Projekt LIFE14 NAT/SE/000201 SemiAquaticLife – “Re-creating habitat complexity for semi-aquatic fauna” medfinansieres fra EU LIFE-programmet.

Report

D2

Monitoring of the impact of project actions: invertebrates in Denmark

Graphoderus bilineatus

Dytiscus latissimus

Leucorrhinia pectoralis

December 2021

Responsible Partner: Amphi International ApS

Projekt LIFE14 NAT/SE/000201 SemiAquaticLife – “Re-creating habitat complexity for semi-aquatic fauna” medfinansieres fra EU LIFE-programmet.

Content

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Introduction

The project SemiAquaticLife – "Recreating habitat complexity for semi-aquatic fauna" (LIFE14 NAT/SE/000201) aims at restoration and improvement of the conservation status of amphibians, *Lacerta agilis* and semi-aquatic insects in Natura-2000 areas in southern Sweden (11), Denmark (18) and Germany (9). The goal is to ensure viable metapopulations of the species listed in Annexes II and IV of the EU Habitats Directive.

The objective of the final monitoring was to assess the status of the target species after implementation of the conservation actions: C1 – digging new ponds and C2- restoring of existing ponds. Therefore, the species were only searched in the ponds established or restored during the project or in immediate vicinity of those ponds.

The invertebrate target species in Denmark were: *Leucorrhinia pectoralis, Graphoderus bilineatus, Dytiscus latissimus* in 10 Danish sites: DK-92, DK-94, DK-95, DK-97, DK-163, DK-168, DK-169, DK-186 and DK-235.

During the site visits under action A3 as well as preparation of the A5 inventory it was concluded that in the sites DK-92 and DK-104 the habitats cannot support the target invertebrates. Thus 8 sites were relevant for action D2: DK-94, DK-95, DK-97, DK-163, DK-168, DK-169, DK-186 and DK-235 and they are described in the report.

The report summarizes results of the final monitoring of targeted insects carried out in 2021 at 7 Danish project sites: DK-94, DK-95, DK-97, DK-163, DK-168, DK-169, DK-235. In the remaining site, DK186, the monitoring of *Leucorrhinia pectoralis, Graphoderus bilineatus* and *Dytiscus latissimus* will be carried out in 2027 due to the late digging and restoration of ponds in fall 2021.

No.	Project site name	Natura 2000 number	Target species of insects	Present in the area before the project start	Monitoring 2021
1	92 Pamhule Skov og Stevning Dam	DK009X059	L. pectoralis	no	Not suitable
2	94 Rinkenæs Skov, Dyrehaven og Rode Skov	DK009X068	L. pectoralis	no	X
3	95 Hostrup Sø	DK009X058	L. pectoralis	no	X
4	97 Frøslev mose	DK009X070	L. pectoralis	no	X
5	104 Lilleskov og Troldsmose	DK009X271	L. pectoralis	no	Not suitable
6	163 Suså, Tystrup-Bavelse Sø, Slagmosen, Holmegårds Mose og Porsmose	DK006Y275 DK006Y231	L. pectoralis, G. bilineatus	yes	X
7	168 Havet og kysten mellem Præstø Fjord og Grønsund	DK006X233	L. pectoralis	yes	X
8	169 Havet og kysten mellem Karrebæk Fjord og Knudshoved Odde	DK006X234	L. pectoralis	no	X
9	186 Almindingen, Ølene og Paradisbakkerne	DK007X080	D.lattasimus, G. bilineatus	yes	Monitoring in 2027
10	235 Jægerspris Skydeterræn	DK003X297	L. pectoralis	no	X

Results

Monitoring of *Leucorrhinia pectoralis* was carried out at 7 sites in 2021: DK94, DK95, DK-97, DK163, DK168, DK169 and DK235. On the 8th site, DK186, the monitoring of *Leucorrhinia pectoralis, Graphoderus bilineatus* and *Dytiscus latissimus* will be carried out in 2027 due to the late digging and restoration of ponds in fall 2021. The experience during the last 25 years from digging of new ponds in sand or clay soil has shown us that new ponds need about five years of maturation before a sufficient diverse and dense vegetation to support demanding/rare species of amphibians and insects. To give all new and restored habitats a chance to be colonized the monitoring will therefore be carried out in 2027.

The monitoring focused on recording colonisations of new and restored ponds. No animals were found thus colonization could not be confirmed. *Leucorrhinia pectoralis* was monitored by searching for adults resting in vegetation around ponds or flying over these on warm and sunny days. *Graphoderus bilineatus* and *Dytiscus latissimus* was monitored by dipnetting in shallow water for the adult beetles on warm and sunny days. Also larvae of *Dytiscus latissimus* was searched by dipnetting.

The targeted insects are highly dependent on a species-specific vegetation dominated by sedges and mosses which takes several years to develop, especially in new ponds. The composition of the soil and possible sources of seeds in the surroundings are determining factors for the speed of colonization. Since the vegetation in most of the project ponds was far from sufficiently developed at the time of monitoring thus no colonisation could be expected. What also must be taken into consideration is the very low number of individuals in the existing populations resulting in a low potential dispersal. I.e., on DK97 the colonisation of the new ponds could only occur from the German side of the bog and *Leucorrhinia pectoralis* is not occurring in a stable population there. It only occurs frequently in some years on the German side. There are no known sources of of *Leucorrhinia pectoralis* in the vicinity of DK94 and DK95. Therefore, colonization probably awaits a good year of reproduction and dispersal of the dragon fly from populations in Schleswig-Holstein. The dispersal of dragon flies differs a lot between the years depending on the summer weather. In DK163 the new and restored ponds were also monitored for *Graphoderus bilineatus* without positive result.

Figure 1 Typical Danish habitat of Leucorrhinia pectoralis. Notice the well-developed flora of mosses in the pond. Photo: Niels Damm

In conclusion the effect of the project on populations of the targeted insect species cannot be assessed fully yet due to the lack of colonization of the newly created habitats. It will take several years for maturation of the habitats and to confirm dispersal of the animals from the quite modest sources to establish new populations.

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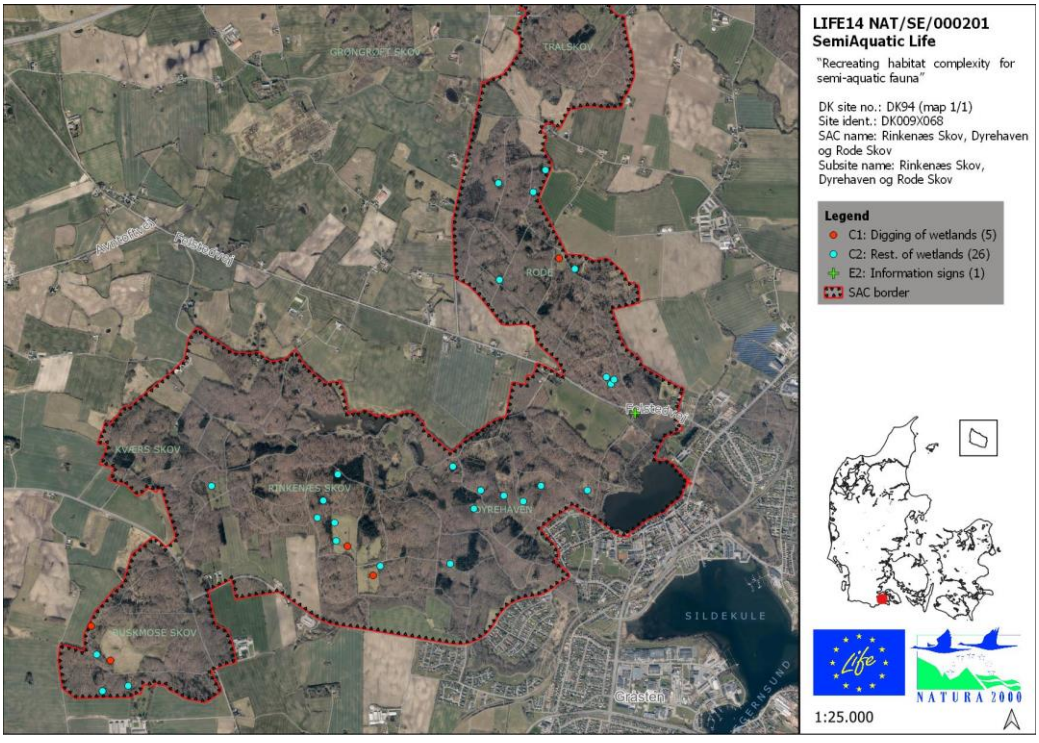
DK94 Rinkenæs Skov, Dyrehaven og Rode Skov

Leucorrhinia pectoralis was not found in the site. Only a few of the new and restored habitats will be suitable for the dragon fly because most ponds are dug on clay soil favoring amphibians. A few ponds on peat soil or partly of peat soil were dug and there is a potential that these habitats can be colonized when the vegetation becomes well developed after min. 5 years. There are no known source populations of of *Leucorrhinia pectoralis* in the vicinity of DK94. Therefore, colonization probably awaits a good year of reproduction and dispersal of the dragon fly from populations in Schleswig-Holstein.

