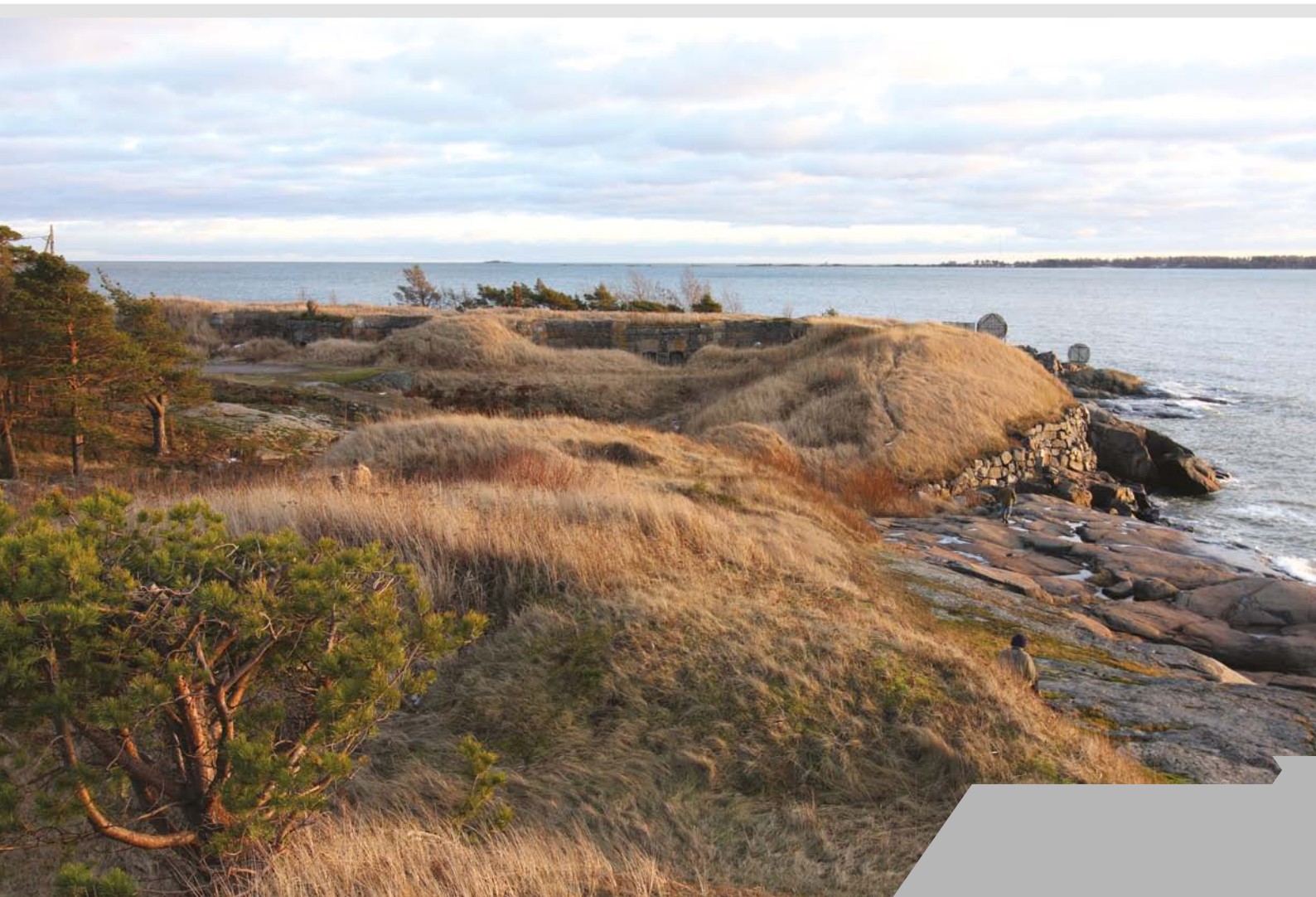




The Defence Forces and Biodiversity

The impact of military activities on natural values



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1 Introduction

The UN declared the year 2010 the International Year of Biodiversity. Biodiversity is the variety of different habitats and species on earth. In honour of the theme year, this publication describes the impact of the Defence Forces' activities on biodiversity and presents some areas used by the Defence Forces that are valuable from the point of biodiversity.

Biodiversity is the variety of different habitats and species on earth.

Finally, environmental protection measures and research relating to the Defence Forces' areas of operation, which is carried out internally by means of planning the Defence Forces' activities and in cooperation with Metsähallitus, will be presented.

2 Impact of military activities on the natural values of areas of operation

The areas used by the Defence Forces are very diverse, not least because of their location. Exercise areas of the Navy are concentrated along the coasts and archipelago of the Archipelago Sea and the Gulf of Finland, while the Army and Air Force operate mainly in forested areas inland and along the coasts as well as in open esker and sand areas. The natural values of the Defence Forces' areas are in other words very different from each other and the effect on the natural values varies according to area and use. The activities' effect on nature is almost always local. However, certain clear common features can be discerned.

The areas used by the Defence Forces are mainly closed and entry into them requires the permission of the brigade-level unit.

■ Closed areas have remained in their natural state

The areas used by the Defence Forces are mainly closed and entry into them requires the permission of the brigade-level unit. These areas also comprise further large areas where movement is restricted; such as firing and target areas used during military exercises. Because the areas are closed and movement is limited, the wear and tear of use in the military's areas has remained low and the nature has not suffered from the effects of building, recreation, road networks or other factors that occur in built-up areas, and that are detrimental to natural values. Forests have been allowed to grow thick and tall to serve as sight, noise and dust barriers, and this helps maintain the biodiversity of nature while at the same time promoting the area's different forms of usage.



■ Regulatory sign in Vattajanniemi.
PHOTO: ANTTI BELOW

In places, the military's exercise activities, especially firing practice and movement of troops has caused a great deal of wear on the terrain. However, considering the pressure on the Defence Forces' areas, despite the exercise activities, natural values have remained unique precisely because the areas have remained closed. In some places exercise activities have even had a positive effect on the biodiversity of nature and a unique flora and set of species has developed that is able to withstand and even requires a certain degree of wear. Changes in the usage of the areas would endanger the sensitive and threatened species that thrive in these dry areas. The areas would become overgrown if usage decreased and increased usage on the other hand would make living conditions too severe.

