46 m, 40—46 m, 32—35 m, 16—18 m, 8—12 m, 4.5—6 m and 2 m a.s.l. The terraces are not evenly distributed and of a differentiated origin. The paper refers to previous Polish proposals of Birkenmajer (1958, 1960) and Jahn (1959 a, 1959 b).

The abrasive monadnocks predominate in the area between the Torell Glacier and the Werenskiold Glacier — at Vimsa and Elveflya (Fig. 2); the monadnocks are locally small and with remnants of accumulative covers. They are best preserved between Vimsodden and western slopes of Jens Erikfjellet. At the peninsula itself there are the terraces at the altitudes of 2 m, 4.5—6 m, 8—12 m, 16—18 m and 22—25 m a.s.l. Instead, a vast area of the terrace 8—12 m a.s.l. (of a peninsular shape) reaches the slopes of Jens Erikfjellet and is overlain at the slope foot by an immense block heap of a rock failure. Only in this part of the whole analyzed area there is a large zone occuppied by the terrace 2 m a.s.l. — close to the mouth of the Vimsa River (fragments of this terrace were also found at Treskelen and Bogstranda).

At the vast area of an extramarginal outwash Elveflya (Fig. 2) there are small abrasive monadnocks in middle and western parts, localized at 4.5—6 m, 8—12 m and 16—18 m a.s.l.

A most complete complex of marine terraces in a seaside plain is noted at Kvartsittsletta (Fig. 3). Between Kvartsittodden and the north-western slope of Gulliksenfjellet to Hyttevika there is an amphitheatrical system from a terrace 4.5—6 m a.s.l., at which there are double or single storm ridges, through the terraces: 8—12 m, 16—18 m, 22—25 m, 32—35 m a.s.l. up to 40—46 m a.s.l. But the abrasive terraces 16—18 m, 22—25 m and

