

Dedicated to Prof. L.-K. Königsson

CHANGES IN CULTURAL LANDSCAPES ON KASSARI ISLAND SINCE THE EARLY 18th CENTURY

Toomas KOKOVKIN and Kaja LOODLA

The Hiiumaa Centre of the Biosphere Reserve, Vabrikuväljak 1, EE-3200 Kärdla, Estonia; e-mail: toomas@bka.hiiumaa.ee

Received 30 October 1997

Abstract. During the last 300 years, the cultural landscapes of Kassari Island (West Estonia) have been developing under changing human activities and natural factors. Shore displacement has caused alterations in the size of the island and the distribution of agricultural lands. Concurrently, changes in land use have shaped the cultural landscape. A comparison of geographical maps from 1709, the late 19th century, 1900, 1956, and 1990 revealed a general tendency towards an increase in forested areas, which replace former grasslands or wooded meadows. Arable lands have, as a rule, remained in the same place over the whole period studied. Relationships between landscape changes, socio-economic conditions, and natural background are discussed. The superposition of maps was carried out using the GIS package IDRISI.

Key words: cultural landscape, landscape change, islands, land uplift, land use.

INTRODUCTION

Small islands, being comparatively closed natural and economic systems, provide favourable conditions for studying changes in cultural landscapes. Because of the limited size of islands, the equilibrium between ecological functions and human demands is rather fragile there. Temporal changes on islands may be sudden and sharp. The modelling of these changes is especially attractive in Estonia as the islands are developing under the conditions of the regressive sea here.

Cultural landscape is an ecosystem pattern modified by human beings in the interaction with geological, edaphic, and climatic factors. A cultural landscape is a heritage of both natural evolution and human cultural history. As Königsson (1986) pointed out, most cultural landscapes depend not only on the present-day situation but also on the accumulated effect of all previously developed

landscapes within a narrow area. Selected parts of the resources of a region have been utilized through the conscious and successive efforts made by farmers, cattle holders, craftsmen, industrial people, and so on, and each new landscape has used additional parts of the original natural wealth (Königsson, 1986).

This article is aimed to demonstrate the temporal variations in cultural landscapes against the background of natural diversity on Kassari Island, West Estonia. The period of time from 1709 to 1990 is covered. This is the period for which we possess geographical maps of the island. The results are part of a broader research carried out as a university degree study of one of the authors (Loodla, 1994).

STUDY AREA AND THE NATURAL BACKGROUND

Kassari Island is considered to be the fifth largest island of Estonia, although it is connected with a bigger island, Hiiumaa, by two dams (Fig. 1). Kassari has been one of the most intensively managed Estonian islands for centuries. The area of the island is about 20 km², and its maximal height is about 15 m a.s.l. The surface of the island is undulating, a glaciofluvial esker crosses the island from south-west to north-east.

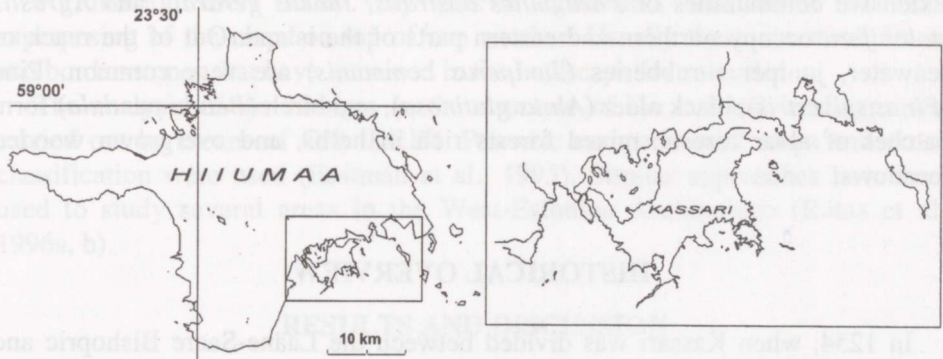


Fig. 1. Location of Kassari Island.