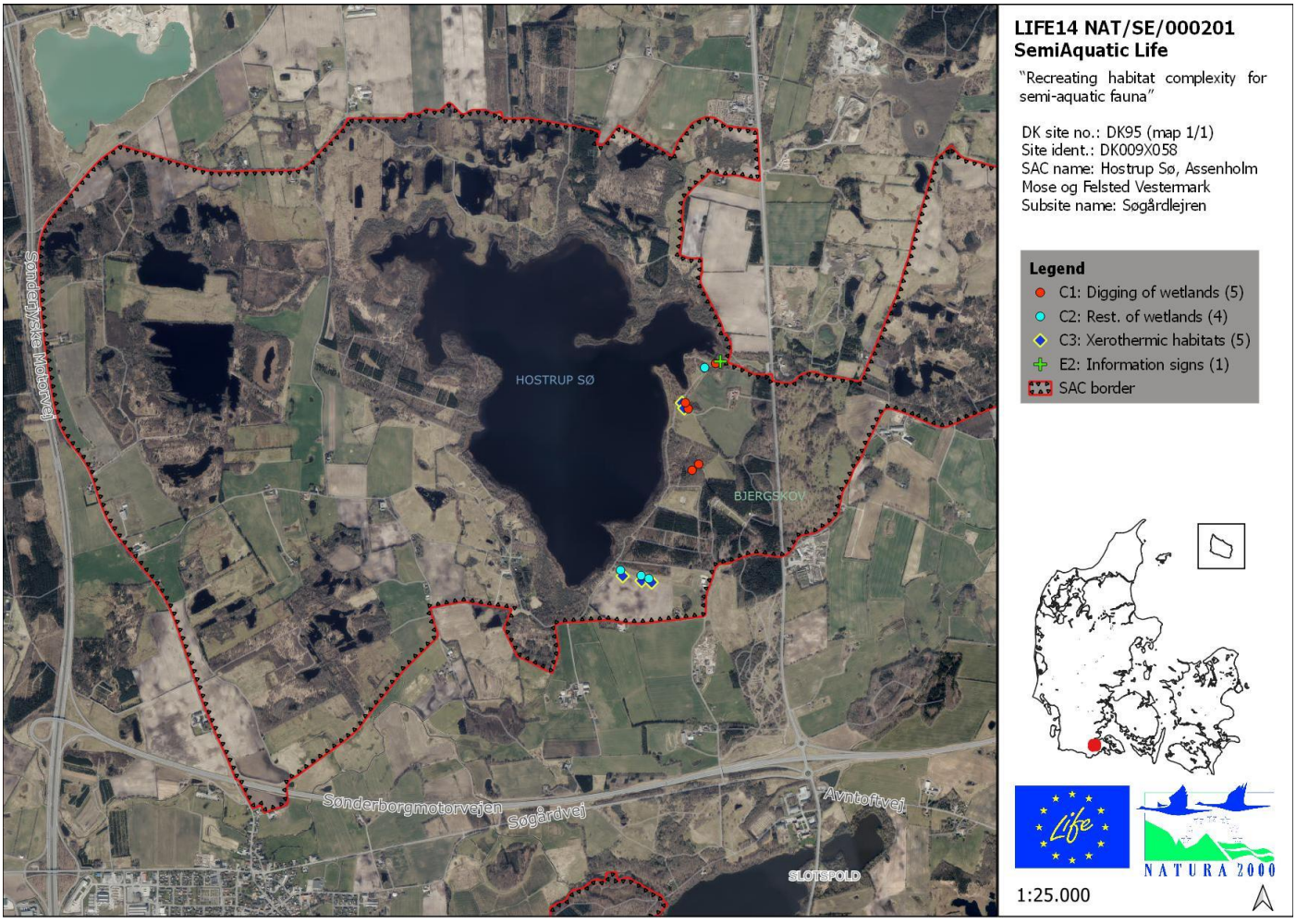
Restored and enlarged ponds during the project.



DK95 Hostrup Sø

Leucorrhinia pectoralis was not found yet in the dug and restored ponds in the site but there has been created a potential habitat in two shallow ponds with a vegetation partly consisting of mosses. There are also smaller trees nearby which is essential for the dragon fly as resting places. There are no known source populations of of *Leucorrhinia pectoralis* in the vicinity of DK95. Therefore, colonization probably awaits a good year of reproduction and dispersal of the dragon fly from populations in Schleswig-Holstein.

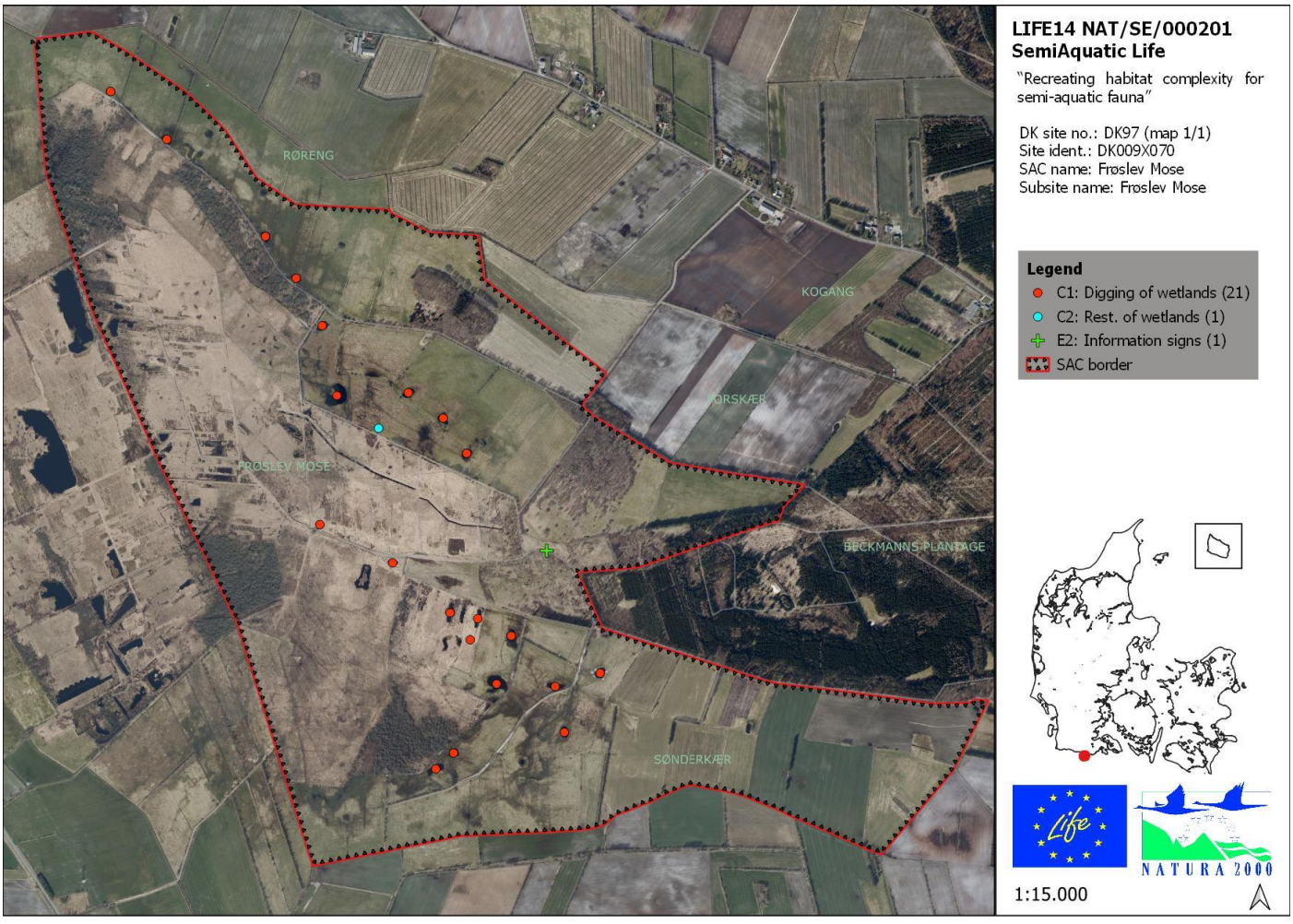
New ponds dug in the project.