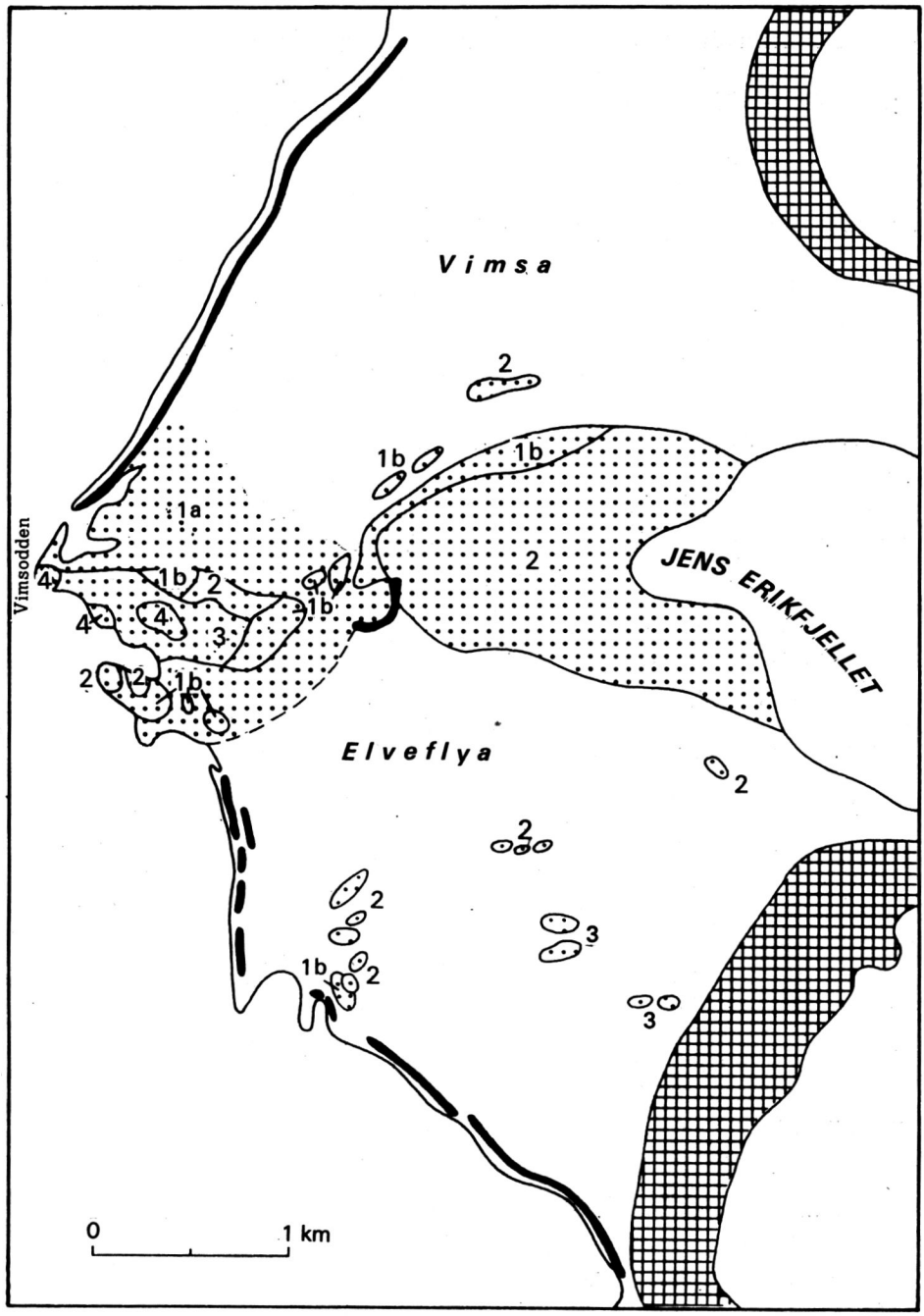


Fig. 2. Raised marine terraces at Vimsa Plain and Elveflya, Wedel Jarlsberg Land (based on authors' fieldworks)
Explanations as at Fig. 3

32—35 m a.s.l. all the other ones are of the accumulative origin. At the lowest terrace there are many tundra lakes formed in result of permafrost degradation. At the highest terrace there is a large lake too.

Starting from Hyttevika to Worcesterpynten there is a most wide-spread area occuppied by the terrace 8—12 m a.s.l.; it covers a considerable part of a seaside plain Skjerstranda and Rålstranda (Fig. 3). A monotony of the terrace surface is only differentiated by abrasive monadnocks reaching the heights of several metres. But also, at the outlets of Steinvikdalen and Gangpasset there are also alluvial fans and erosive cuts at the terrace; they occur as if they are a continuation of the streams that drain these valleys. Within the bays the discussed terrace contacts by an edge or by a storm ridge with a lower terrace 4.5—6 m a.s.l. At the peninsulas as Seterdalneset, near Låkpynten, there are fragments of a higher level i.e. of the terrace 16—18 m asl; the latter is of an abrasive type and possesses a relict accumulative cover. The area occuppied by the terrace 8—12 m a.s.l. is maximum 1 200 m wide. Its surface is inclined towards the sea and its altitude reaches 22—26 m a.s.l. at the foot of the mountains.

On evolution of a relief of the terrace by cutting and permafrost degradation, is influenced by small streams flowing out from under a debris, being deposited at the foot of a mountain slope along the whole mountain range of Gulliksenfjellet, Trulsenfjellet, Torbjörnsenfjellet and Rotjesfjellet. The streams carry out a fine matter, transport it at the terrace surface and enrich an active bed in great amounts of water and very fine mineral matter. Due to that, the marine terraces at the foot of the mountains are covered with a thick series of subslope deposits, overgrown by a thick moss layer. Locally, there are tundra lakes and areas with structural soils.

A small fragment of the terrace 32—35 m a.s.l. was also noted at the outlet of Steinvikdalen.