Old forests are important for biodiversity. They offer a living environment for numerous groups of species and almost one third of Finland's endangered forest species live in old forests. The importance of old forests has to do with the large amount of rotten trees. One fifth of forest species are at least to some extent dependent on rotten wood and the amount of trees in different stages of decay in old forests

exceeds one third of the entire tree stand. The fact that the Defence Forces' areas are closed has spared the forests from efficient forestry and several old forest areas have developed within the military's areas of operation. A broad variety of the endangered shelf fungus species live in these old forests, along with a diverse woodland avifauna that is protected by European Union Directive. In addition to the existing old forests on the land used by the Defence Forces, there is a great deal of future old forests. Protecting their natural state and avoiding forestry measures is especially important in maintaining their natural biodiversity. In areas used by the Defence Forces where forestry has changed the structure of the forests, restoration work has been done under the environmental protection management of Metsähallitus.



■ Live firing exercises promote biodiversity

In recent years, the military's live firing areas have been studied and it has been found that some flora and species that were more common in Finland earlier have been preserved only in the military's exercise areas; where exercise activities have kept sandy areas open and repeatedly created artificial forest fires. Due to efficient fire prevention, natural forest fires are rare in esker areas nowadays and the erosion that takes place after forest fires no longer occurs under natural conditions. As erosion has decreased in sandy areas, the vegetation has slowly taken over the living environment and the endangered species that appear in dry forest fire areas have disappeared as the areas have become overgrown. The military's firing activities have slowed and in places even prevented endangered species from becoming overgrown in the live firing areas.

In sandy areas, the firing causes the fragmentation of the topsoil, the shifting of the sand and small sandpits and sand fields where so-called pioneer plants spread. Pioneer plants, such as Wild Thyme (*Thymus serpyllum*) that is favoured by several endangered species of butterfly, do not compete well with other plants, but do spread quickly to new open substrates. If new ground was not opened up, other vegetation would take over the living area of the pioneer plants and poor competitors such as the wild thyme plants would disappear. Because the larvae

of several endangered insect species that favour hot sandy areas use Wild Thyme, Cat's Foot (*Antennaria dioica*) and other low-growing pioneer plants as a source of nutrition, overgrowth would also weaken the living conditions of the endangered insect species.

The military's firing activities have slowed and in places even prevented endangered species from becoming overgrown in the live firing areas.

◀ Cat's foot on the firing range on the Säkylänharju esker. PHOTO: SARA KAJANDER

Damage to the dunes in Syndalen ▶ caused by too much wear. PHOTO: ANTTI BELOW

Occasional forest fires caused by live firing open up the ground surface to insect species that like scorched environments. Many endangered beetle, true bug, wasp and spider species have been found in the military's exercise areas. In addition to providing hot open sandy areas, firing and keeping visibility sectors open results in fallen trees and rotten wood, which provides a habitat for several insect and shelf fungus species. Thanks to the military, the firing areas have become unique living environments that are not found anywhere else in Finland.

■ Exercise activities and nature

The Defence Forces exercise activities inevitably affect the natural environment, e.g. by wearing down the vegetation, making vehicle tracks and shattering the terrain.

The movement and camouflaging of the troops keeps open biotopes that would otherwise become overgrown and keeps the ground surface broken, thus promoting the living

conditions of the species that live there. However, digging foxholes and moving heavy equipment can cause extensive damage to sensitive habitats.

Assessing and understanding the durability and in some cases durability requirements of areas, improves the possibilities for taking natural values into consideration in exercise activities and in planning them. Concentrating exercise activities in areas where wearing is desirable, for example, saves other more sensitive areas. As conditioning measures, activities have also been moved away from the more sensitive areas.

The prerequisites for the endangered species in the exercise areas have also been taken into consideration in projects supporting the Defence Forces' exercise activities. In connection with the project plans, Metsähallitus was consulted on the conservation of the areas' natural values in the project's implementation phase and after it. Some of the projects have even improved the living conditions of the endangered species and promoted the species' conservation in the future.



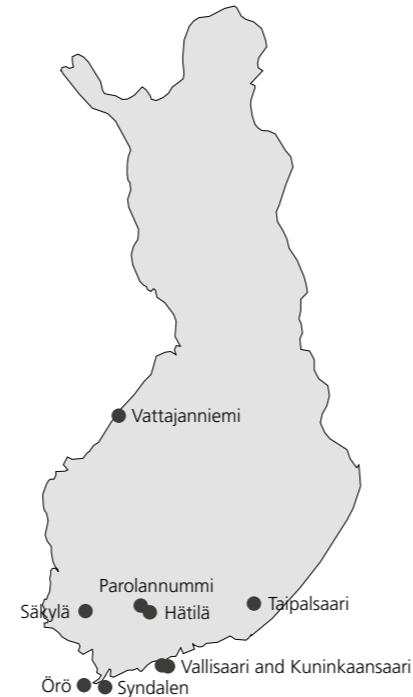
3 Valuable natural environments used by the Defence Forces

The Defence Forces have areas all around Finland at their disposal. Each area of operation has developed over time into a unique natural environment with regard to location, topography and history. Some of the valuable natural areas used by the Defence Forces for live firing and exercises are presented in the following.

■ Vattajanniemi cape, Kokkola

Vattajanniemi is situated on the coast of the Gulf of Bothnia in Central Ostrobothnia, approximately 30 km north of Kokkola. With a usage of over 200 exercise days, Vattajanniemi is one of the Defence Forces' most important military live firing and exercise areas. Vattajanniemi also has Europe's most extensive and impressive range of dune habitats in the boreal or coniferous forest belt and it is an EU *Natura 2000* conservation site. According to the esker protection programme and provincial land use plan, Vattajanniemi is part of a provincially significant regional park. The objectives of these is to limit activities that irreversibly weaken the natural state and landscape of the areas under conservation. Vattajanniemi also belongs to the beach protection programme that aims to keep the beaches unbuilt and in their natural state.

The Vattaja sandy beach is part of the Gulf of Bothnia's most extensive unbroken Eolian sand areas and it is Finland's most important open sand habitat conservation site. The beach was formed into a distinctive sand habitat during the underwater phase following the Ice Age in connection with strong land uplift. The site is on Europe's most rapid land uplift coastline and due



▲ The Defence Forces have at their disposal several valuable natural areas around Finland.

to this the shoreline and vegetation types are moving slowly towards the sea. Due to the rapid coastal land uplift, the wind, movement of the ice, and surge of the sea; sand from the esker area was spread over a large area and became heaped in sandbank and dune formations. The coastal forces continue to shape Vattajanniemi's nature and sandbanks.

