

Progress on in situ conservation of crop wild relatives in Norway



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Forages 2020 workshop

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In situ conservation of CWR in Norway

Following two approaches:

1) in semi-natural habitats

- “Our semi-natural heritage”- project since 2006

2) in wild flora / protected areas

- Strategy for *in situ* conservation of crop wild relatives, pilot project in 2012

Project: “Our semi-natural heritage”

Aims:

- Secure continued cultivation of valuable fields through traditional farming
- Define secured fields as *in situ* gene banks for forage grass and legume plants

Includes:

- Cooperation between farmers, governmental bodies and research
- Development of management plans for each location/field
- Schemes for governmental financial support
- Monitoring

Results:

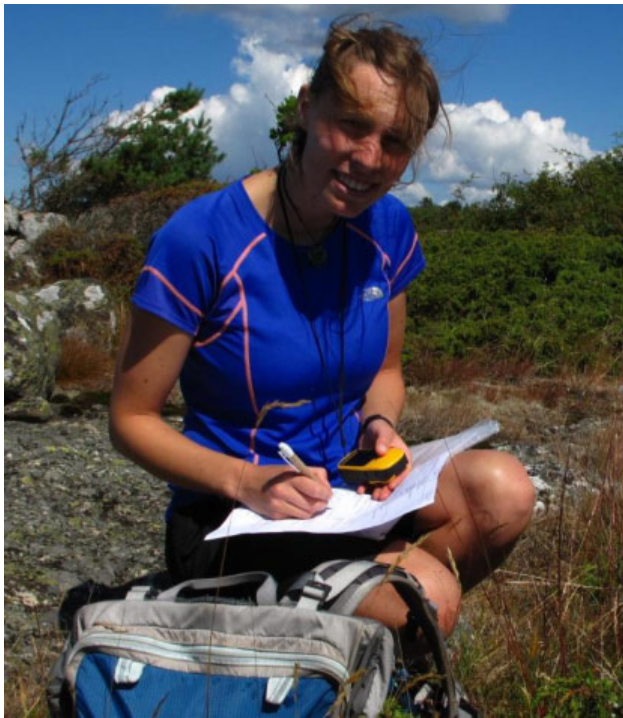
- Understanding among farmers of the concept; unploughed fields are gene banks for future plant breeding
- At the end of 2014: 584 fields traditionally farmed according to plans and agreements



In situ conservation of CWR in protected areas



- Pilot project 2012, in cooperation with University of Birmingham
Preliminary report:
Jade Phillips; Norwegian Crop Wild Relative in situ conservation strategy
- New project 2013-2016:
Establishment of PGR in situ conservation in protected areas in Norway



- *Funded by the Norwegian Ministry of Agriculture and Food*
- *A list of 206 CWR species established*
- *Combined with PhD work for Jade Phillips, Univ. Birmingham*
- *Samples for DNA analyses collected:
From southern Norway in 2014, northern Norway in 2015
To be analysed in UK this autumn*

Prosjekt 2013-2016:

In situ conservation of CWR in protected areas in Norway



Objectives:

- National implementing:
 - Provisions on *in situ* conservation in ITPGRFA
 - FAOs global plan of action (GPA)
 - CBDs Aichi goal 13; within 2020 having maintained genetic diversity of cultivated plants and their wild relatives
 - In accordance with the Nature Diversity Act and its regulations
- Financed by Ministry of Agriculture and Food, University of Birmingham og Norwegian Genetic Resource Centre
- Participants: School of Biosciences, Univ. Birmingham, GBIF Norway and Nature History Museum, University of Oslo, NordGen og County governors
- Norwegian Environment Agency as observer

Objectives / tasks:



- a) To publish a national strategy for in situ conservation in Norway, included a plan for organizing, cooperation and practical implementation
- b) To identify a minimum number of in situ sites to conserve maximum CWR genetic diversity in Norway (best locations for all priority CWR)
- c) To clarify the needed number of in situ sites to conserve 99% of adaptive alleles for top 5 Norwegian CWR
- d) To establish 5 Norwegian in situ CWR genetic reserves, alternatively to develop the scientific basis for this
- e) To develop a manual for collection, ex situ conservation and use of seeds from wild flora according to the Nature Diversity Act and ITPGRFA