The Quaternary cover of Kassari consists of till, glaciolacustrine clays, glaciofluvial gravels, and various marine sediments (Fig. 2). The thickness of the Quaternary cover, underlain by Silurian limestone, is about 5–20 m (Eltermann, 1992). Due to the uplift of the earth's crust in the region, the island is rising at a rate of about 2 mm per year (Vallner & Zhelnin, 1975). This has caused considerable shoreline displacements in the shallow sea observable over a period of the last 300 years.

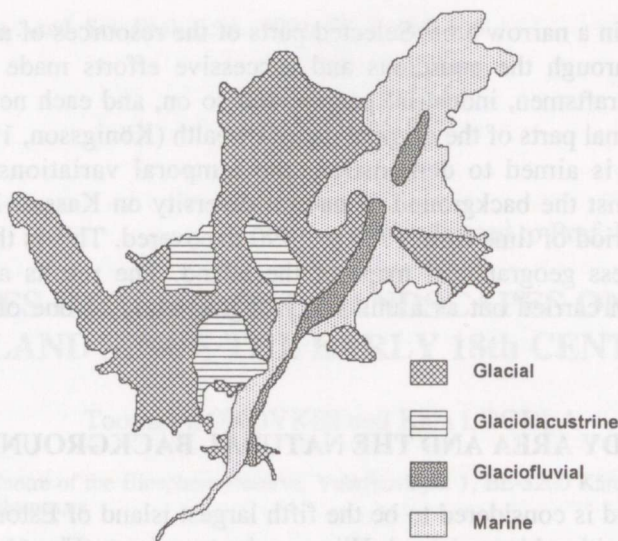


Fig. 2. Quaternary deposits of Kassari Island (Eltermann, 1992).

Coastal meadows and reed-beds are widespread due to sloping shores. Extensive communities of *Phragmites australis*, *Juncus gerardii*, and *Agrostis stolonifera* occupy northern and eastern parts of the island. Out of the reach of seawater, juniper shrubberies (*Juniperus communis*) are very common. Pine (*Pinus sylvestris*), black alder (*Alnus glutinosa*), and birch (*Betula pendula*) form patches of alvar forests, mixed forests rich in herbs, and overgrown wooded meadows.

HISTORICAL OVERVIEW

In 1254, when Kassari was divided between the Lääne-Saare Bishopric and the Livonian Order, the island consisted of two parts separated by a shallow strait. On the maps of 1709, this channel has disappeared. Shortly before the period of our observation several dramatic events took place: in 1695–97 crop failures and famine, and in 1700 the Great Northern War began. The war did not affect directly the islands of Hiiumaa and Kassari, except that the Swedish rule was replaced by Russian one. In 1710, the plague devastated the country.

In the 18th century, under the conditions of serfdom, the land was owned and the economy of the island was operated by two manors. Since the middle of the 19th century, peasants could buy the land into private ownership. This change in the land ownership ended the communal land use, which had its roots in prehistoric primitive communities, and destroyed the traditional village system.

The 20th century has seen extensive social and economic changes with several land reforms, involving nationalizations and privatizations of land.

The population of Kassari has been quite stable: there were about 300 inhabitants on the island in 1709 and 301 in 1994. In 1850 the number of inhabitants was 472, in 1930 there were over 400 inhabitants, while in 1970 the number was 269 and by 1989 it had fallen to 248 (Loodla, 1994; Ihermann, 1994).

METHODS

Changes in the cultural landscape of Kassari Island were studied by comparing geographical maps of the island dating from 1709 to 1990 (see list of maps, p 124). All the maps were digitized and transformed to a common scale using the GIS package IDRISI. A common simple classification of land use was applied to describe the landscape units.

There are several restrictions to the method. First, the meanings of land use and reflection of vegetation on the maps may have changed during the observed period. Secondly, the maps are of different scale and projection. Thirdly, the shape of the island has changed considerably during 300 years. Fourthly, no map to cover the period from the early 18th century to the mid-19th century was available.

Fortunately, there exist very precise landmarks that allow of exact superposing of the maps on top of one another. Usually these are stone fences and border-stones that have remained in the landscape for centuries.

The analysis of the changes in the structure of the cultural landscape was carried out by means of GIS IDRISI. Pairwise comparison of maps and cross-classification were used (Eastman et al., 1995). Similar approaches have been used to study several areas in the West-Estonian Archipelago (Ratas et al., 1996a, b).