Vattajanniemi has been annexed to the *Natura 2000* conservation area network as a site of community importance (SCI), i.e. as a special area of conservation included in Annex I of the Habitats Directive. In the approximately 4,000 hectare *Natura* area, there are 18 habitats that are noted in the Habitats Directive, and 8 of these are especially important prioritised natural habitats. Closest to the sea there are open sand dunes that, moving inland, gradually become covered with vegetation and mainly pine forest. This kind of natural habitat series that includes the entire dune succession is very rare in Finland.

In addition to unique nature conservation values and the Defence Forces' activities, the area is used a lot for recreational purposes. The aim is for the area's usage to be developed and planned so that the drawbacks that ensuring the Defence Forces' activities, recreational use and environmental protection cause each others is minor as possible. In 2005, the *Vattaja Dune Life* project was started up supported by the EU. The purpose of the project was to consolidate the different forms of use in the Vattaja area with preserving its natural values. One of the aims of the Life project was to repair and restore some of the damage caused to the dune nature and collect information on the suitability of restoration methods for sand dune areas.

Vattajanniemi and especially its southern part are among Finland's most important bird areas. Tens of valuable bird species endangered or protected under the EU Birds Directive nest in the area. For example the Baltic Dunlin (*Calidris alpina schinzii*), a critically endangered subspecies of the Dunlin, has been found in Vattajanniemi.

Vattajanniemi habitats

Prioritised habitats

- coastal lagoons
- grey dunes (fixed coastal dunes with herbaceous vegetation)
- dunes with Crowberries (*Empetrum nigrum*)
- coastal meadows
- natural forests of primary succession stages of the land uplift coast
- bog woodland
- deciduous swamp woods
- western Taiga

Other habitats:

- sandbanks which are slightly covered by sea water all the time
- Baltic sandy beaches
- embryonic shifting dunes
- white dunes (shifting dunes along the shoreline with marram grass)
- wooded dunes
- humid dune slacks
- heaths with Heather and Crowberries
- transition mires and quaking bogs
- wooded pastures small rivers and streams

Dunlin in Finland is low-growing coastal meadows. Since the most intensive grazing period ended, the meadows have closed in and become overgrown with bushes, which has led to unfavourable living conditions for the species. Also the coastal meadows of Vattajanniemi have suffered since the end of the grazing period, but in places low-growing living environments favourable for the Baltic Dunlin can still be found. The restoration of the coastal meadows through clearing and grazing began in connection with the Life project in the summer of 2006. The Vatunginjärvi Lake in the north-eastern part of Vattajanniemi, which was almost totally dried out at the beginning of the 1900s, was also restored in connection with the Life project. The aim of this was to improve bird protection, landscape values and the possibility for fish to breed in the lake.

Finland's extensive dune and sand areas have been subjected to tourism and this changed their natural state and affected e.g. the shape and development of the dunes. Vattajanniemi's use as a military live firing and exercise area has kept more extensive recreation and building activities at

bay from the sensitive natural habitats. Although the Defence Forces' activities in Vattajanniemi have been long-term and the wearing effect on the dunes has been significant, from an environmental protection viewpoint, the activities have also had positive effects on the ecological activity and structure of the dune area. The Defence Forces exercise use partly compensates for the missing effect of grazing, in places keeping the dunes active and preventing stabilised dunes from becoming overgrown by the forest. The crowberry dunes for example require the shifting of the sand and the movement caused by the trampling of the military's brigade-level units keeps the sand moving. The existence of the crowberry dunes is essential for the presence of the endangered *Scythris empetrella* moth in the area. In Vattajanniemi, there are at least 5 nationally and 13 regionally threatened species of butterfly and 5 near threatened beetle species. The prerequisite for the existence of species adapted to open sands should be ensured by making sure that their habitat is sufficient, which also helps maintain the diversity of the nature.

Dune succession phases in a nutshell

Sandbanks that are covered by sea water slowly rise above the surface as a result of land uplift, which uncovers new open sand to be shifted by the coastal forces. The sandbanks have almost nothing growing on them and are located close to the beach zone to a depth of approximately 20 meters. The pioneer stage of the dunes is the embryonic shifting dunes, where the waves and wind pile the sand in small mounds at the top of the beach or in dunes on the slopes facing the sea.

In the second phase of dune succession, the shifting marram grass dunes are higher dune formations than in the embryonic phase, where the sand has become permanently stationary. These so-called white dunes have received their name from the light sand that can be seen beneath the sparse vegetation.

Fixed dunes covered with herbaceous vegetation, i.e. grey dunes, are the third phase of dune succession, where the

sand no longer accumulates and the dunes no longer shift. In the grey dune zone, the wind and rain cause erosion, which often lowers the dune ridges and breaks down the surface of the dunes, turning them into an undulating field. This type of dune is named after the grey bottom layer formed by lichen and moss.

Crowberry dunes that are poor in nutrients are located in sheltered places where sand no longer accumulates and the Crowberry (*Empetrum nigrum*) is the absolute dominant species.

Wooded dunes are mostly stable dunes where the accumulation of sand has ceased already a long time ago. Most wooded dunes are located between the open sandy beach or the dune area and the actual forest.

Humid dune slacks are located between the dunes. They are varied environments usually in the form of deflation basins affected by ground water.

■ Vatunginjärvi Lake after its restoration.
PHOTO: ANTTI BELOW

■ Santahamina island, Helsinki

Santahamina is one of the largest islands off the coast of Helsinki and an active training and exercise centre of the Defence Forces. The island is connected to the mainland via the Hevossalmi Bridge. The island of Santahamina is made up of large sand areas, rocky forests as well as forest pools and open bogs. The middle and western part of the island, which is limited by rock ridges, is a class I ground water area. Entry onto the island is subject to permission and for this reason knowledge of the species there is still lacking in part. Based on studies conducted; however, it is clear that Santahamina is an important area for insects, bats, vegetation and birds.