Choosing CWR species for in situ conservation



skog
landskap

Criteria:

- Value and significance for Food and Agriculture, global, regional and national
- The populations in the protected areas should be quite stable and comprise a minimum number of individuals
- Species should not be very common / widespread, nor very rare

List developed in consultation with stakeholders, breeders and others

A list of 206 species; forage plants, berries, edible plants/vegetables, herbs and crop wild relatives



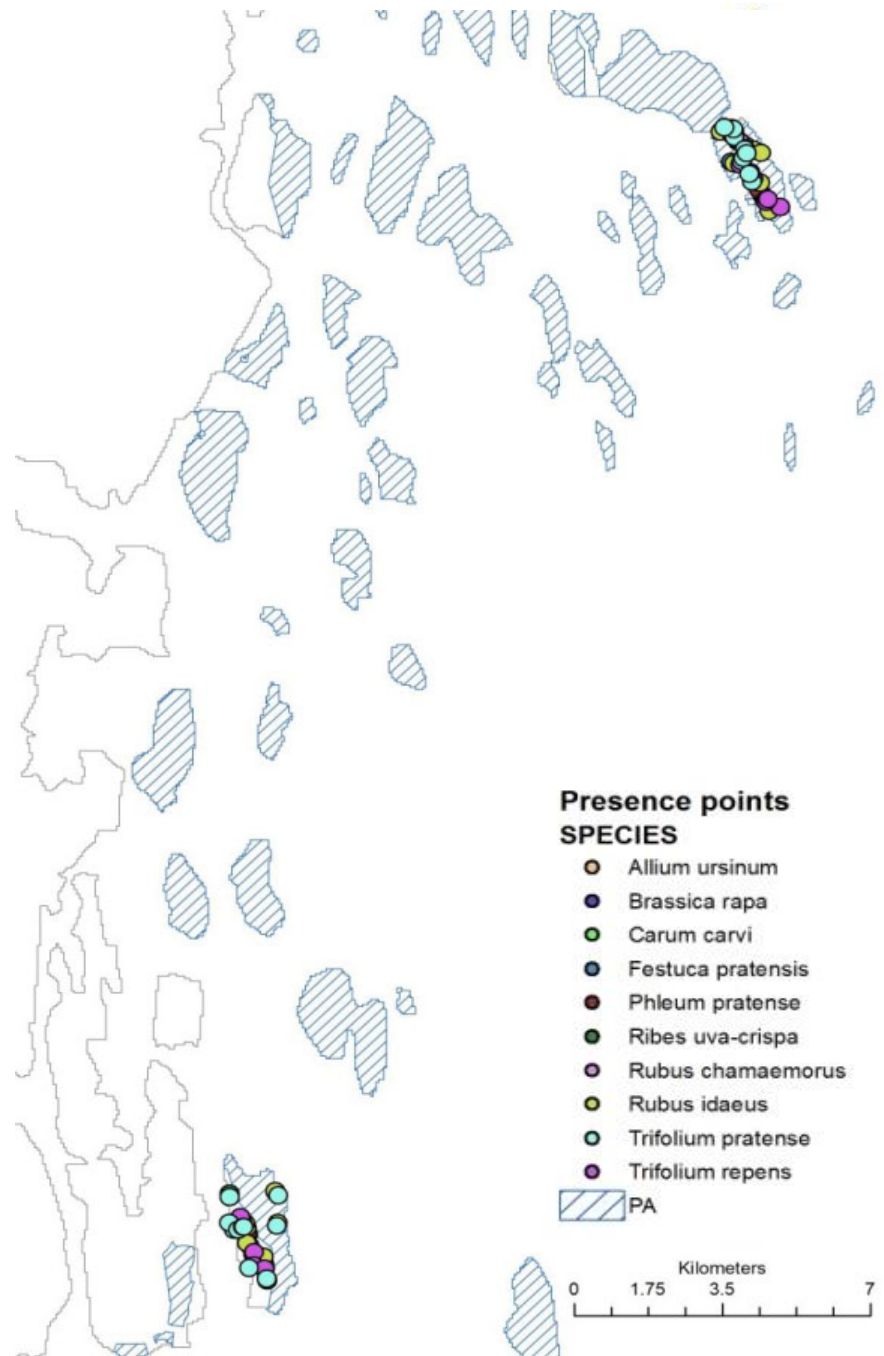
Genetic analyses of ten species

- How many populations are needed to conserve the genetic diversity within the species
- *Caraway (Carum carvi)*, *Timothy (Phleum pratense)*, *Meadow fescue (Festuca pratensis)*, *Red clover (Trifolium pratense)*, *White clover (T. repens)*, *Raspberries (Rubus idaeus)*, *Gooseberries (Ribes uva-crispa)*, *(Allium ursinum)*, *(Brassica rapa)*, *Cloudberries (Rubus chamaemorus)*



Collecting leaf samples at
Østre Bolærne and
Sandøya, Færder NP,
July 2014

7 species sampled:
Timothy (20)
Fescue (20)
Red clover (20)
White clover (20)
Raspberries (20)
Gooseberries (20)
Åkerkål (11)





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The first genetic reserve in Færder National Park?

- Quite recently established national park
- Hot spot for CWR in Norway
- Flora very well documented
- Management plan under development
- Enthusiastic NP management staff



Oddvar Pedersen, botanist at Nature History Museum in Oslo

*Nordic, Baltic, British meeting / workshop about in situ / CWR conservation,
Færder National Park May 2015*