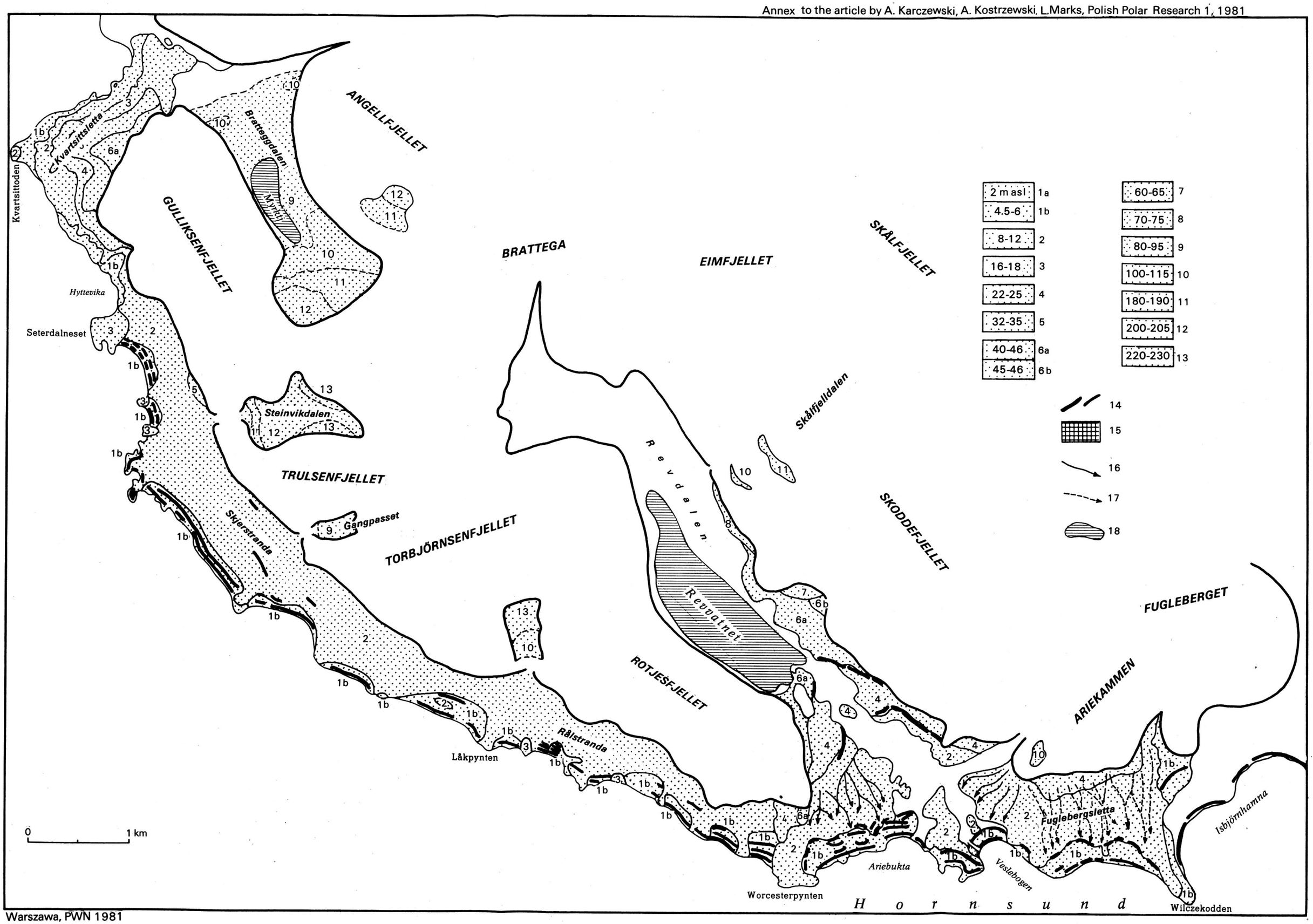
But the seaside plain the marine terraces occur also in side or main valleys (Fig. 3) although they occuppy or are noted in fragments only.

In the Brattegg Valley the terrace 80—95 m a.s.l. occuppies the greatest area, with the valley bottom included. At the outlet — at both sides of the valley — there are small fragments of the terrace 100—115 m a.s.l. The same level is also noted in the upper part of the valley where it is partly covered by great quantities of boulders of a rock failure. At the same slope, if going up the valley, there are fragments of the terraces 180—190 m and 200—205 m a.s.l. They are partly masked by vast and overlying rubble zones. Here and there among the rock blocks there are quite large areas of an abrasive origin. In the hanging valley at the western slopes of Angellfjellet there are also two levels — 200—205 m and 220—230 m a.s.l.