There are many open sand areas on the island, the largest are the extensive "Sahara" in the middle of the island and the firing range called "Riviera" on the eastern shoreline. The 300 years of use as an exercise area have kept Sahara a partly open sand area. Due to the Defence Forces' live firing exercises, Riviera for its part has remained a broad, open sand area that is rich in species. Riviera's beaches are, however, under threat of becoming overgrown. Because it is open and shallow, the beach is a resting and feeding place favoured by wading birds and ducks. In places on the sandy beaches, which are partly made up of active dunes, there is plenty of vegetation typical for sandy beaches such as sea wheatgrass, sea sandwort, sea vetchling, sea rocket and sea kale. Coastal meadow species are also found to a smaller extent along the eastern coastline of the island and the vegetation on the rocky shore is very resembling of the vegetation in the outer archipelago.

The size of the mainly unbuilt island, the varied and heavy use of the land, and its special geomorphology has created the prerequisite for the development of varied vegetation. Santahamina's multiform biotope is greater

than that of the other islands around Helsinki partly because the island's location on the border between the inner archipelago and the open sea increases the variation of vegetation. Also the island's large size, small amount of usage, as well as its unique history has enabled the formation of large forest and bog areas as well as smaller wet areas. The island's main biotopes are rough rocks with pine trees and partly overgrown boreal forest. In the north-western part of Santahamina there are many cultural biotopes, such as old trees and sand embankments. A great deal of old forest has developed on Santahamina, the forests along the beaches have been maintained as visibility and sound barriers as well as protection against the wind in order to avoid storm damage and the forest behind the firing embankments has not been cleared for safety reasons. The island's vegetation includes many endangered plant species that are rare in Helsinki and its archipelago. More than 450 species of vascular plant have been found on Santahamina, which is more than on any other island off the coast of Helsinki.

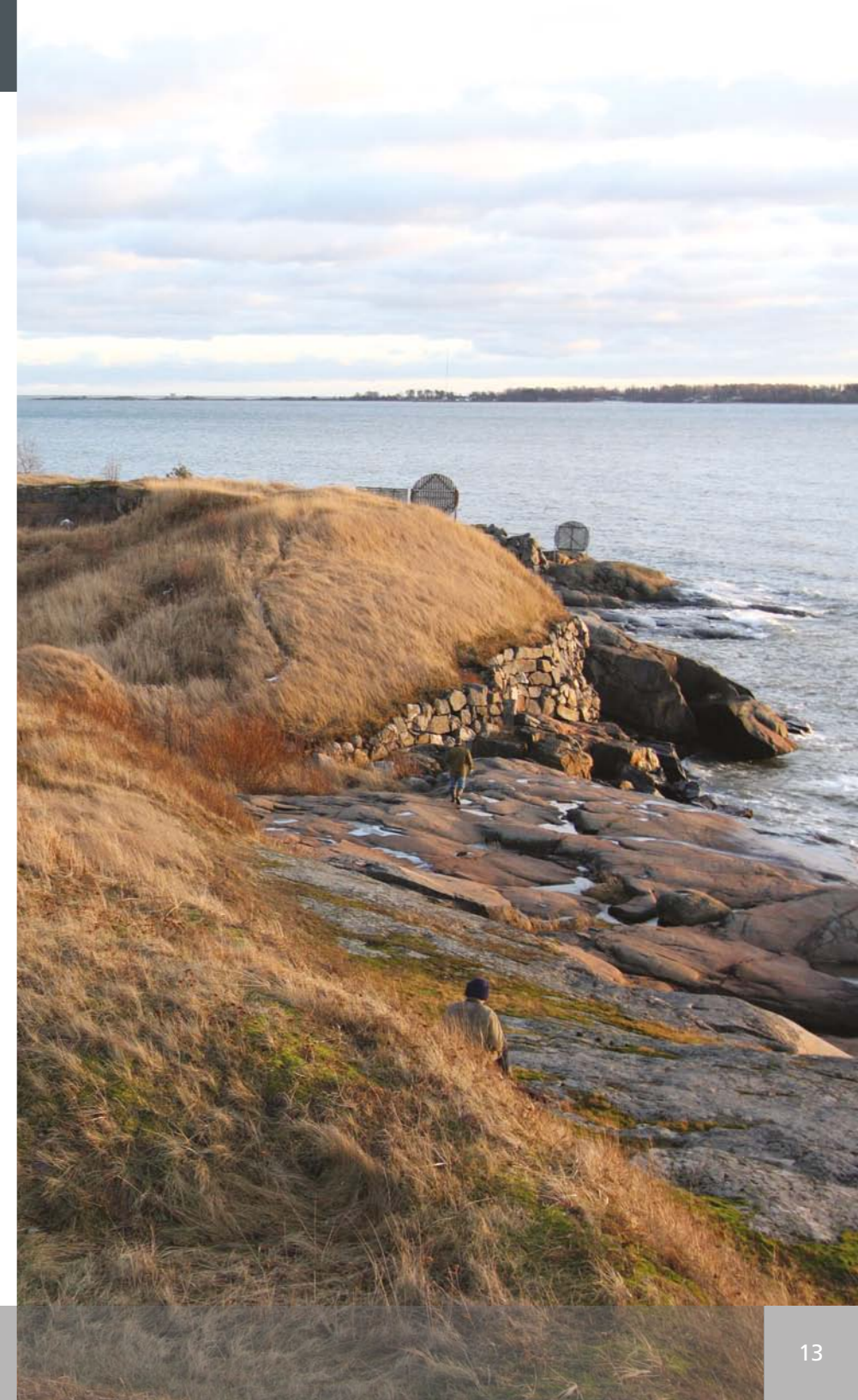
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As part of the coast of the Gulf of Finland, Santahamina is an important habitat for several species of bat. Santahamina's bats, Daubenton's Bat, Whiskered/Brandt's Bats and Northern Bat all require different living conditions to survive. Daubenton's Bat (*Myotis daubentonii*), for example, needs a calm and open

hunting ground, such as a calm beach or an open beach forest, while the light-shy Whiskered Bat (*Myotis mystacinus*) and Brandt's Bat (*Myotis brandtii*), whose sound is almost indistinguishable, hunts in forests and small forest clearings. The Whiskered Bat is not found in economic forests, logging forests and forests with lit recreational pathways. The Northern Bat hunts on beaches and in small open spaces such as parking lots. All of Finland's 11 bat species have been found around the Gulf of Finland and it is quite possible that, in addition to its own bat species, Santahamina is along the migratory route of also other species. Due to their decreasing number, all of the bat species in the EU area are protected according to annex IV of the EU Habitats Directive.