RESULTS AND DISCUSSION

According to Königsson (1990), the cultural landscape may be defined as the result of transfers of resources from Nature to Man. All sorts of human activities are counteracted by nature within the range of the ecological reactions. The result is the landscape aspect, which is dynamic, and which mirrors the functionalistic relations between man and nature (Königsson, 1990). In this meaning the notion of cultural landscape has very tight connections to the term 'land use'.

Using these 'functionalistic relations' as the starting point, we shall try to find answers to the following questions concerning the changes of cultural landscape of Kassari since the early 18th century:

1. What units of landscape have been most stabile and which ones most variable?

2. How is the stability (variability) of landscape units related to the history and natural background of landscapes?

3. What have been the main tendencies of changes of landscape units?

The landscape pattern of the island is described on the basis of a classification that includes fields, grasslands, wooded meadows, shrubberies, woodlands, orchards, and settlements. Figures 3–7 present the cultural landscapes of Kassari in the early 18th century, second half of the 19th century, early 20th century, in the 1950s, and at the end of the 1980s.

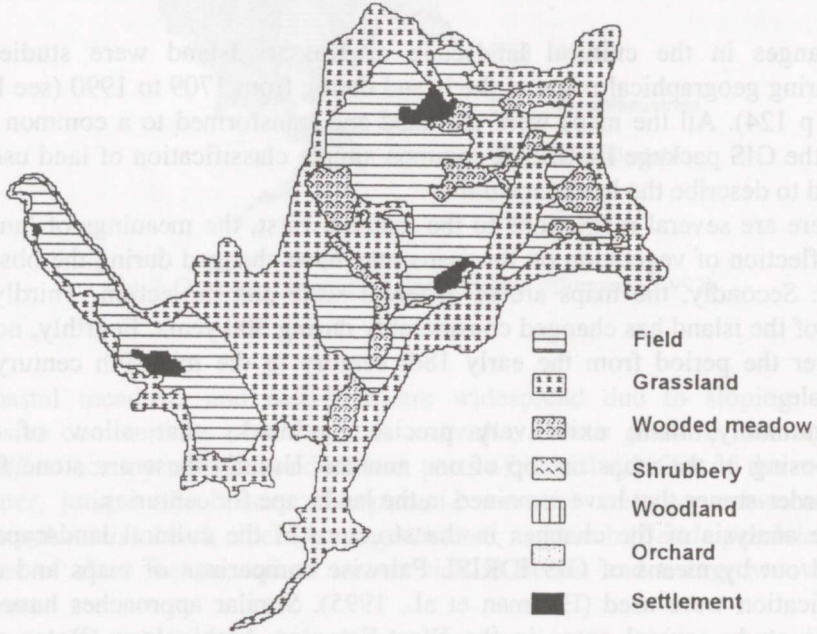


Fig. 3. Landscape of Kassari Island in the beginning of the 18th century.

A comparison of the maps from the 18th and 19th centuries reveals, as the main difference, an increased area of coastal grasslands, which is a result of the shoreline displacement. As seen from the map of 1709, all lands suitable for fields were tilled, and overmoist coastal areas were grazed. By that time, there was no primary vegetation left on Kassari. Shrubberies were almost absent due to heavy grazing. In places, badlands with exposed stones and opened sand had developed as a probable result of overgrazing. Cows were the main domestic animals in that time, which is shown in the legend of the original map, but also horses, sheep and goats were grazed. Hay was mown from wooded meadows. Hence, in the beginning of the 18th century, Kassari had opened landscapes where fields and grasslands predominated with some proportion of wooded meadows.



Fig. 4. Landscape of Kassari Island in the 1880s. See Fig. 3 for legend.

By the 1880s, the area of fields had decreased. Some changes in the location of fields had taken place: 126 ha of fields had been abandoned in comparison with 1709, and 86 ha of new fields had been created. New fields were established on former grasslands. The village of Orjaku had been destroyed and ploughed into a manor's fields (Tiik, 1974). Also, several wooded meadows had been cut to create fields, but the total area of wooded meadows remained unchanged since some grasslands had overgrown with trees. Fields had shifted to new locations, particularly to former overmoist grasslands. Thanks to improved agricultural technology, more gleyic soils were cultivated in addition to rendzic soils. A considerable increase in the area of grasslands in the course of 200 years is related to the exposing of vast sandy coasts formerly submerged by the sea.