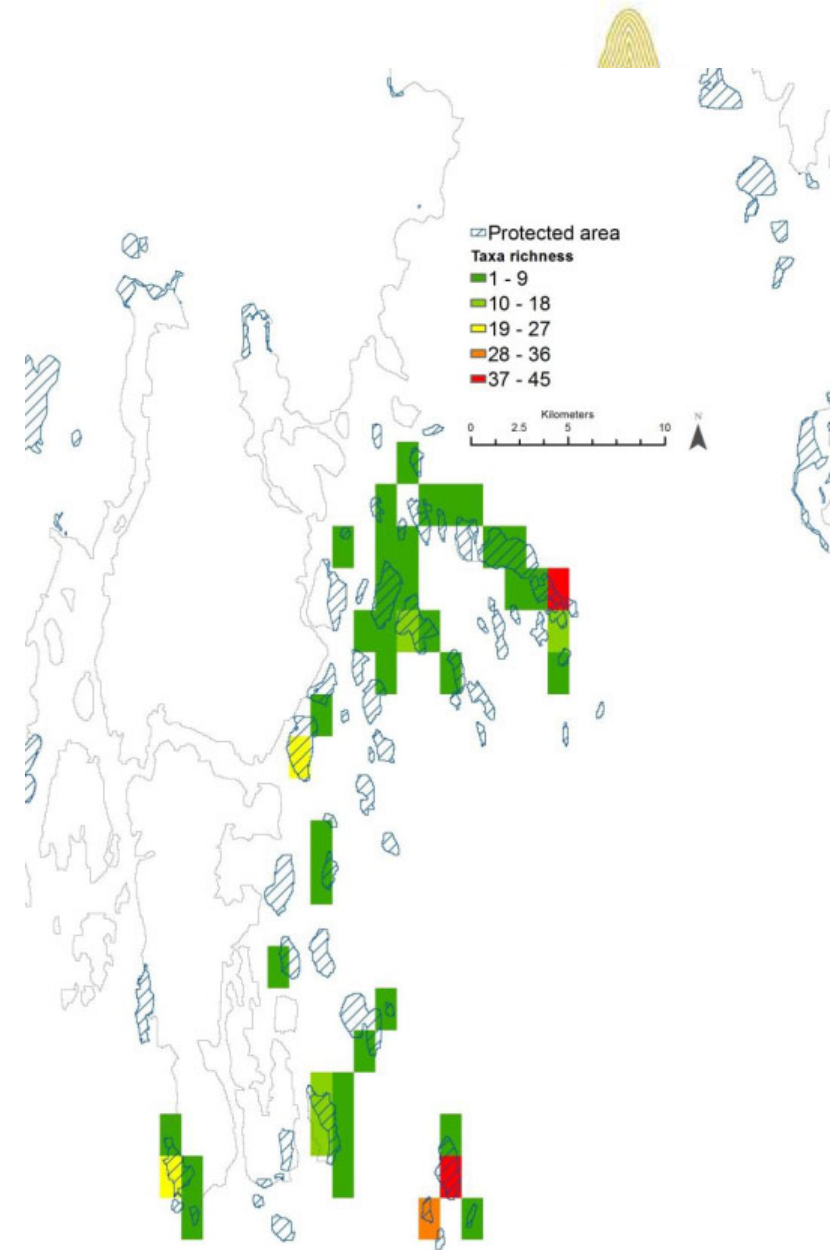
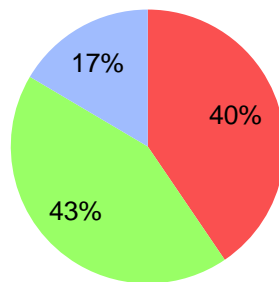
	A	B	C	D	E	F	G	H	I
1	Genus	Species	Norwegian Name	RevNavn	Antall øyer	Nøtterøyer	Tjøme-øyer	Sist observert	Øyer (ved tre eller færre)
2	Achillea	millefolium	Ryllik	Achillea millefolium	57	41	16	2014	
3	Agrostis	capillaris	Engkvein	Agrostis capillaris	30	22	8	2014	
4	Agrostis	gigantea	Storkvein	Agrostis gigantea	3	1	2	1975	Østre Bolærne, (Østre Bustein, Sandøy)
5	Agrostis	stolonifera	Krypkvein	Agrostis stolonifera	61	43	18	2014	
6	Agrostis	vinealis	Bergkvein	Agrostis vinealis	44	30	14	2014	
7	Allium	oleraceum	Vill-løk	Allium oleraceum	19	15	4	2013	
8	Allium	schoenoprasum	Gressløk	Allium schoenoprasum	13	11	2	2014	
9	Allium	scorodoprasum	Bendelløk	Allium scorodoprasum	4	4	0	2014	
10	Allium	ursinum	Ramsløk	Allium ursinum	2	1	1	2014	Østre Bolærne, Store Færder
11	Allium	vineale	Strandløk	Allium vineale	62	44	18	2014	
12	Alopecurus	geniculatus	Knereverumpe	Alopecurus geniculatus	15	9	6	2014	
13	Alopecurus	pratensis	Engreverumpe	Alopecurus pratensis	1	0	1	2014	Burøy
14	Anthoxanthum	odoratum	Gulaks	Anthoxanthum odoratum	54	38	16	2014	
15	Arrhenatherum	elatius	Hestehavre	Arrhenatherum elatius	60	43	17	2014	
16	Artemisia	absinthium	Ekte malurt	Artemisia absinthium	5	4	1	2014	
17	Artemisia	maritima	Strandmalurt	Artemisia maritima	3	0	3	2014	Nordre Mostein, Store Færder, Kileskjær