In the mouth of Steinvikdalen there is a narrow ledge of the terrace 180 m asl. Quite a vast accumulative area is occuppied by the level 200—205 m a.s.l. At the slopes of Trulsenfjellet — at both sides of the valley — there are small fragments of the terrace 220—230 m a.s.l.

In the next side valley — Gangpasset there is a distinct accumulative level at 80—95 m a.s.l. It starts at the edge of the valley and spreads towards the ice-cored moraines of the Gangpasset Glacier.

In the other valley at Rålstranda — small valley of the Rotjesfjellet



Warszawa, PWN 1981

Fig. 3. Raised marine terraces of a seaside plain and side valleys between Kvartsittsletta and Fuglebergsletta, Wedel Jarlsberg Land (based on authors' fieldworks)
1—13 — raised marine terraces, 14 — storm ridges, 15 — ice-cored moraines, 16 — outwash tracks at marine terraces, 17 — tracks of pronival streams at marine terraces, 18 — lakes

massif, there are two distinct terraces. The lower at 100—115 m a.s.l. and the higher at 220—230 m a.s.l. are of an abrasive-accumulative type.

The next area with marine terraces i.e. middle and lower parts of Revdalen and Fuglebergsletta (Fig. 3): at the base of Worcesterpynten there are the abrasive (40—46 m a.s.l.) and the accumulative (22—25 m and 8—12 m a.s.l.) terraces. Between Ariebukta and the southern part of Revvatnet there is a system of fan-shaped terraces with Revelva as the axis (described in the paper: Karczewski, Kostrzewski and Marks 1981). At the bay itself there is a vast fragment of the terrace 4.5—6 m asl, surrounded from the sea and contacted with a higher terrace by systems of large storm ridges. A vast area is occuppied by the terrace 8—12 m asl at both sides of Revelva. It includes many small abrasive monadnocks up to 2—3 m high, particularly exposed from under an accumulative cover at the cuts of meltwaters flowing during the Late Holocene glacier advance (Karczewski, Kostrzewski and Marks 1981). The bottoms of these cuts are connected with an older outwash level along the Revelva. The terrace 22—25 m asl is separated from the previously mentioned one by large storm ridges at considerable parts of the area. The terrace is of an accumulative origin and is noted in the western as well as in the eastern part of the lower Revdalen, at the foot of Skålfjellet and Skoddefjellet. To the south and south-west of Revvatnet there is a terrace 40—46 m a.s.l. separated from the lower terrace also by a storm ridge. The terrace is of an accumulative origin and its considerable fragments contact with the slopes of Skoddefjellet. It is covered in the subslope parts by vast scree-aluvial fans. A fragment of this terrace close to the southern part of Revvatnet, contacts with a large roche moutonnée. At the foot of Skoddefjellet, by the southern Revvatnet bank, there are small fragments of the terraces 45—46 m, 60—65 m and 70—75 m a.s.l. In the inner part of Revdalen — at the outlet of Skålfjelldalen, there are by a rocky threshold the narrow ledges of abrasive-accumulative terraces 100—115 m and 180—190 m asl.

At the south-western slope of Ariekammen — by the outlet of Ariedalen (Fig. 3), there is a fragment with a thin accumulative cover of the terrace 100—115 m a.s.l. which probably corresponds with the mentioned ledge near the mouth of Shålfjelldalen.

In Fuglebergsletta there are three levels of raised terraces 4.5—6 m, 8—12 m and 22—25 m a.s.l. (Fig. 3). The lowest level occurs at the continuation of the bays, between Isbjörnhamna and Veslebogen. It is isolated from the sea and from a higher terrace by intensively developed storm ridges. Particularly by Wilczekodden there are tundra lakes at its surface. The terrace 8—12 m a.s.l. occuppies the greatest area. It is of accumulative origin with many abrasive outliers, several metres high. To the east, these rock outliers are of a roche moutnonnée type.