Over 770 different butterfly species have been found over the decades, and over 50 of these are threatened or near threatened. The numbers of some of the endangered butterfly species have increased over the years, but some have retrogressed and their appearance on Santahamina is threatened. The prevalence of the nationally vulnerable Marsh Dagger (*Acronicta strigosa*) and the Wormwood (*Cucullia absinthii*), for example, has increased, while that of among others the Burren Green (*Calamia*

Santahaminan eteläinen linnoitusvalli, ► jolla kasvaa merenrantaniityille tyypillistä kasvistoa.
KUVA: ANTTI BELOW





tridens) and the critically endangered May Shade (*Cnephasia communana*) has decreased on the island. Because it is not permitted to enter some of the areas on the island for security reasons, it has not been possible to extensively chart all of the butterfly species on the island.

The preservedness of the southern tip of the island, its diversity, the representativeness of its flora, aesthetic values such as the impressive seascape and the historical value of the earthworks give added value to Santahamina. Many endangered plant species grow in the meadows and on the cannon battery emplacements, such as the nationally endangered Yellow bedstraw (*Galium verum*), for example. The Kissalampi and Likolampi pools are important nesting places for Horned Greb and an important rearing pond for other waterfowl. The pools also have a diverse variety of dragonflies. The extensive, impressive bog and forest area in near natural state on the south-western side of the island with its diverse type of hardwood swamp also brings added value to the nature of Santahamina.

By Government Decision, Santahamina is classified as a naturally valuable cultural environment. In order to maintain its cultural value, the Decision guides the owners and users of the land and real estate on the island.

Holub Zeiller's Ground Pine has been the first to spread in the burnt area of Säkylä's firing and exercise area. ▶

PHOTO: SARA KAJANDER

◀ PHOTO: SA-KUVA, Defence Forces Photographic Centre.

■ Säkylänharju esker, Säkylä

Säkylänharju is an exceptionally large esker in southern Satakunta and the area is used as an exercise and firing area as part of the Säkylä garrison. The nature of the Säkylänharju area has significant scenic value and it is a geologically and biologically important site. The esker belongs to the national esker conservation programme and the international project to assure the survival of natural biodiversity, the *Natura 2000* network. Due to its long and specific use, a very valuable set threatened species has developed in the area. Many rare plant and insect species, as well as bird species protected by annex I of the EU Birds Directive are found on the Säkylänharju esker.

The vegetation in the Säkylänharju exercise and firing area is very valuable and interesting. Several protected plant species are found in the area, such as the flowering Anthyllis vulneraria subsp. fennica plant, which is only found in Finland. The exercise area is especially well-suited for the vegetation of sunny, dry and sandy areas and it contains many of the food plants used by the species that exist in such areas. Due to this, also the insect species of the area are very valuable, including several endangered species of butterfly and grasshopper. Of the birds included in the Birds Directive, e.g. the European Nightjar and the Woodlark also benefit from the openness of the exercise area.

The only known occurrence of the Eastern Baton Blue (*Scolitantides vicrama*) in Finland and all the Nordic Countries is found in the Säkylä exercise area. The critically endangered Eastern Baton Blue is protected and a species under strict protection that lives in open and semi-open sunny and dry areas with low vegetation. Although the rifle firing range, the so-called Harju range, which is no longer used by the Defence Forces is the Eastern Baton Blue populations' core area, the butterfly is also found to a lesser extent also in the grenade range and open spaces east of the rifle range. Wild Thyme, the food plant used by the larvae is essential for the existence of the Eastern Baton Blue.



The activities of the Defence Forces have promoted the conservation of the species along the Säkylänharju esker as the firing activities have kept open the living environment of the Eastern Baton Blue. Well-known living environments that are favourable for the species have also been maintained since the 90s in cooperation between the Pori Brigade, Metsähallitus and the WWF, e.g. by clearing seedlings and shrubs as well as by burn-clearing overgrown areas.

The Rose Winged Grasshopper (*Bryodemella tuberculata*), another critically endangered insect species also lives on

Säkylänharju. In Finland, the species has been found only in a small area on the Harju rifle range and its population is only a few individuals. Among others the endangered Klimeschia transversella moth and the vulnerable Silver-barred Sable moth (*Pyrausta cingulatus*) and Rattle Grasshopper (*Psophus stridulus*) are also found in the area. In addition to the valuable insect species on Säkylänharju, there is also a strong European Flying Squirrel (*Pteromys volans*) population in the newer forests in the southern part of the esker.

The most important reason for the preservation of threatened insect species in the Defence Forces' firing and exercise areas is the fact that the areas remain open and unbuilt, the pressure of usage is suitable and movement in them is restricted. The overgrowth of vegetation has decimated the living environments of such insect and plant species that used to be common in Finland, and with them the species themselves have disappeared. On the other hand, in some of the open sand areas, the wear has been too strong and food plants have not been able to

establish themselves in the constantly shifting sands and this has also led to a decrease in insect species in these areas. In its present form, however, the use of Säkylänharju has apparently been favourable for the preservation of threatened species, since year after year, critically endangered species continue to be present in the area.

Rattle Grasshopper male. ▼
PHOTO: ANTTI BELOW

Säkylänharju. ▼
PHOTO: SARA KAJANDER

The threatened Rose Winged Grasshopper (*Bryodemella tuberculata*) lives on Säkylänharju. In Finland, the species has been found only in a small area on the Harju rifle range and its population is only a few individuals.



■ Örö island, Kemiönsaari

The fortress island of Örö is located in the Municipality of Kemiönsaari, in the joint action area of the Archipelago Sea National Park. The island is part of the second Salpausselkä esker and has a very valuable concentration of endangered species. Örö is in an exceptionally natural state and contains several natural habitats to be conserved according to the Habitats Directive and Nature Conservation Act. Its most significant natural habitat, esker islands, covers most of Örö and the water area surrounding it. The island's vegetation is very diverse and its insect species is uniquely abundant.

An abundant set of endangered species has developed on the island, which consists mostly of sandy ground and dry boreal forest. Örö's diverse and extensive living environments are in part the reason that the threatened species have remained so healthy in the area. Especially important habitats for butterfly, plant and newcomer plant species are the open and dry areas e.g. at the centre of the island and on the helicopter field. Örö offers a living environment for several bird species classified as threatened and protected by the Birds Directive, as well as for over 160 different types of mushroom.