The main change by the beginning of the 20th century was an increase in shrubberies. Most probably former sparse juniper shrubberies had become denser. Some increase in the area of fields can be observed, however, it does not reach the level of the Swedish period in 1709. The area of wooded meadows increased by about 50 ha during 30 years. Former grasslands were ploughed up to make new fields. This can be explained by the improvement of amelioration systems. By the end of the 19th century, according to maps, the area of shrubberies had

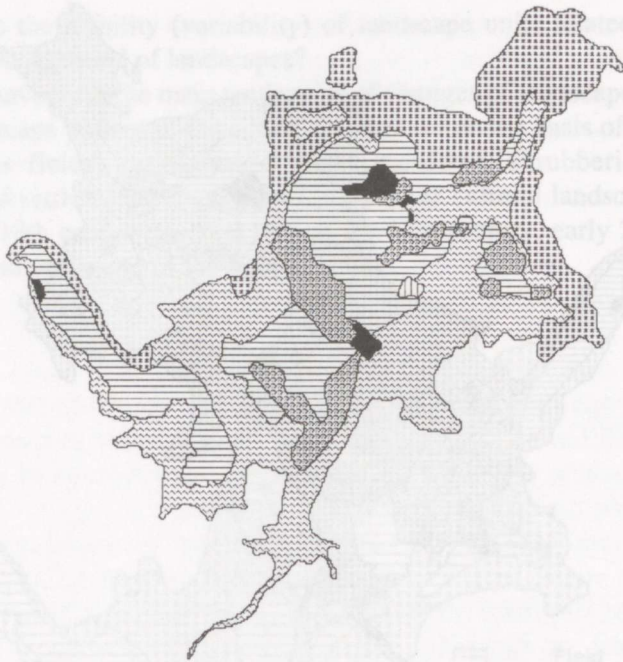


Fig. 5. Landscape of Kassari Island in the beginning of the 20th century. See Fig. 3 for legend.

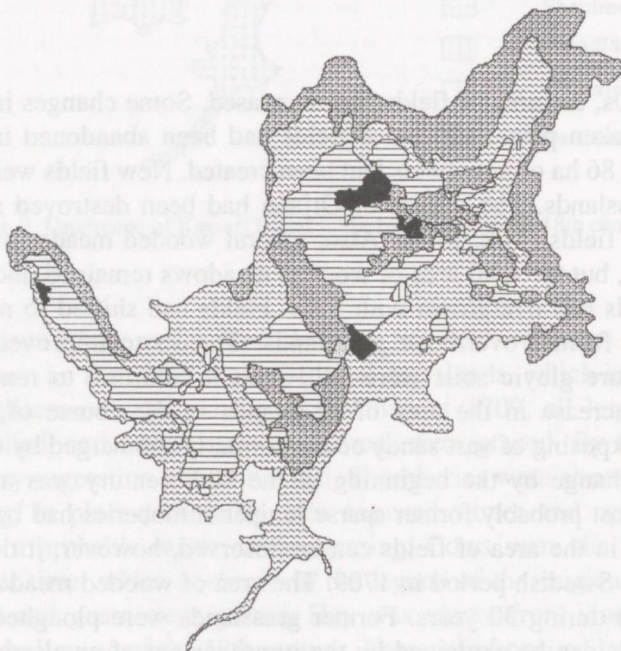


Fig. 6. Landscape of Kassari Island in the 1950s. See Fig. 3 for legend.