In the western part of Fuglebergsletta there are longitudinal cuts of meltwaters, similarly as in the mouth of Revdalen. Instead, in the middle part of Fuglebergsletta there are, particularly in the contact zone with a higher terrace, the erosive cuts in the compact rocks eroded by pronival waters coming from the slopes of Ariekammen (Karczewski, Kostrzewski and Marks 1981). In the hinterland of a large storm ridge there are

many tundra lakes. The next, higher terrace at 22—25 m a.s.l. represents generally an abrasive area. Here and there only, there are thin accumulative covers. Here, there are the starting points of the pronival cuts.

Much smaller areas are occuppied by raised marine terraces in the north-middle part of Hornsund, between the Hans Glacier and the Treskelen Peninsula (Figs 4 and 5).

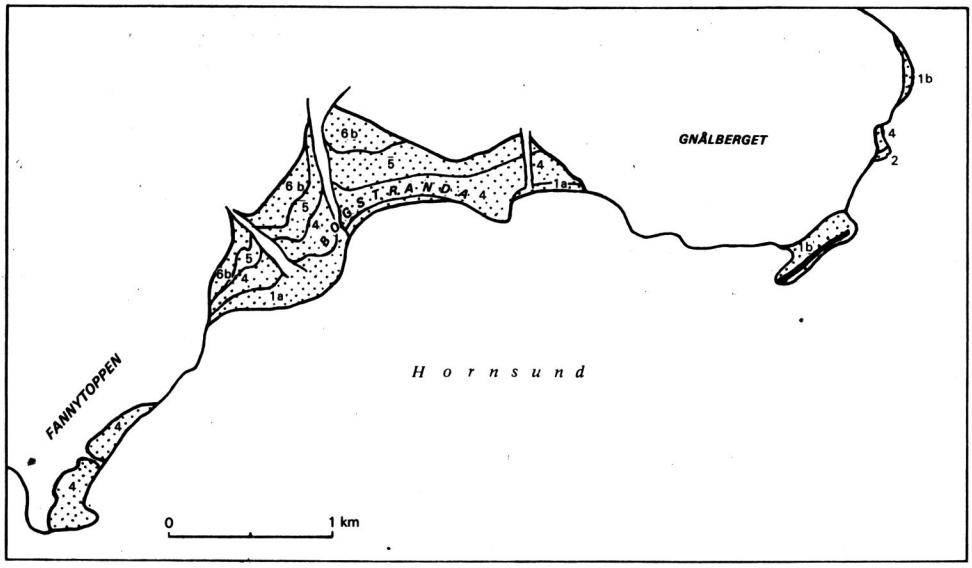


Fig. 4. Raised marine terraces at Bogstranda, Hornsund (based on authors' fieldworks)
Explanations as at Fig. 3

The most distinct terrace system is noted at Bogstranda, between Fannytoppen and Gnålberget (Fig. 4). Quite a large area is occupied there by the terrace 22—25 m, then 32—35 m and 40—46 m a.s.l. These terraces are mainly of an accumulative type. At the foot of Gnålberget, on the side of Burgerbukta, there are lower terraces i.e. 3—6 m, 8—12 m and 22—25 m a.s.l. At the lowest level there are small storm ridges. These terraces as well are generally of an accumulative origin.

The next area of the northern seaside of Hornsund with marine terraces occurs at the foot of Marietoppen by Hyrneodden (Fig. 5). The terrases are also small there and occur at the following altitudes: 8—12 m, 22—25 m and 32—35 m a.s.l.

At last, there are also marine terraces at the base and at the western side of the Treskelen Peninsula (Fig. 5). They form narrow ledges at the altitudes: 2 m, 4.5—6 m, 8—12 m, 16—18 m, 22—25 m, 40—46 m, 45—46 m, 60—65 m and 100—115 m a.s.l. They avail of a structural relief of the peninsula and represent an abrasive-accumulative type.