18	Asparagus	officinalis	Asparges	Asparagus officinalis	3	3	0	2006	Gåsøy, Nordre Årøy, Skrøslingen
19	Deschampsia	flexuosa	Smyle	Avenella flexuosa	55	39	16	2014	
20	Avenula	pratensis	Enghavre	Avenula pratensis	25	17	8	2014	
21	Avenula	pubescens	Dunhavre	Avenula pubescens	22	14	8	2014	
22	Brassica	rapa	Akerkål	Brassica rapa ssp. campestris	4	3	1	2014	
23	Carum	carvi	Karve	Carum carvi	17	12	5	2014	
24	Crambe	maritima	Strandkål	Crambe maritima	51	39	12	2014	
25	Dactylis	glomerata	Hundegras	Dactylis glomerata	27	17	10	2014	
26	Daucus	carota	Gulrot	Daucus carota	1	1	0	1925	Østre Bolæren
27	Elymus	caninus	Hundekveke	Elymus caninus	4	3	1	2013	
28	Festuca	ovina	Sauesvingel	Festuca ovina	45	33	12	2014	
29	Festuca	rubra	Rødsvingel	Festuca rubra	71	51	20	2014	
30	Festuca	trachyphylla	Stivsvingel	Festuca trachyphylla	1	0	1	2001	Store Færder
31	Fragaria	vesca	Markjordbær	Fragaria vesca	58	42	16	2014	
32	Fragaria	viridis	Nakkebær	Fragaria viridis	4	3	1	2014	
33	Fragaria	x ananassa	Hagejordbær	Fragaria x ananassa	1	1	0	2013	Barneskjær
34	Hippophae	rhamnoides	Tindved	Hippophaë rhamnoides	1	1	0	2014	Vestre Bolærne
35	Hordeum	jubatum	Silkebygg	Hordeum jubatum	2	2	0	2013	Vestre Klauver, Skrøslingen
36	Humulus	lupulus	Humle	Humulus lupulus	3	2	1	2013	Mellom-Bolærne, Roppestadholmen, Ildverket