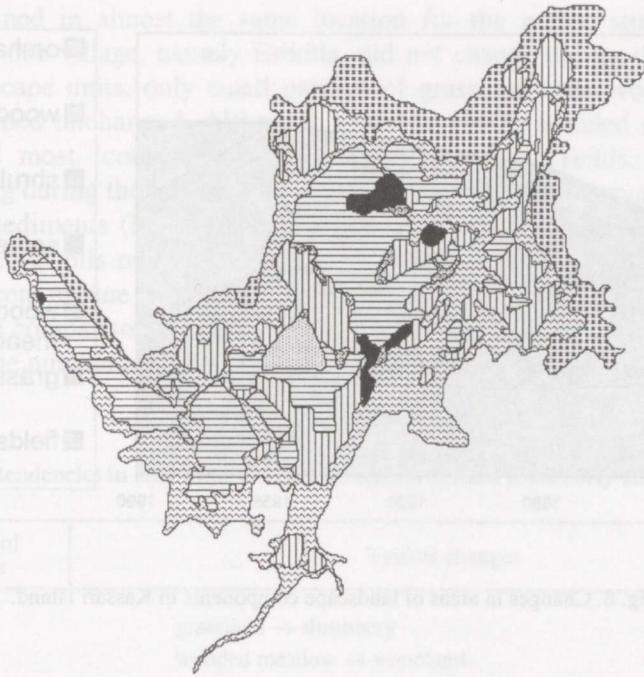


Fig. 7. Landscape of Kassari Island by the end of the 1980s. See Fig. 3 for legend.

increased due to overgrowing of grassland. Saying this, we are aware of a possibility of changed map legends rather than real changes in nature. However, the overgrowing of the island is quite probable, since the manors of Kassari and Orjaku had extensive grasslands for hay-making, about 500 ha in total, out of Kassari Island, on Hiiumaa.

By the 1950s, a considerable increase had occurred in the area of fields, of which newly reclaimed lands constituted a large part. Wooded meadows were still extensive, but juniper shrubberies had expanded considerably. Since the 1950s until today, the changes in the cultural landscapes of Kassari have been more dramatic than during the preceding 250 years.

Until 1990, the main change was replacement of shrubberies and meadows by woodlands. Woodlands, which did not occur in Kassari at least from the beginning of the 18th century, occupied about 450 ha of the island in 1990. At the same time, the area of fields reached its minimum. A new unit on maps is a large orchard.

The above-described changes in the extent of landscape units of Kassari are shown in Fig. 8. Concurrently with changes in proportions, an increase in the total area of the island is apparent, making up about 5 km² during the 300 years.

Superposition of the five maps used reveals areas that have not changed (Fig. 9). Cultivated fields have been the most stable landscape unit, since they

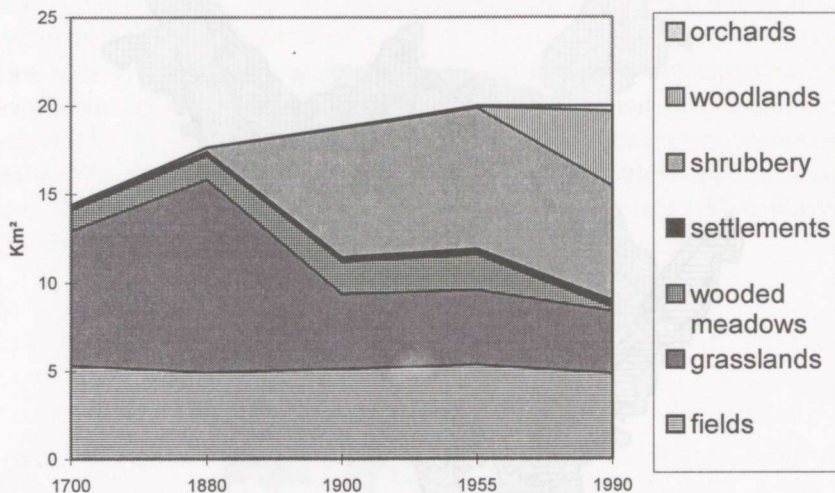


Fig. 8. Changes in areas of landscape components in Kassari Island.