DK97 Frøslev Mose

Leucorrhinia pectoralis was not found yet in the dug and restored ponds in the site, but Frøslev Mose will probably be one of the first Danish sites to be colonized by the dragonfly. If a stronger population can be built up from the German side of the moor, there is now a cluster of new ponds dug in the transition zone between the moor and the sand. Due to the low level of nutrients in the soil the development of vegetation will take at least five years.

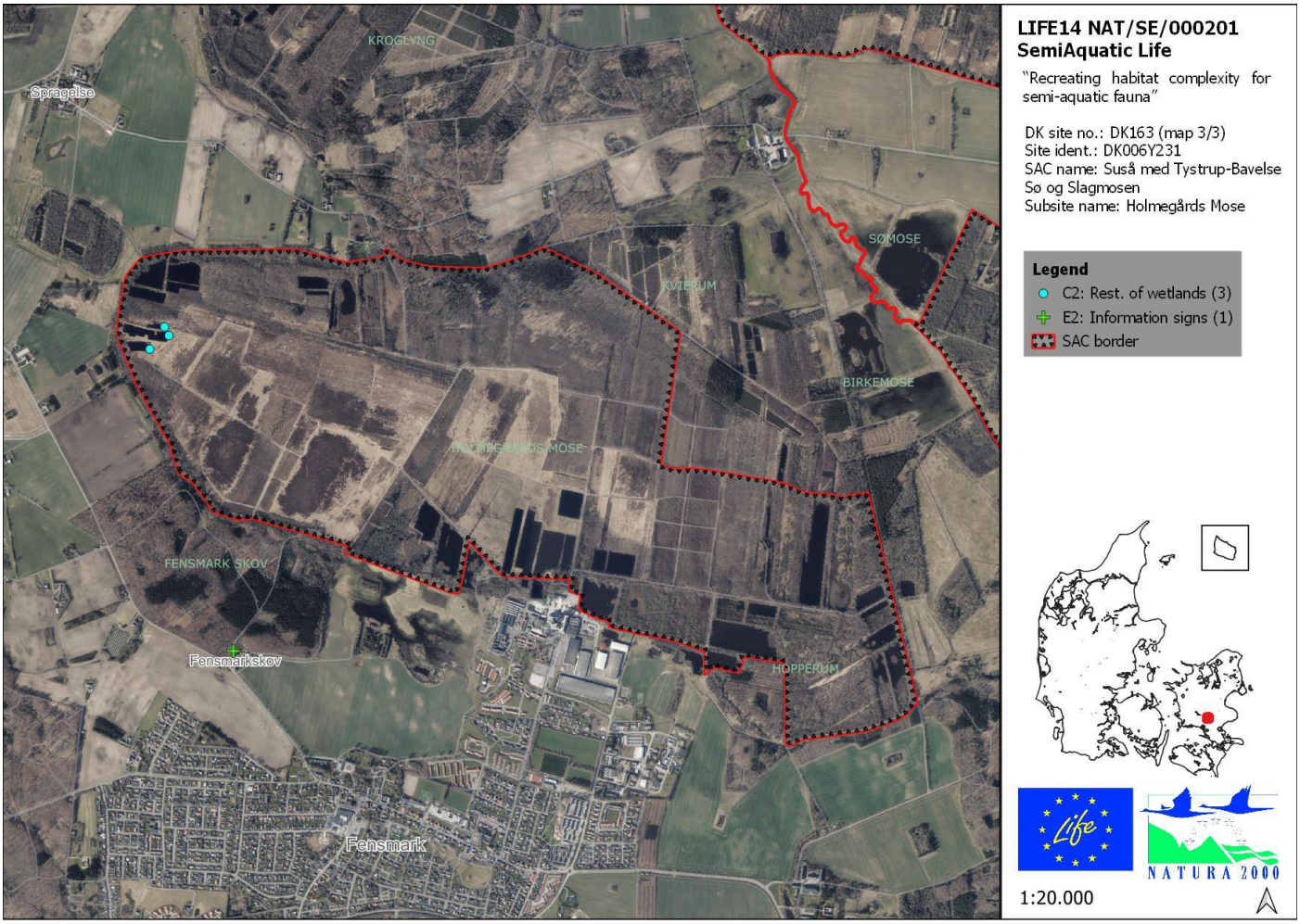
New ponds in the moor situated next to trees dug during the project.



DK 163 Holmegaards Mose, Tystrup-Bavelse

In Holmegaards Mose old peat-ponds were improved by lowering the banks of the former almost vertical sides. These old ponds probably will be among the first to be colonized by *Leucorrhinia pectoralis* and *Graphoderus bilineatus* present in the area (Fig.2, Fig.3,).

Restored and new pond in the project.