History of the island

The fort was built by the Russians at the beginning of the 1900s, but handed over to Finland already in 1917. After the war years, the fort functioned as a training fortification of the Defence Forces until 2005. The island is currently used for military war fighting and live firing exercises.



Due to the influence of the sea, the island has impressive sandy beaches, dunes, rocky stone fields and embankments. Örö's western sandy beach is one of the most impressive in Finland and the most valuable for the part of the diversity of its rare and threatened beach vegetation and species. Sea wheat grass (*Elimys fractus ssp. boreoatlanticus*), which is critically endangered and under strict protection, is found in Finland only in the military area on Örö and to a smaller extent on the island of Jurmo. On the western shore grows among other things the rare sea kale (*Crambe maritima*), sea sedge (*Carex arenaria*) and the nationally vulnerable marram grass (*Ammophila arenaria*).

For the part of its butterfly species, Örö Fort is one of Finland's most valuable natural sites. Due to the live firing exercises, tilling of the land and clearing of trees, hot and dry areas have developed on the island that are suitable living environments for many species of butterfly. More than 1,500 species of butterfly are known on the island, and more than one hundred of them are threatened or near threatened species. The numbers are significant, as a total of around 2,500 species of butterfly are known in Finland,

with around 180 classified as threatened or near threatened. Although populations of the island's threatened species have decreased considerably elsewhere in Finland, some of the species are quite numerous on Örö. Restrictions concerning entry and the scarcity of building and recreational use of the island have in part contributed to this. For example the Middle Lace Border (*Scopula decorata*), which was classified as extinct in Finland in the 70s, was still found on Örö at the end of the 90s. The nationally vulnerable large Apollo butterfly (*Parnassius apollo*), which is protected by the Nature Conservation Decree can currently be found on Örö. It is important to note that butterfly species cannot be protected without also protecting their habitats.

The most significant threat to the island's threatened species is the terrain becoming overgrown. This has been slowed by clearing pine and juniper trees and by means of moderate wear on dry areas, e.g. on the helicopter field. The Defence Forces' activities on the island have contributed to maintaining the area's diversity of species by maintaining environments that are favourable for them.

◀ Apollo butterfly on Örö.
PHOTO: ANTTI BELOW



PHOTO: Puolustusvoimien kuvakeskus



■ Syndalen valley, Hanko

The 1,800 hectare exercise area of Syndalen is located on the Hanko peninsula and the area has been used by the Defence Forces since 1931. The rocky ridges of the exercise area are part of the first Salpausselkä esker formation and the area is partly situated in a first class ground water area. The exercise area is mainly composed of dune, bog, forest, lake and sea areas that offer a diverse living environment for Syndalen's abundant threatened species. Syndalen's most important natural sites are the Falkpottarn dune area, the shores of the Sandöträsk and Tvärminneträsk marshes that belong to the shore protection programme, as well as the Stormossen bog area, which partly belongs to the EU project to assure the survival of natural biodiversity, i.e. the *Natura 2000* network

In its entirety, the Stormossen bog and its bordering hardwood swamp is a valuable bog area and it is used as an exercise area by the Defence Forces. Several species of

bird included in Annex I of the EU Birds Directive, rare and threatened species of butterfly, vascular plant and moss and valuable natural habitats included in the Habitats Directive are found in the bog area. One of the area's rarities is the nationally vulnerable peat moss (*Sphagnum molle*), which is under strict protection and thrives on Stormossen's rugged bog with its thin peat layer. The area also functions as a research and teaching site of the University of Helsinki. The Stormossen bog has lost its environmental protection value through drainage. In the near future the bogs will be restored to their natural state. The conservation of Stormossen is important also because of the area's location; Stormossen is Finland's southernmost over 100-hectare bog. The rugged pine woods and future old forests of the Falkpottarn dune area in Syndalen are also valuable natural sites, along with the sandy beach on the north-eastern part of the Hanko peninsula, which to a certain extent has suffered from recreational use that has affected the vegetation and species there.

A very important set of burnt and esker area insect species live in Syndalen, including several threatened spider, true bug, dragonfly and beetle species such as the critically endangered Cardinal Click Beetle (*Ampedus sanguineus*). An abundant set of beetle species live in the Falkpottarn dune area's open sands and dry vegetation, comprising at least ten rare and threatened beetle species. The species of stinging wasp on the exercise area's rocket-propelled grenade range is especially interesting, including among others the internationally very rare Alvar Trail Wasp (*Arachnospila alvarabnormis*) and Finland's only occurrence of Speckled Trail Wasp (*Aporinellus sexmaculatus*). The lack of vegetation in open sandy areas is very important for the conservation of the stinging wasp species and the Defence Forces' firing activities has promoted the conservation of the species by means of ground broken by ammunition and recurring forest fires. Insects that prefer moister conditions thrive along the protected beaches, which are also favoured by threatened birds and protected plants.

The Syndalen exercise area is one of Finland's most important spider areas. Syndalen offers a habitat for many threatened and rare spider species that favour open sand areas. More than 100 species of spider have been found in the area, including many interesting species. For example the Funnel Web Spider (*Agelena labyrinthica*) was supposed to have disappeared in Finland already in the 1950s, but it has slowly increased in number in Syndalen in the 2000s. The Funnel Web Spider, which favours dry meadows and is found mostly in dry open areas, has been seen in Finland only on Öro and a few other islands, in addition to those in Syndalen. Several other threatened, near threatened and rare spider species have also been found in the area, such as the endangered Berlandina cinerea spider and the vulnerable Araneus angulatus spider.

Syndalen firing range after a forest fire. Pioneer grass plants begin to spread onto the open sand areas. PHOTO: ANTTI BELOW

- The Tvärminneträsk target area offers a habitat for bird and plant species that require moist conditions.

PHOTO: ANTTI BELOW

- ▼ Funnel Web Spider waiting for prey in its funnel in Syndalen.