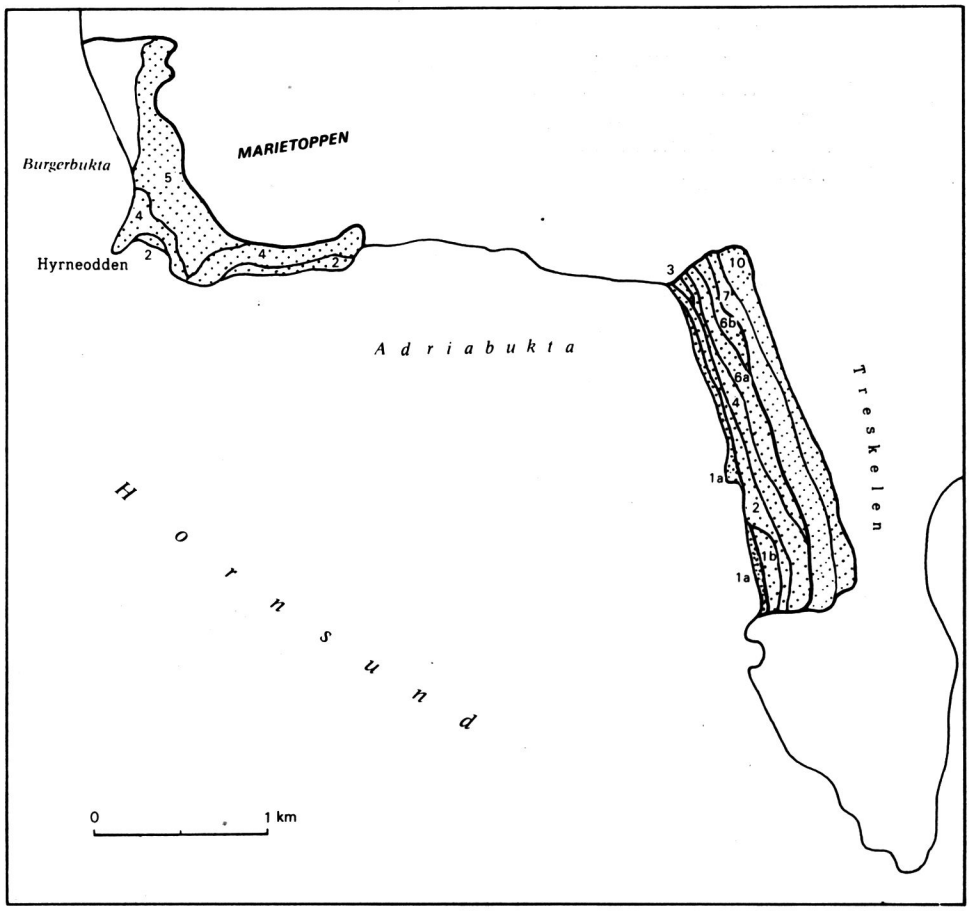


Fig. 5. Raised marine terraces at Hyrneodden and Treskelen, Hornsund (based on authors' fieldworks)
Explanations as at Fig. 3

4. Attempt of defining the age of the terraces

The age of the raised marine terraces has been many a time discussed (Szupryczyński 1968), basing on examples from various parts of the Svalbard Archipelago. Within the studies there are principal differences in separating the Holocene and the Pleistocene terraces. Among the ones who defined the lower terraces to be of the Holocene age, there are: Feyling-Hanssen (after Szupryczyński 1968) — up to 60 m a.s.l., Birkenmajer (1960) — up to 45 m a.s.l., Szupryczyński (1968) — up to 80 m a.s.l. Instead, Jahn (1959 a) found all the terraces up to 275 m a.s.l. to be of the Postglacial age. The last cited papers consider the Hornsund area. Lately Boulton (1979) found that just after the Billefjorden Stage (10 000—

11 000 years B. P.) the terraces 40 m and 45 m a.s.l. had been formed in the Hornsund area.

The authors did not find any new sites with a marine fossil fauna within the terraces that could suggest a more detailed definition of the age. For that reason, we cannot supply with any new arguments for a chronologic arrangement of the terraces (as the main task of our fieldworks was to prepare a uniform map of marine terraces in the northern part of the Hornsund area).