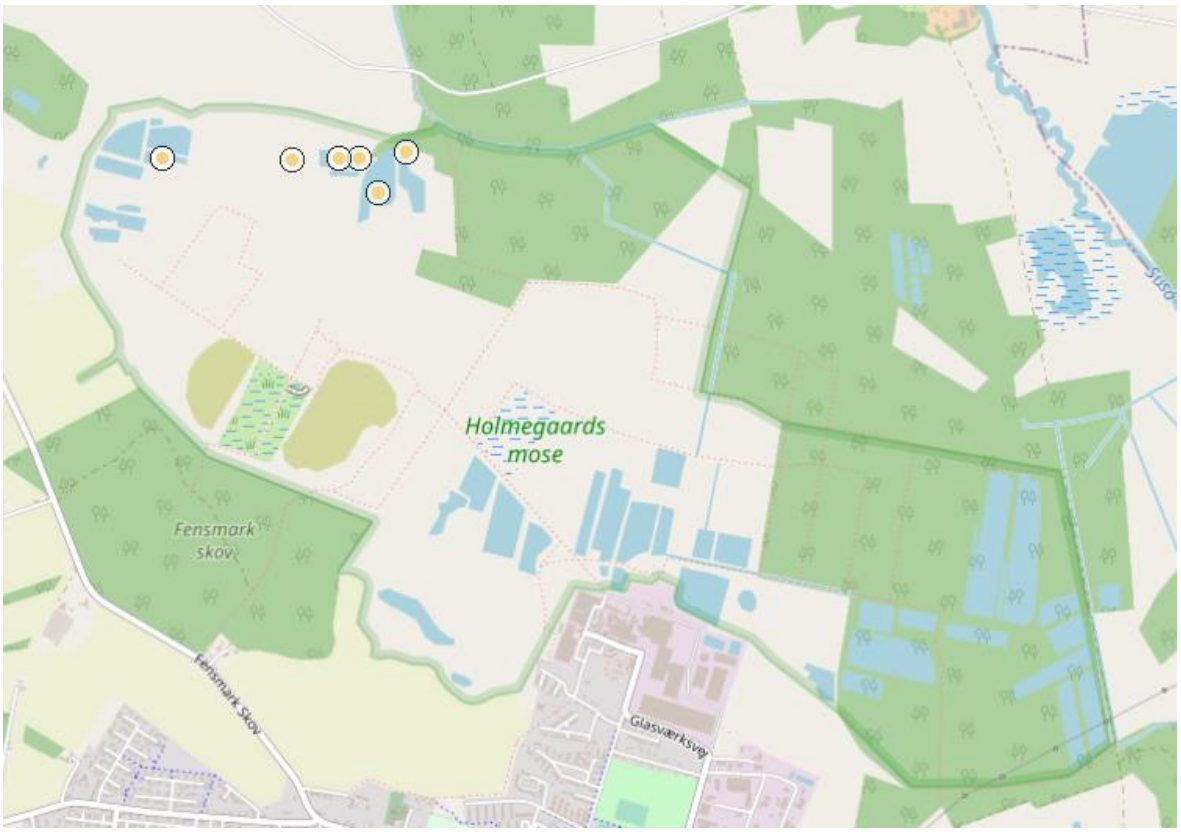


Figure 2 Presence of G.bilineatus in the area. Source: arter.dk

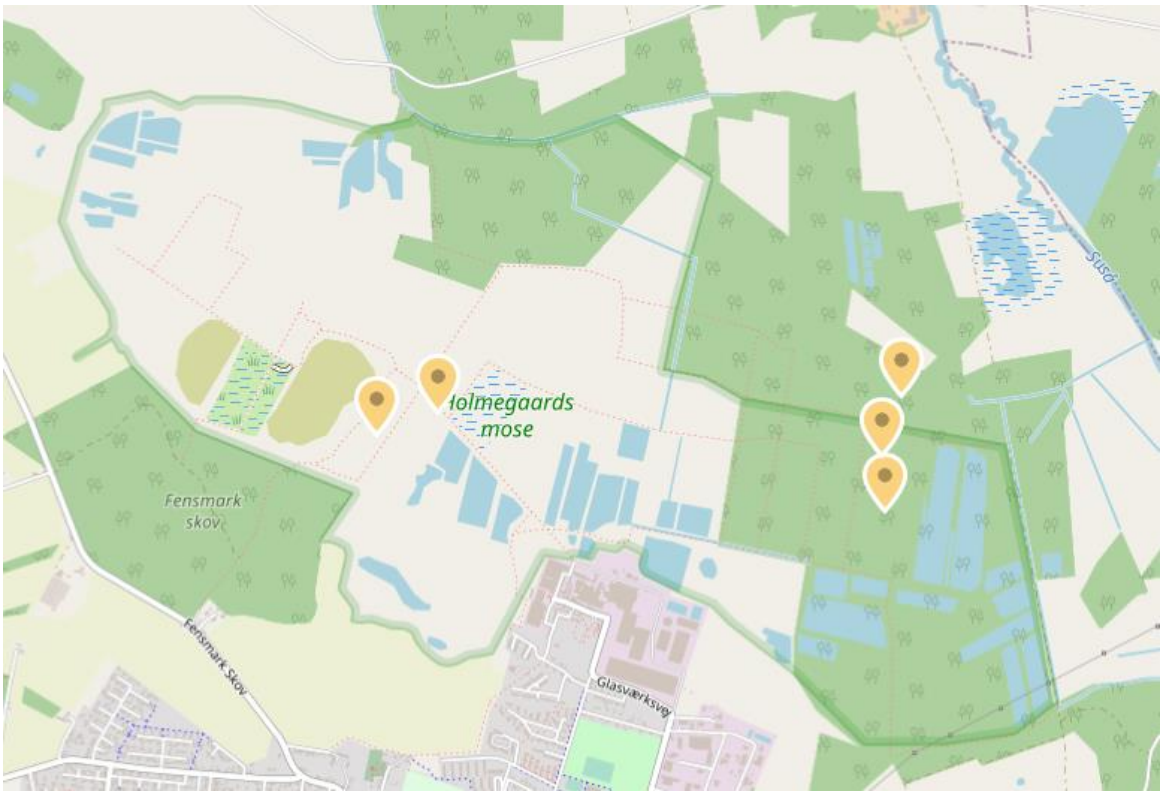
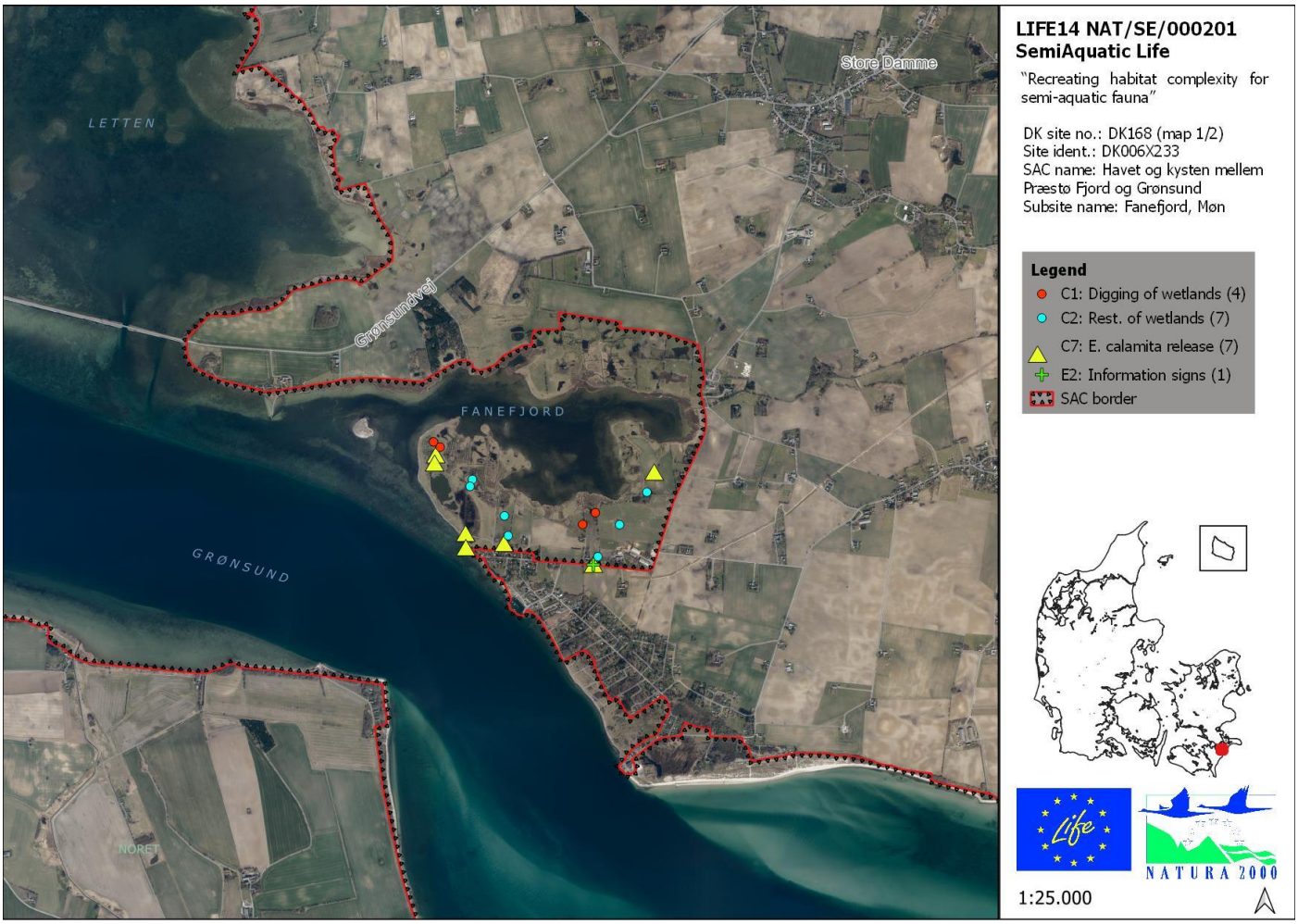


Figure 3 Presence of L.pectoralis in the area. Source: arter.dk

DK 168 Vestmøn

Leucorrhinia pectoralis was not found in the dug and restored ponds during the project. Closest populations of the species were recorded in the northern part of the island at Ulvshale during 2011-2014 and it is expected that colonisation will take time.