PHOTO: ANTTI BELOW



■ Vallisaari and Kuninkaansaari islands, Helsinki

The islands of Vallisaari and Kuninkaansaari, the largest islands in the Helsinki archipelago, are connected to each other by the Kukisalme sound. The fortification of the islands began in the 1550s, but most of the buildings are from the Russian era in the 1800s. The most intensive use of Vallisaari and Kuninkaansaari by the military lasted until the 1930s, after which the islands have functioned as the naval command's munitions storage area and as an area of operation for individual combat exercises. The islands, which for the most part have been closed, have no permanent population and they have been allowed to develop towards a natural state. The long history of usage and the diversity of the terrain on Vallisaari and Kuninkaansaari have allowed for the development of a rich flora. Their historical and cultural value, together with their diversity and unique nature make Vallisaari and Kuninkaansaari very interesting islands.

The natural value of Vallisaari makes it one of Helsinki's most diverse and valuable areas, and the variety of its flora and biodiversity conservation value are among the most significant in the Helsinki archipelago. The natural reasons for the diversity and impressiveness of Vallisaari and Kuninkaansaari can be found in

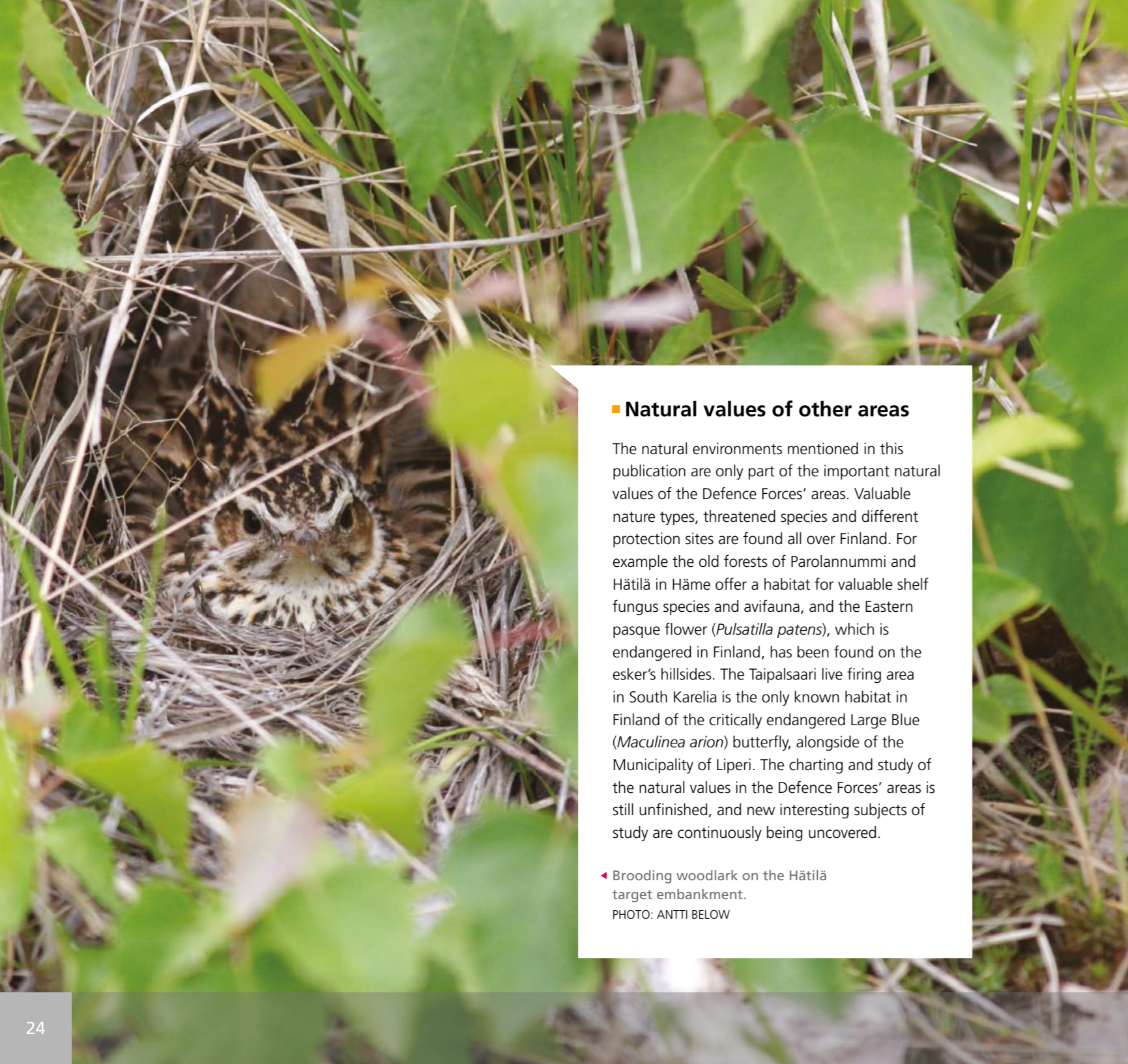
their topography, the variation in conditions of the beach environments, the rock type zone favoured by saxatile plants, the old forested areas in natural state, as well as their pond nature. Fortification and grazing have also increased the number of vegetation types and promoted the natural biodiversity. The diversity of habitats can also be seen in e.g. the number of vascular plant species. Over the years, more than 450 different vascular plant species have been found on Vallisaari and Kuninkaansaari. This is a significant number when considering that the total area of the two islands together is only about 113 hectares. Among others the nationally vulnerable Yellow Bedstraw plant (*Galium verum*) is found on Vallisaari's fortification earthworks, which are also protected by the Protection of Antiquities Act. The islands are significant for the protection of shelf fungi that depend on rotten wood and aspen, and the islands also have some of Helsinki's most impressive deciduous forests. The west-southwest part of Vallisaari is in its natural state, and the impressive common alder swamp has been confirmed as a protected site in the Nature Conservation Act.

Vallisaari and Kuninkaansaari are characterised by strong topography and large differences in elevation. They contain many rare biotopes, such as Vallisaari's common alder and hardwood forests, which are rarely found on other islands. These sizable islands have a low level of usage and are a significant addition to the biotope diversity of Helsinki's archipelago. Silicate rock, a common nature type in Finland, is found in ample measure on the islands. The bedrock on the south part of Vallisaari and a large part of Kuninkaansaari is amphibolite, which is beneficial for vegetation, and although the northern part is mainly composed of rough granodiorite, the opulent vegetation caused by the former population on the island eases the bedrock's effect on the vegetation. The groves, which are relatively frequent on Vallisaari and Kuninkaansaari, originate from human culture. However, the marks directly due to human activity are disappearing. Fortification meadows are common on both islands but as usage has decreased, they are becoming overgrown with vegetation, especially on Kuninkaansaari.