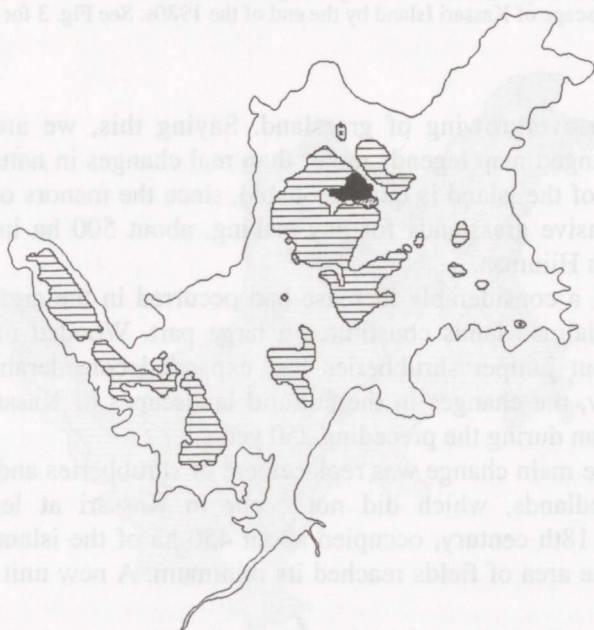


Fig. 9. Areas without changes in land use since the early 18th century. See Fig. 3 for legend.

have remained in almost the same location for the period studied. Also the location of one village, namely Esiküla, did not change during that time. As to other landscape units, only small patches of grasslands and wooded meadows have remained unchanged. Although, until the 1950s, wooded meadows were the second most 'conservative' landscape units after fields. However, the overgrowing during the last decades makes the difference. Comparing unchanged areas and sediments (Fig. 2) one may conclude that the most stabile areas are those of fertile soils on glacial deposits. Oppositely, the use of less fertile soils on more recent marine sediments has altered repeatedly.

Pairwise comparison of maps gives interesting results about the tendencies of changes. The number of changes and the main tendencies are shown in the table.

Main tendencies in landscape changes on Kassari Island since early 18th century

Number of changes	Typical changes
1	grassland → shrubbery wooded meadow → woodland
2	grassland → shrubbery → woodland grassland → wooded meadow → woodland
3	grassland → field → shrubbery → field flooded area → grassland → shrubbery → woodland
4	(insignificant area)

It is remarkable that only one tendency revealed in the table is of human origin, i.e. grassland → field → shrubbery → field, which describes recurring cultivation of land. All other tendencies reflect the process of natural successions.

The changes observed on Kassari are in agreement with the main tendencies of landscape changes of Estonian islands during the 20th century, as reported by Ratas et al. (1996a, b):

natural grasslands	→	deciduous woodlands,
natural forests	→	managed forests,
natural grasslands	→	large fields,
natural woodlands	→	large fields, and
small fields	→	woodlands

Nowadays, Kassari is a landscape reserve and a very attractive site for tourists. Coastal areas are under pressure of new residencies and summer houses, while agricultural activities have strongly decreased. Although it is difficult to predict the development trends of future cultural landscapes, it is probable that overgrowing with woods and shrubs will continue. The reason is that the demand for landscape as a resource has changed in the course of last decades. The landscapes of Kassari provide mainly recreational resources; their function for sustaining the local community through agricultural use has become less significant.

CONCLUSIONS

1. The history of the cultural landscape of Kassari is a reflection of political, social, economic, and technological events. Cultural landscapes have remained unchanged only in cases of constant use of natural resources.

2. Fields have been the most stable landscape units and have mainly remained in the same location for the studied period; only small patches of grasslands and wooded meadows have remained unchanged.

3. The most stabile landscape units were those on fertile soils on glacial deposits. Oppositely, the use of less fertile soils on more recent marine sediments has altered repeatedly.

4. By the beginning of the 18th century, all the natural resources of Kassari were exploited. The main changes until the second half of the 20th century were connected with the improvement of agricultural technologies on arable lands. The second half of the 20th century is characterized by falling diversity in landscape utilization. Mowing and grazing have almost vanished. The island is overgrowing with woodlands.

5. An overall tendency during the last 300 years is a shift from human-shaped opened landscape towards seminatural closed landscape.

6. The conservation of the 'traditional' landscape of Kassari is possible only through the conservation of traditional agriculture and lifestyles, which is obviously an unrealizable task.

MAPS

Geometrisk Charta Öfwer Oriaks, 1709. Geometrisk Charta Öfwer Cassari Hollma, 1709.