Ponds restored in the project.



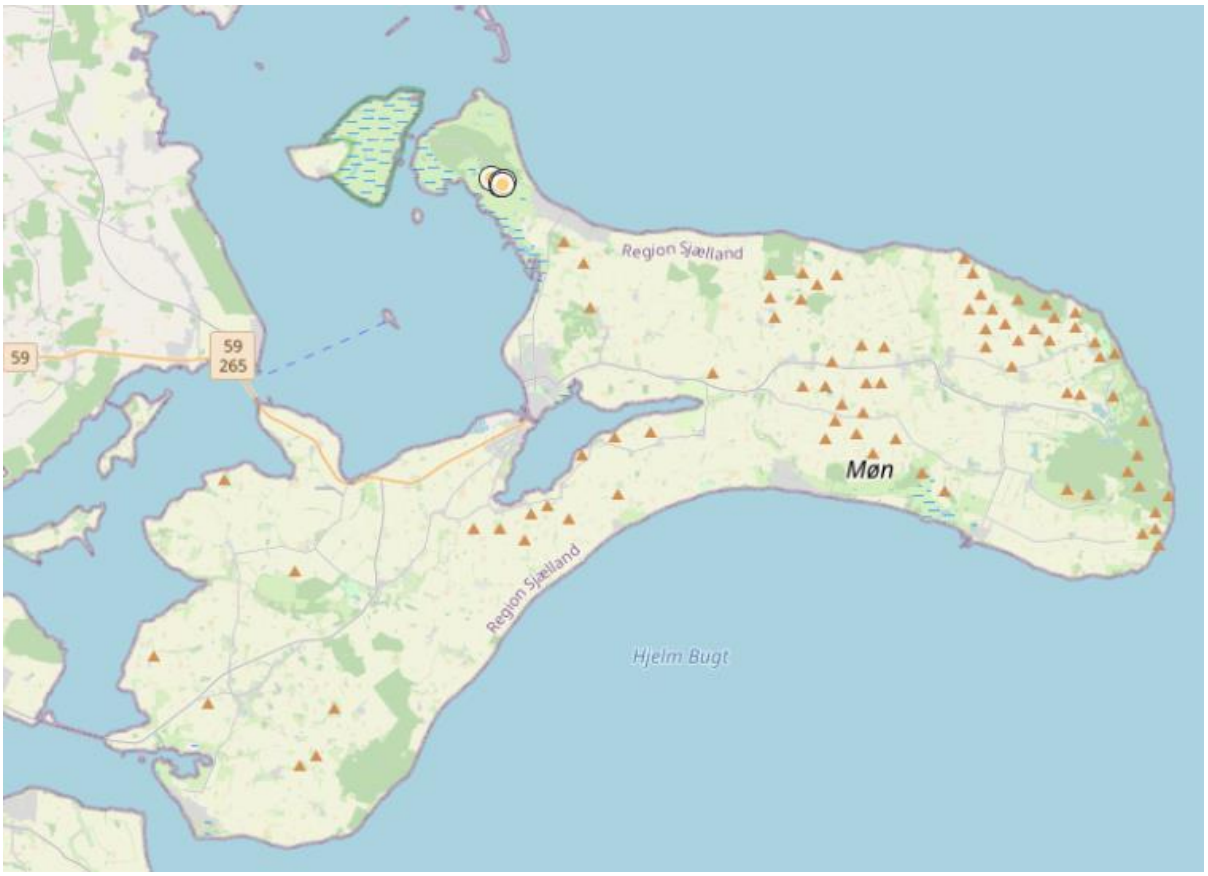
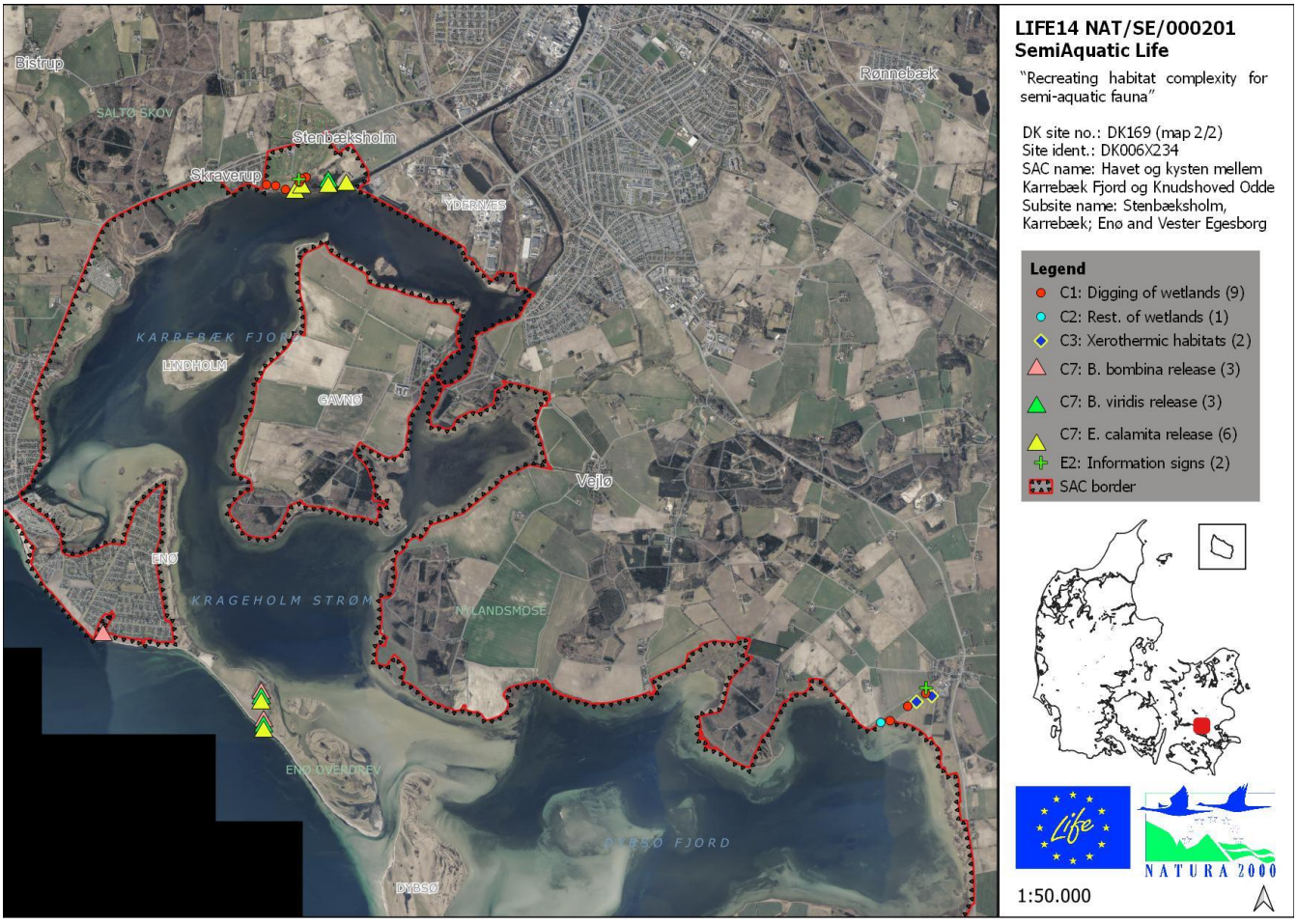


Figure 4 Presence of L. pectoralis on Møn. Records are from the period 2011-2014. Source: arter.dk

DK 169 Enø, Gavnø, Svinø, Knudshoved Odde

Leucorrhinia pectoralis was not found yet in the dug and restored ponds during the project. Closest known source populations is about 7,5 km from the Avnø, so it is expected that colonization will take time and requires good dispersal year for the species.

Ponds at Avnø.