Thanks to the islands' integrity and peacefulness, the avifauna on Vallisaari and Kuninkaansaari is very valuable and diverse. Up to 60 bird species have been found on Vallisaari, of which more than 45 are nesting species. Bird species that are near threatened nationally that nest on the island are at least the Black Grouse (*Tetrao tetrix*), Northern Wheatear (*Oenanthe oenanthe*), Red-backed Shrike (*Lanius collurio*), Common Starling (*Sturnus vulgaris*) and the Hawfinch (*Coccothraustes coccothraustes*). Several threatened and near threatened species of bird protected by the Birds Directive have been observed on both islands. A species noted in the Birds Directive and protected in Finland, the Eurasian Eagle-Owl (*Bubo bubo*), has nested on Kuninkaansaari for years and as far as is known, this pair of Eagle-Owls is the only pair to nest in the Helsinki area.

Over the years, more than 450 different vascular plant species have been found on Vallisaari and Kuninkaansaari. This is a significant number when considering that the total area of the two islands together is only about 113 hectares.

Almost 700 different species of butterfly have been observed in the area of Vallisaari and Kuninkaansaari, of which more than 50 are threatened or near threatened. The abundance of butterflies is explained by the area's topography, which has enabled the exceptional development of the vegetation. In addition to this, the islands are the first places where possible migrating butterflies are observed. Most butterfly observations have been made on the southern part of Vallisaari, near the Alexander battery emplacement where there are many hardwood trees. A large number of other insect species are also found on the islands, such as beetles, stinging wasps and dragonflies and the area's insects include several threatened, rare and otherwise interesting species.



■ Natural values of other areas

The natural environments mentioned in this publication are only part of the important natural values of the Defence Forces' areas. Valuable nature types, threatened species and different protection sites are found all over Finland. For example the old forests of Parolannummi and Hätilä in Häme offer a habitat for valuable shelf fungus species and avifauna, and the Eastern pasque flower (*Pulsatilla patens*), which is endangered in Finland, has been found on the esker's hillsides. The Taipalsaari live firing area in South Karelia is the only known habitat in Finland of the critically endangered Large Blue (*Maculinea arion*) butterfly, alongside of the Municipality of Liperi. The charting and study of the natural values in the Defence Forces' areas is still unfinished, and new interesting subjects of study are continuously being uncovered.

◀ Brooding woodlark on the Hätilä target embankment.
PHOTO: ANTTI BELOW

4 Active environmental protection and research

Within the Defence Forces' areas there are several protected esker and beach areas, Natura 2000 areas as well as other protected natural and cultural areas. In relation to the protected areas, a large amount of inventory and research on nature and the conservation of nature values is done in the military's areas. Alongside of the natural values already charted, also new sites with environmental protection value continue to be sought. Locating such sites is very important in order for it to be possible to ensure the conservation of nature values also in the future, by taking them into consideration when planning the areas' usage and different projects relating to them.

■ Guidelines and management plans support the conservation of natural values

The importance of the conservation of biodiversity and valuable nature types has been taken into consideration within the Defence Administration. The Defence Forces have adapted the activities in their exercise areas in order for the disturbances caused to nature to be as minor as possible. By placing and guiding functions, the aim is to minimise the impact on nature types, so that negative effects that cannot be avoided will be as small as possible. Different agreements and environmental surveys give recommendations on how to consider natural values and the Defence Administration takes these recommendations into consideration in its own decisions, e.g. by limiting usage in key biotopes found to be among the most important

in environmental inventories. By means of internal steering, the protection of the habitats of endangered species and conservation of valuable nature types has begun.

All troops are subject to the service regulations for firing and exercise areas, concerning environmental protection in the area and the minimisation of impact on the environment. The regulations state the known key biotopes that activities are to avoid damaging and the objects of protection programmes that are to be protected as far as possible. E.g. the use of motorised vehicles can be guided through the regulations in such a way that roads and tracks leading to the firing positions are used instead of untouched nature. It is prohibited to drive motorised vehicles on the valuable dunes of the Vattajanniemi sandy beach, for example. The regulations also presume that the troops using the area are familiar with agreements concerning them, as

well as the rules and restrictions concerning the area's usage. In addition to this, the Defence Forces' personnel are trained to know the natural value of the area, so that unintentional accidents do not occur.

In connection with different nature surveys, and in addition to actual natural and species knowledge, recommendations are also given on how to ensure the area's natural value in the future. By means of different restoration and maintenance actions for forests, bogs, lakes, and esker areas, the aim is to repair damage that has already occurred and give instructions on how the natural values in the area could be conserved as well as possible.

■ Research and management measures in cooperation with Metsähallitus

Metsähallitus owns a large amount of the land and water areas used by the Defence Forces, and is naturally also interested in the natural values of the areas. The exercise areas' natural values have been surveyed in cooperation between Metsähallitus' Nature Services and the military's brigade-level units, both for the part of their vegetation and species. Field visits in the areas provide very valuable information on the areas' species and the conservation of biodiversity.

Metsähallitus owns a large amount of the land and water areas used by the Defence Forces, and is naturally also interested in the natural values of the areas.

Together, the Defence Forces and Metsähallitus have carried out management measures in order to conserve valuable natural sites and species. The engineers' detonations, for example, produce dead wood, which benefits species that are dependent on rotten wood. By planning live firing exercises the pressure of usage can be directed to suitable places at suitable intervals. For reasons of fire safety, the tree stand is diversified by increasing the amount of deciduous trees and hardwood swamps are allowed to become waterlogged in order to serve as fire barriers. In addition to this, clearing of juniper trees and seedlings has been carried out in overgrown areas. All of these measures increase the biodiversity of the area both directly and indirectly by creating varying habitats for plant, insect and animal species.

Often, changes to biodiversity in one direction or other are not seen for a long time. The continuation of research and follow-up work in already charted areas is very important because it is difficult to predict how the unique nature in the Defence Forces' areas will react to changes in the use of the land. When planning the future of areas that are no longer used, the unique natural values of the areas must be taken into consideration along with the reasons for the existence of certain rare species and nature types in precisely those areas. Here, research and follow-up work provides essential information.

Steps have been built in Vattajanniemi to direct the movement of the troops and decrease the amount of wear on the wooded dunes. PHOTO: ANTTI BELOW



■ The Defence Forces and Biodiversity

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