Karte von den im Wieckschen Kreise und Phhalepschen Kirchspiel gelegenen, zum privaten Gute

Dagoë Kassar gehörigen Dörfern Ees & Taggakülla, Ignatius, 1883.

Karte der Hofslaendereien des privaten Gutes Dagoë Kassar, Ignatius, 1885.

Karte von der Landstelle Orjack, Ignatius, 1875.

Russian Verst Map of Estonian Province, 1900.

Topographical map, 1956. 1:10 000. Fotoplan. Severo-Zapadnoye predpriyatiye Selkhozaoeros'emka.

Topographical map, 1990. 1: 10 000. Riigiettevõtte "Eesti Maauringud".

REFERENCES

- Eastman, J. R., McKendry, J. E. & Fulk, M. A. 1995. *Change and Time Series Analysis*. UNITAR, Geneva.
- Eltermann, G. 1992. Hiiumaa pinnakatte geoloogiast. Manuscript in The Hiiumaa Centre of the Biosphere Reserve.
- Ihermann, A. (comp.) 1994. *Hiiumaa aastaraamat A.D. 1993*. Hiiumaa Teadus- ja Hariduskeskus TUURU, Kärdla.
- Königsson, L.-K. 1986. The Fjällnäs project: Natural and cultural components in landscape formation. – Nordic Late Quaternary biology and ecology. *Striae*, **24**, 177–186.
- Königsson, L.-K. 1990. Pollen analysis in archaeology and geoarchaeology. *FACT* **13**, 81–104.
- Loodla, K. 1994. Kultuurmaastike muutused Kassari saarel aastatel 1709–1990. Diploma paper. Manuscript in the Institute of Geography, University of Tartu.
- Ratas, U., Kokovkin, T. & Puurmann, E. 1996a. Pikaajalised maastikulis-ökoloogilised struktuuri-muutused saarte geosüsteemides. ETF Grant 1192. Final report. Ökoloogia Instituut, Tallinn. Manuscript in the Institute of Ecology, Tallinn.
- Ratas, U., Puurmann, E. & Kokovkin, T. 1996b. Long-term changes in insular landscapes on the example of Vohilaid, West Estonia. In *Estonia. Geographical Studies*. Estonian Geographical Society, Tallinn, 90–106.
- Tiik, L. 1974. Kassari kaugetest aegadest. *Nõukogude Hiiumaa*, 4. juuli.
- Vallner, L. A. & Zhelnin, G. A. 1975. Novaya karta izobaz territorii ÉSSR. In *Sovremennye dvizheniya territorii Pribaltiki*. Tartu, 48–57.

KULTUURMAASTIKE MUUTUSED KASSARI SAAREL ALATES 18. SAJANDI ALGUSEST

Toomas KOKOVKIN ja Kaja LOODLA

Kassari asub Hiiumaa kaguosas ja on viimasega ühendatud tammidega. Saare suurus on 20 km² ja maksimumkõrgus 15 m ü.m.p. Pinnakattes on valdavaks mitmesugused merelised setted, liustikutekkelised kruusliivad, viirsavid ja moreen. Saar asub maakerke alal, mistõttu viimase 300 aasta rannajoone ümberkujunemine on olnud märkimisväärne. Mitmetesse ajajärkudesse kuuluvate geograafiliste kaartide võrdlemisel on selgitatud Kassari kultuurmaastikes toimunud muutuste põhitendents. Olemasolevad kaardid pärinevad 1709. aastast, 19. sajandi teisest poolest, 20. sajandi algusest ning 1950. ja 1980. aastate lõpust. Kaardid digitaliseeriti ja analüüsiti programmiga IDRISI.

Ligi kolme sajandi jooksul on koos saare pindala kasvuga toimunud mitmed kultuurmaastike pindalalised muutused. Rootsiaegse Kassari maastik oli avatud, põldude ja rohumaade kõrval oli vähesel määral puisniite. 19. sajandil lisandus põõsastikke arvatavasti niitmise ja karjatamise koormuse vähenemisel. Suurem murrang on toimumas 20. sajandi lõpul, kui puisniidud ja põõsastikud hakkavad metsastuma. Põllumaa pindala ei ole sajandite jooksul muutunud ning põllud on paiknenud kestvalt samal kohal.