Færder National Park:

- Records of 79 of 206 CWR inside borders of Færder NP, based on GBIF-data.
- Based on records from Oddvar Pedersen/UiO, 110 of the 206 species are present in the NP.

Type of CWR in Færder National Park

■ food ■ forage ■ other



Species in Færder NP - summary



- Grasses; Many species of *Festuca*, *Agrostis* and *Poa*, less/single species of *Alopecurus*, *Phleum*, *Lolium* and *Dactylis*.
- Legumes; *Trifolium*s and *Vicia*s, smaller numbers of genera *Melilotus*, *Lathyrus*, *Lotus* and *Medicago*.
- Fruit & berries; *Malus sylvestris*, *Prunus sp*, *Fragaria*, *Ribes*, *Hippophae*, raspberries and many blackberries (*Rubus*).
- Relatives to cereals and potato; *Hordeum jubatum*, *Arrhenatherum*, *Avenula* og two *Solanums*
- Vegetables; *Brassica rapa campestris*, *Daucus carota*, *Lactuca serriola* and several *Alliums*.
- Edible plants/herbs; *Carum carvi*, *Crambe maritima*, *Humulus lupulus* and *Origanum vulgare*

51 species suggested for in situ
conservation in Færder National Park



Species	Scientific nam	No islands	Findings later than 2010
Vill-løk	<i>Allium oleraceum</i>	21	12
Gressløk	<i>Allium schoenoprasum</i>	16	16
Bendelløk	<i>Allium scorodoprasum</i>	4	3
Ramsløk	<i>Allium ursinum</i>	2	1
Strandløk	<i>Allium vineale</i>	65	65
Strandkvann	<i>Angelica archangelica ssp. litoralis</i>	58	57
Ekte malurt	<i>Artemisia absinthium</i>	5	1
Strandmalurt	<i>Artemisia maritima</i>	3	3
Enghavre	<i>Avenula pratensis</i>	26	24
Dunhavre	<i>Avenula pubescens</i>	33	32
Karve	<i>Carum carvi</i>	20	18
Strandkål	<i>Crambe maritima</i>	61	59
Gulrot	<i>Daucus carota</i>	1	0
Saesvingel	<i>Festuca ovina</i>	50	49
Rødsvingel	<i>Festuca rubra</i>	86	86
Stivsvingel	<i>Festuca trachyphylla</i>	1	0
Markjordbær	<i>Fragaria vesca</i>	64	64
Nakkebær	<i>Fragaria viridis</i>	5	4
Hagejordbær	<i>Fragaria x ananassa</i>	1	1
Silkebygg	<i>Hordeum jubatum</i>	3	3
Humle	<i>Humulus lupulus</i>	5	4
Villeple	<i>Malus sylvestris</i>	11	
Sneglebelg	<i>Medicago lupulina</i>	10	8
Lusern	<i>Medicago sativa ssp. sativa</i>	1	1
Bergmynte	<i>Origanum vulgare</i>	7	6
Tranebær	<i>Oxycoccus palustris</i>	8	5
Sandtimotei	<i>Phleum arenarium</i>	1	1
Timotei	<i>Phleum pratense</i>	5	
Kirsebær	<i>Prunus avium</i>	53	
Slåpetorn	<i>Prunus spinosa</i>	51	51
Solbær	<i>Ribes nigrum</i>	7	6
Villrips	<i>Ribes spicatum</i>	41	40