But in connection with the datings by a radiocarbon method of two lowest marine terraces in this area (Birkenmajer and Olsson 1970) we suppose that the higher marine terraces were probably formed during Pleistocene.

5. Conclusions

The remarks collected during a geomorphologic mapping of the northern Hornsund seaside enabled to:

— application of uniform morphologic criteria at defining the marine terraces,
— separation of 15 marine terraces; the lower ones (2 m, 4.5—6 m, 8—12 m, 16—18 m, 22—25 m, 32—35 m, 40—46 m, 45—46 m, 60—65 m, 70—75 m a.s.l.) occur mainly in a seaside tundra whereas the higher ones (80—95 m, 100—115 m, 180—190 m, 200—205 m, 220—230 m a.s.l.) — lie in side hanging valley and are preserved in fragments only.

6. Summary

A geomorphologic map of the area to the north of Hornsund (between the Torell Glacier and the Treskelen Peninsula) was prepared. Basing on uniform morphologic criteria (Fig. 1) fifteen raised marine terraces were distinguished at the altitudes: 220—230 m, 200—205 m, 180—190 m, 100—115 m, 80—95 m, 70—75 m, 60—65 m, 45—46 m, 40—46 m, 32—35 m, 22—25 m, 16—18 m, 4.5—6 m and 2 m a.s.l. (Figs 2—5). The terraces occur at the seaside tundra as well as within the side valleys. They are unevenly distributed; the greatest areas are occuppied by them at Kvartsittsletta, Skjerstranda and Rålstranda where they occur at the altitudes of 4.5—6 m, 8—12 m, 16—18 m, 22—25 m a.s.l. and sporadicly, at 32—35 m and 40—46 m a.s.l. Vast areas are also occuppied by the marine terraces in lower and middle part of Revdalen and at Fuglebergsletta (the terraces: 4.5—6 m, 8—12 m, 22—25 m, 40—46 m, 45—46 m, 60—65 m, 70—75 m a.s.l.), but the terraces 8—12 m and 22—25 m a.s.l. have been dissected by pronival and outwash waters. In the other parts of the Hornsund area the marine terraces are in fragments only, either due to the outwash erosion (Elveflya) or due to predominance of a shore destruction by the sea over the processes of accumulation (Hyrneodden, at the foot of Gnålberget and Fannytoppen). Larger areas are occuppied by the marine terraces in inner Hornsund: at Bogstranda (2 m, 22—25 m, 32—35 m, 45—46 m a.s.l.) and at Treskelen (2 m, 4.5—6 m, 8—12 m, 16—18 m, 22—25 m, 40—46 m, 45—46 m, 60—65 m, 100—115 m a.s.l.).

The highest terraces (80—95 m, 100—115 m, 180—190 m, 200—205 m, 220—230 m a.s.l.) occur almost entirely in side hanging valleys (Bratteggdalen, Steinvikdalen, Gangpasset, a small valley in the Rotjesfjellet massif, Skålfjelldalen, Ariedalen) and are much destructed.

On the ground of other papers the authors suppose the lower terraces to have been formed in Holocene whereas the others — in Pleistocene.

7. Резюме

Составлено геоморфологическую карту территории, расположенной севернее Хорнсунда, между ледником Торелла и полуостровом Трескелен. На основании однородных морфологических критериев (рис. 1) выделено 15 возвышенных морских террас, расположенных на высоте: 220—230 м, 200—205 м, 180—190 м, 100—115 м, 80—95 м, 70—75 м, 60—65 м, 45—46 м, 40—46 м, 32—35 м, 22—25 м, 16—18 м, 8—12 м, 4,5—6 м и 2 м выше уровня моря (рис. 2, 3, 4 и 5). Эти террасы выступают как на морской низменности, как и в области боковых долин. Они распределены неравномерно; Самые большие пространства занимают Квартситтлетта, Скерстранда, Ральстранда, где выступает система террас: 4,5—6 м, 8—12 м, 16—18 м, 22—25 м выше уровня моря и время от времени: 32—35 м и 40—46 м выше уровня моря. Такие же большие пространства занимают морские террасы в нижнем и серединном участке Ревдален, а также на Буглебергслетта (террасы: 4,5—6 м, 8—12 м, 22—25 м, 40—46 м, 56—46 м, 60—75 м, 70—75 м выше уровня моря), но террасы 8—12 м и 22—25 м выше уровня моря были разрезаны водами пронивальными и зандровыми. На остальной территории морские террасы выступают фрагментарно из-за зандровой эрозии (Эльвефолия) или вследствие преобладания процессов уничтожения берегов морем над процессами аккумуляции (Хырнэодден и подножья Гнальбергет и Фаннитоппен). Большие пространства, занятые морскими террасами, обнаружены внутри Хорнсунда: на Богстранда (2 м, 22—25 м, 32—35 м, 45—46 м выше уровня моря) и Трескелене (2 м, 4,5—6 м, 8—12 м, 16—18 м, 22—25 м, 40—46 м и 45—46 м, 60—65 м, 100—115 м выше уровня моря).