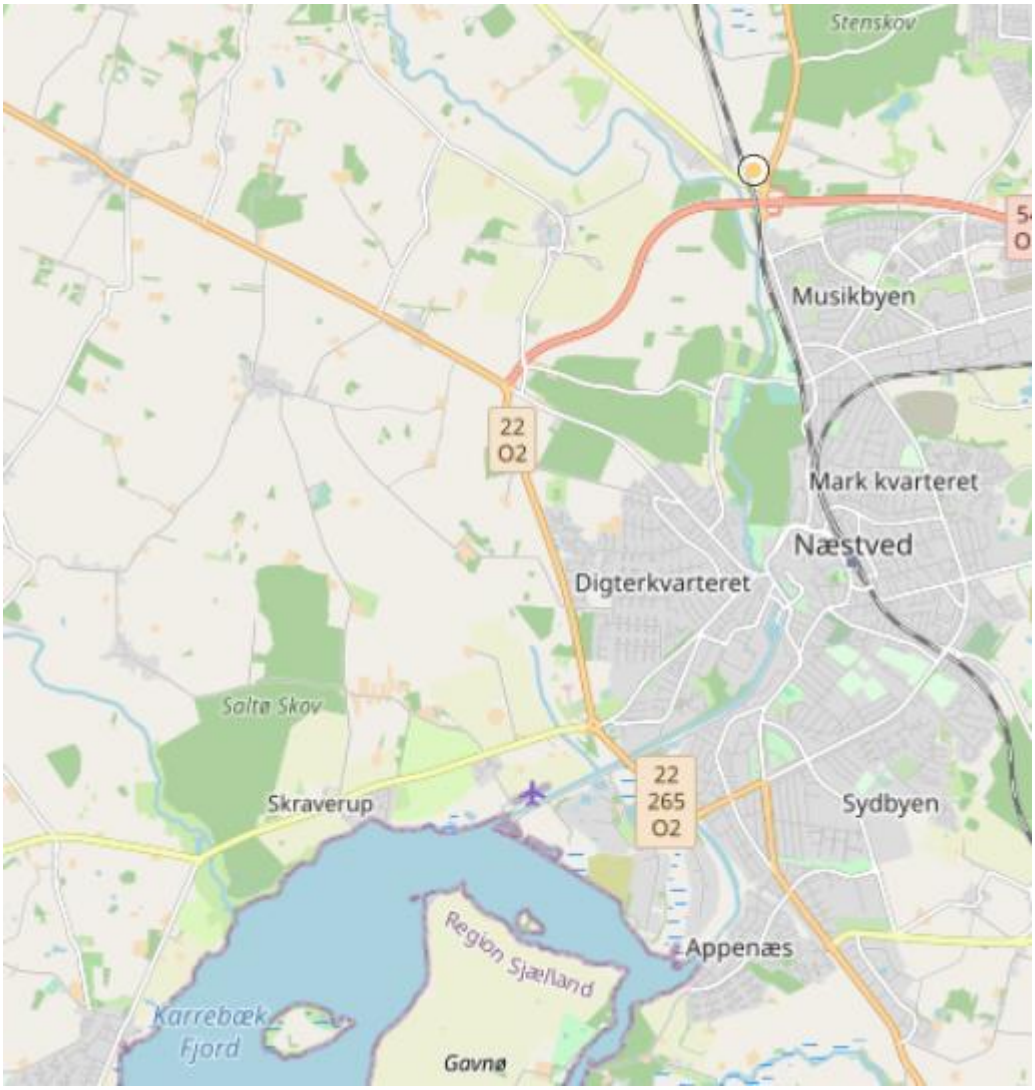


Figure 5 Closest confirmed presence of L.pectoralis, record from 2015. Source: arter.dk

DK 186 Almindingen

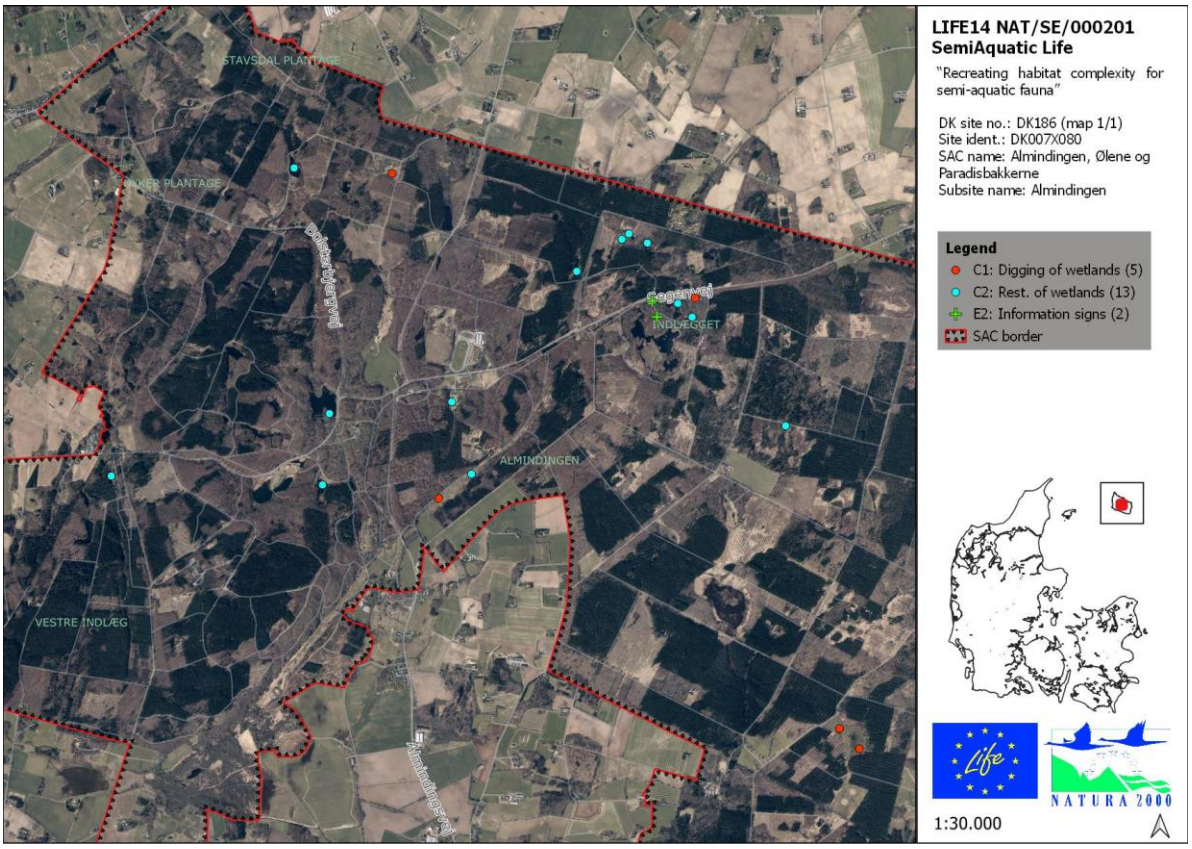
The semiaquatic insects *Graphoderus bilineatus*, *Dytiscus latissimus* and *Leucorrhinia pectoralis* are target species of the actions on the site.

The monitoring will be carried out in 2027 due to the late digging and restoration of ponds in fall 2021.

In 2020 and 2021 *L.pectoralis* was recorded very close to the restored ponds in the project therefore there is very high possibility of colonization in the future (Fig.7). The experience during the last 25 years from digging of new ponds in sand or clay soil has shown us that new ponds need about five years of maturation before a sufficient diverse and dense vegetation to support demanding/rare species of amphibians and insects. To give all new and restored habitats a chance to be colonized the monitoring will therefore be carried out in 2027.

Forest lake in the area.