Самые высокие террасовые уровни (80—95 м, 100—115 м, 180—190 м, 200—205 м, 220—230 м выше уровня моря) выступают почти исключительно в завешенных боковых долинках (Браттеггдален, Стеинвикдален, Гангпассет, долинка в массиве Роттесфеллет, Скальфеллдален, Аредален) и в большой степени разрушены.

8. Streszczenie

Wykonano mapę geomorfologiczną obszaru położonego na północ od Hornsundu, pomiędzy lodowcem Torella a półwyspem Treskelen. W oparciu o jednolite kryteria morfologiczne (rys. 1) wyróżniono 15 podniesionych tarasów morskich, położonych na wysokościach: 220—230 m, 200—205 m, 180—190 m, 100—115 m, 80—95 m, 70—75 m, 60—65 m, 45—46 m, 32—35 m, 22—25 m, 16—18 m, 8—12 m, 4.5—6 m i 2 m n.p.m. (rys. 2—5). Tarasy te występują zarówno na równinie nadmorskiej, jak i w obrębie bocznych dolin. Są one rozmieszczone nierównomiernie; największe przestrzenie zajmują na Kvartsittsletta, Skjerstranda i Rålstranda, gdzie istnieje system tarasów: 4.5—6 m, 8—12 m, 16—18 m, 22—25 m n.p.m. oraz sporadycznie: 32—35 m i 40—46 m n.p.m. Równie rozległe powierzchnie zajmują tarasy morskie w dolnym i środkowym odcinku Revdalen oraz na Fuglebergsletta (tarasy: 4.5—6 m, 8—12 m, 22—25 m, 40—46 m, 45—46 m, 60—65 m, 70—75 m n.p.m.), ale tarasy 8—12 m i 22—25 m n.p.m. uległy tam rozcięciu przez wody proniwalne i sandrowe. Na pozostałym obszarze tarasy morskie występują szczątkowo, bądź wskutek erozji sandrowej (Elveflya), bądź wskutek dominacji procesów niszczenia brzegu przez morze nad procesami akumulacji (Hyrneodden, u podnóża Gnålberget i Fannytoppen). Większe przestrzenie zajęte przez tarasy morskie stwierdzono miejscami we wnętrzu Hornsundu: na Bogstranda (2 m, 22—25 m, 32—35 m, 45—46 m n.p.m.) i Treskelenie (2 m, 4.5—6 m, 8—12 m, 16—18 m, 22—25 m, 40—46 m, 45—46 m, 60—65 m, 100—115 m n.p.m.).

Poziomy tarasowe najwyższe (80—95 m, 100—115 m, 180—190 m, 200—205 m, 220—230 m n.p.m.) występują prawie wyłącznie w zawieszonych dolinkach bocznych (Bratteggdalen, Steinvikdalen, Gangpasset, dolinka w masywie Rotjesfjellet, Skålfjelldalen, Ariedalen) i są w poważnym stopniu zniszczone.

Na podstawie nawiązań literaturowych autorzy sądzą, że tylko najniższe tarasy morskie powstały w holocenie, zaś pozostałe reprezentują starszy okres — plejstoceński.

9. References

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