Figure 6 Increasing the area with open shallow water during implementation of C2. Photo: N.Damm



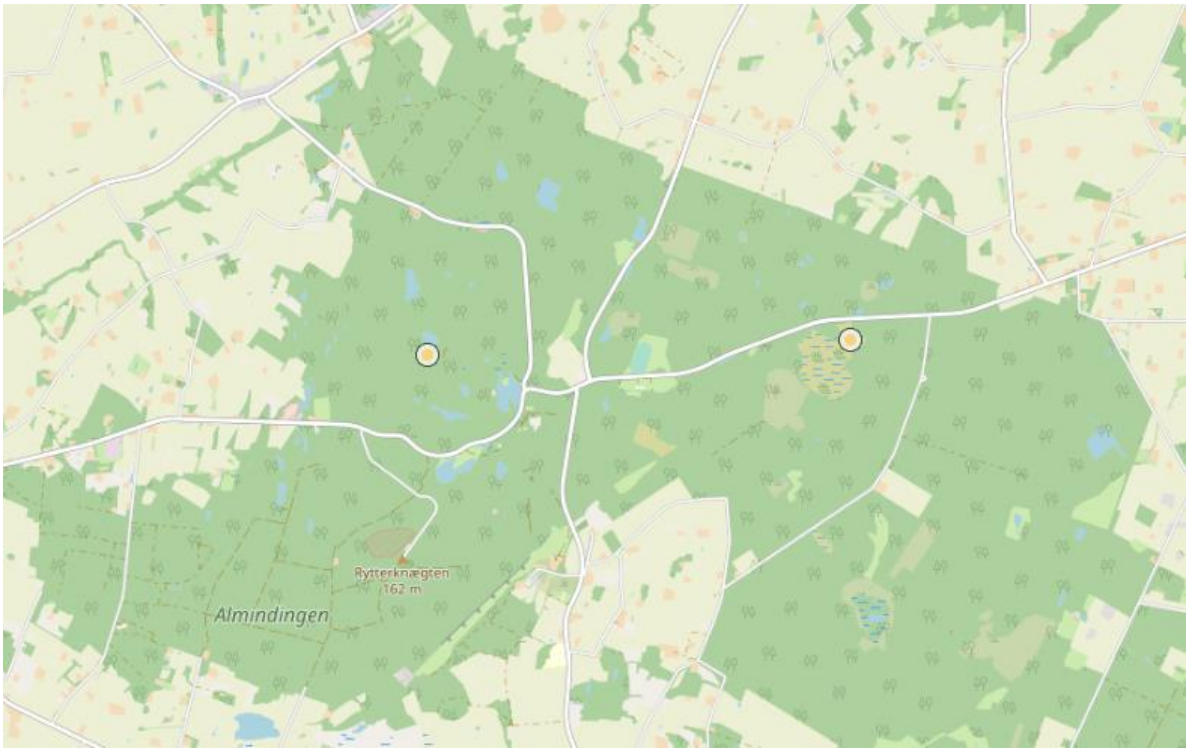


Figure 7 Presence of L.pectoralis close to the area were ponds were restored in 2021. Eastern observation is from 2.06.2020 (NOVANA, MST), western from 14.06.21 (J.M.Møller). Source: arter.dk

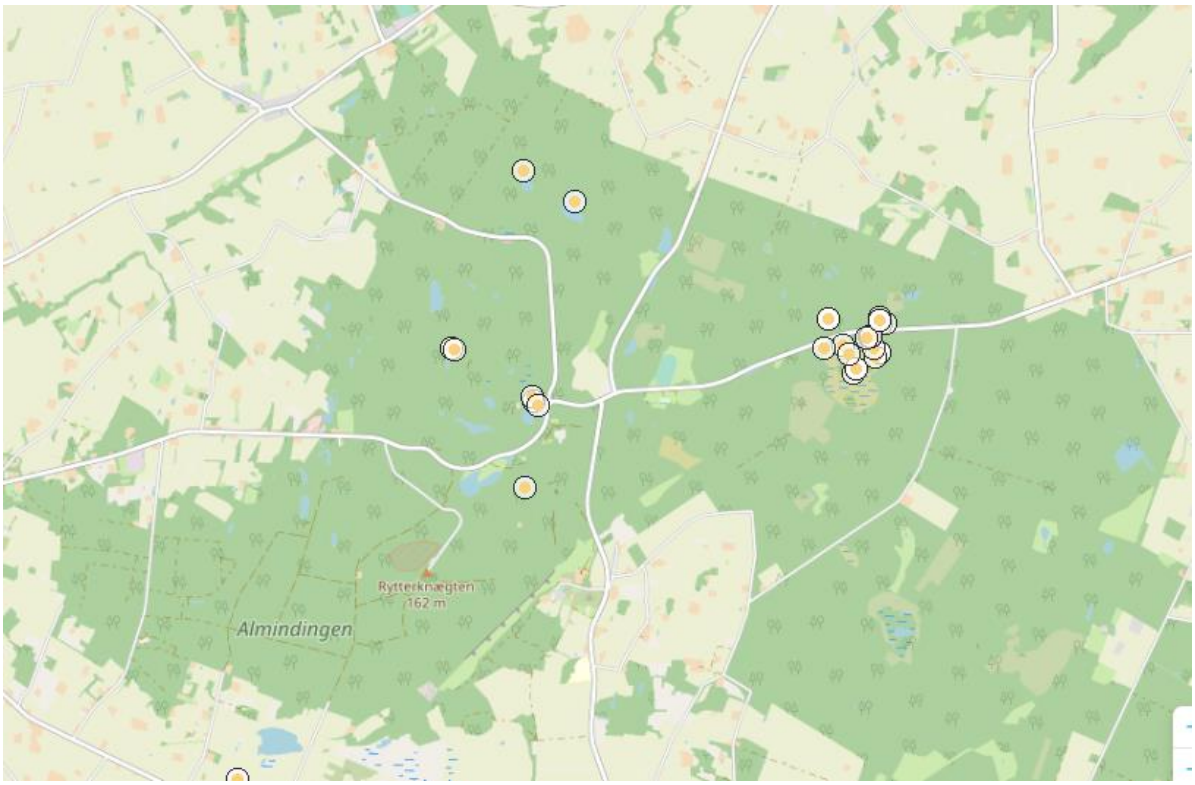


Figure 8 Presence of G.bilineatus close to the area were ponds were restored in 2021.Observations are made before Autumn 2021. Source: arter.dk

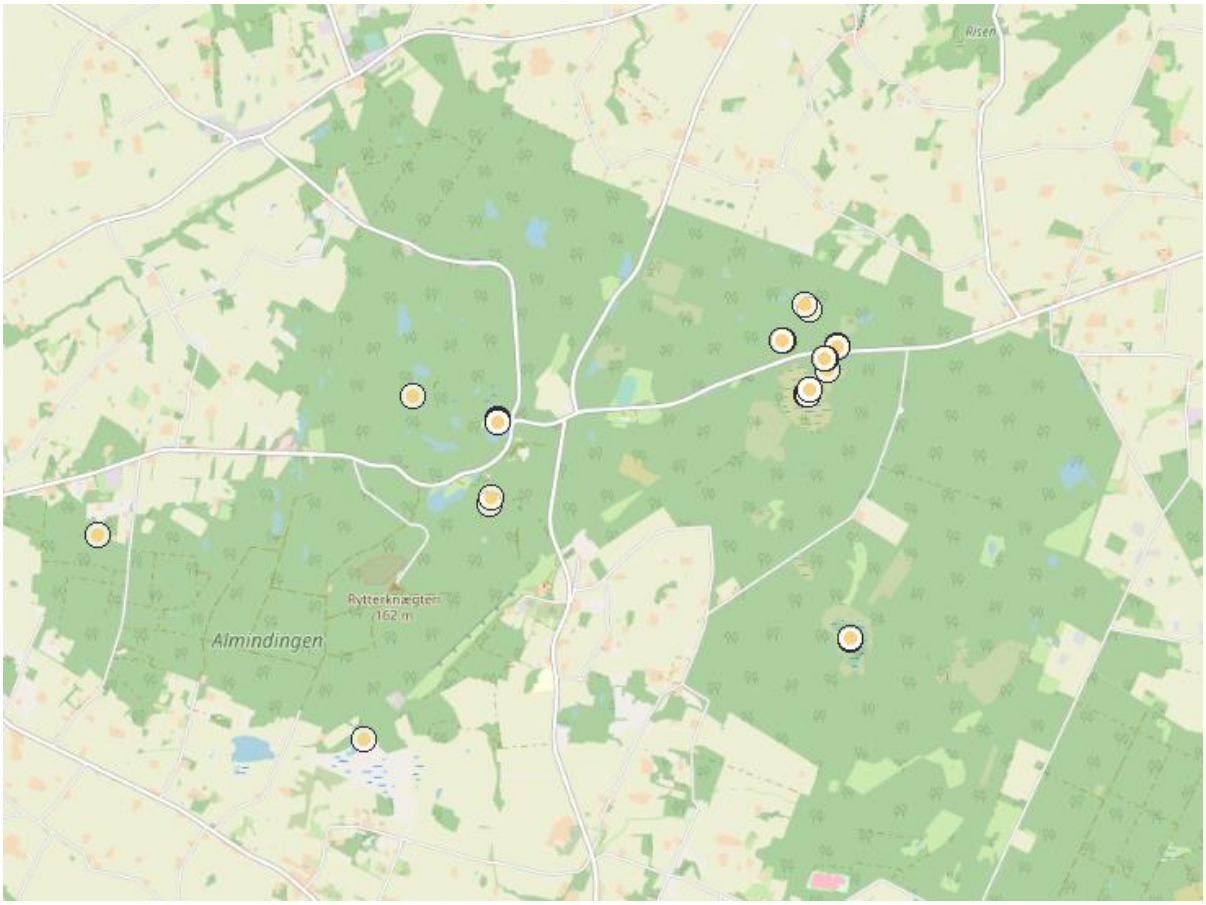


Figure 9 Presence of D.latissimus close to the area were ponds were restored in 2021.Observations are made before 21.09.2021. Source: arter.dk

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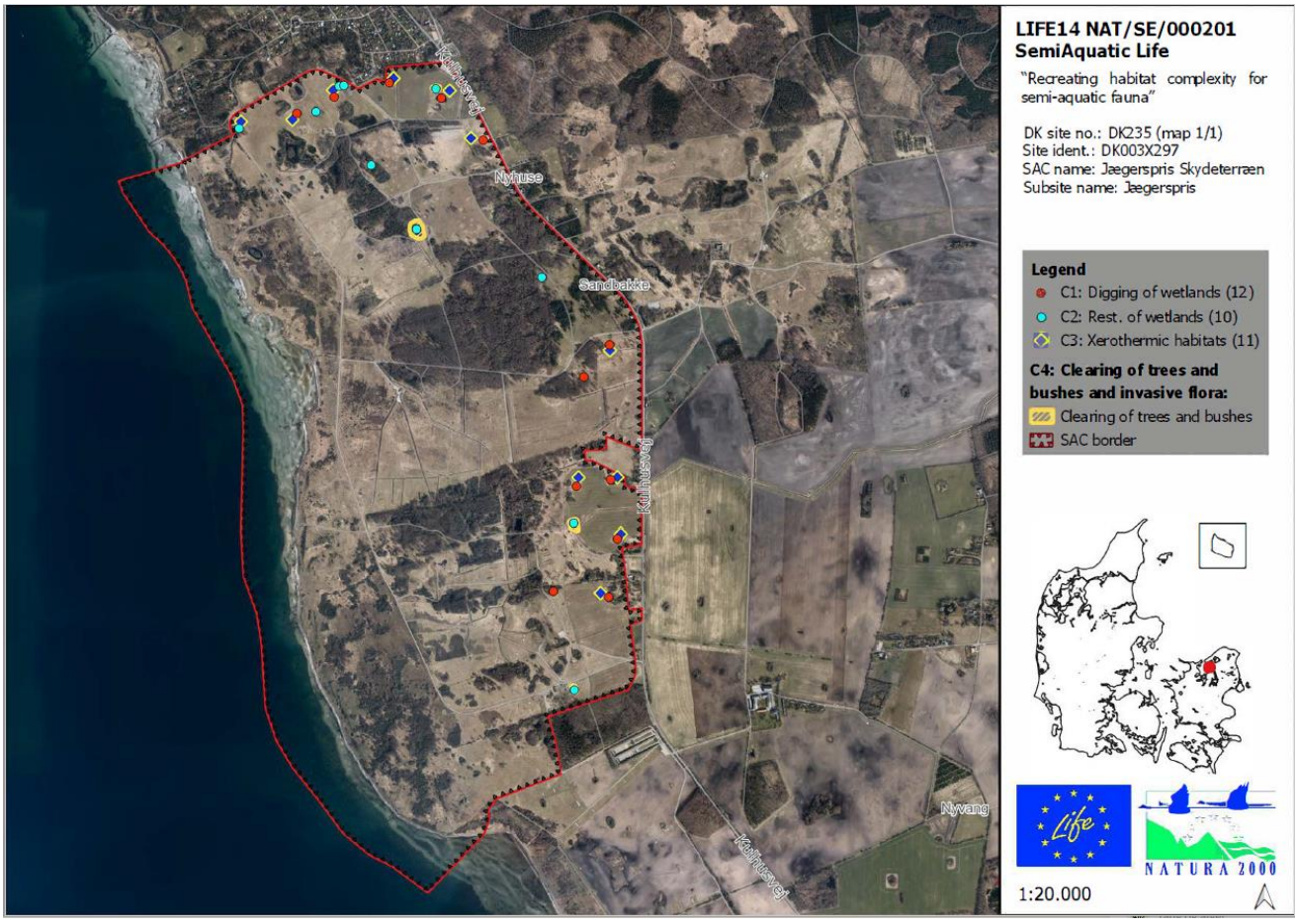
DK 235, Jægerspris Skydeterræn

Leucorrhinia pectoralis was not found yet in the dug and restored ponds during the project. Closest recorded presence of *L.pectoralis* is about 15 km apart in straight line (Fig.9).

Restored ponds in the project area.



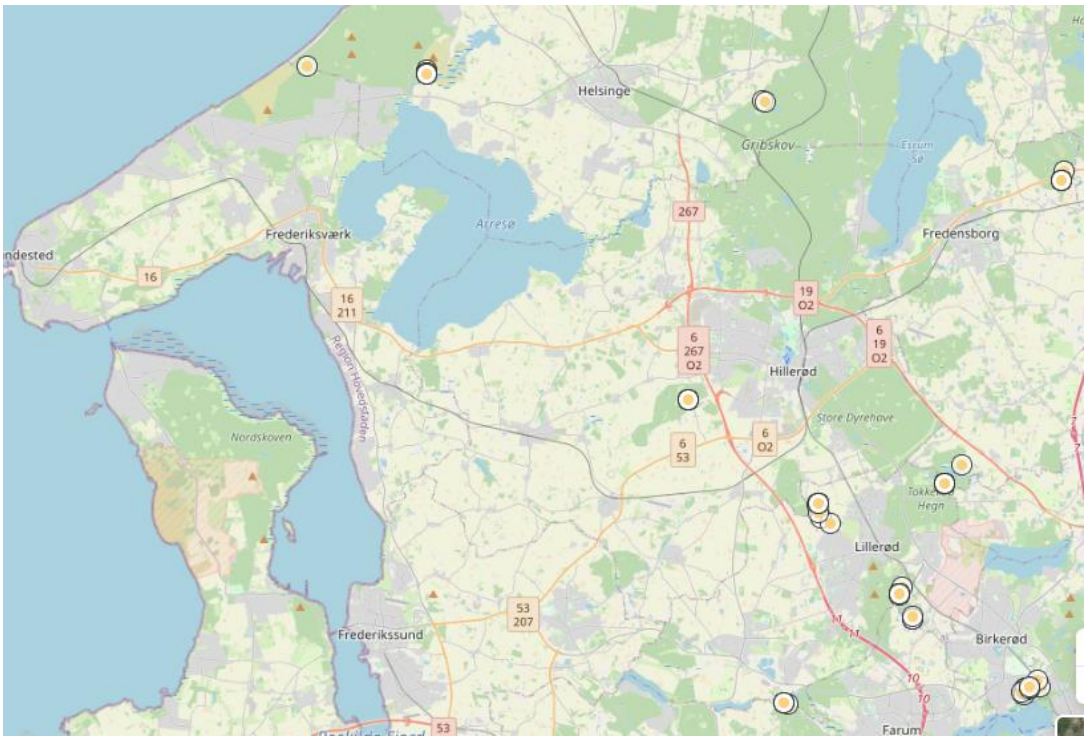


Figure 10 Closest known populations of L.pectoralis on Sjæland. Source: arter.dk