Species	Scientific nam	No islandsøyer	Later than 2010
Stikkelsbær	Ribes uva-crispa	22	22
Molte	Rubus chamaemorus	3	2
Strandsvingel	Schedonorus arundinaceus	4	2
Kjempesvingel	Schedonorus giganteus	4	3
Engsvingel	Schedonorus pratensis	6	4
Harekløver	Trifolium arvense	27	26
Gullkløver	Trifolium aureum	1	0
Musekløver	Trifolium dubium	2	1
Jordbærkløver	Trifolium fragiferum	11	4
Alsikekløver	Trifolium hybridum	3	2
Skogkløver	Trifolium medium	19	16
Rødkløver	Trifolium pratense	43	41
Hvitkløver	Trifolium repens	43	41
Fuglevikke	Vicia cracca	76	76
Tofrøvikke	Vicia hirsuta	11	9
Vårvikke	Vicia lathyroides	3	3
Gjerdevikke	Vicia sepium	19	18
Skogvikke	Vicia sylvatica	9	7
Firfrøvikke	Vicia tetrasperma	20	17



Island	Municipality	CWR species
Midtre Bolærne	Nøtterøy	31
Østre Bolærne	Nøtterøy	33
Store Færder	Tjøme	23
Gåsøy	Nøtterøy	24
Kløvningen	Tjøme	19
Sandøy	Tjøme	33
Tørfest	Nøtterøy	22

*Seven islands in Færder NP especially rich in CWR species.
These seven islands are selected for genetic reserve locations*

















Input to the management plan from NGRC



- Conservation objective – genetic resources for food and agriculture
 - a) Færder NP is an *in situ* conservation area for plant genetic resources, and hence vigorous populations of valuable species shall be conserved in their natural habitats. An overview of the species covered by the *in situ* conservation and where they are found is shown in Annex xx
 - b) Objectives and measures for maintaining the natural values, which also includes plant genetic resources, in different part of the NP, is described in the following paragraphs.
 - c) To achieve that goals are fulfilled and that maintenance actions are having the intended effects, the populations of certain species should be monitored, e.g. by counting individuals and observation of population parameters at regular intervals.
 - d) The *in situ* locations will be registered as such in national records at NGRC and genetic resources will be available in accordance with The Nature Diversity Act §§ 55 – 59.
- General information about PGRFA
- Populations of PGR / CWR in Færder NP
- Potential threats to the populations

Standards for the management of protected areas with added function as in situ location for PGR



Including

- Locality description
- Protection status
- Geographical extension
- Chosen species (taxa)
- Population size
- Principles for management:
 - Conservation is acknowledged
 - Concise objectives
 - Conflicts between objectives are clarified
 - Scientifically based management plan
 - Plan og protocol for monitoring
 - Material of seeds and plants are collected as 'baseline' plant material for monitoring
 - Results from monitoring are reported
 - Economical, scientific and human resources are allocated
 - Local stakeholders interests are identified and addressed
 - The procedures for withdrawal and use of GR are in place



Summary



- A scientific based national strategy for *in situ* conservation of CWR for Norway is developed
- Færder National Park can be the first plant genetic reserve in Norway and one of the first in Europe
- Good records of the flora and good cooperation with NP management staff are essential preconditions
- The ongoing Norwegian project could give inputs to Nordic, European and International projects:
 - NordGen-project: *Ecosystem services: Genetic resources and crop wild relatives*
 - *ECPGR Activity Grant Scheme: CWR Conservation Strategies*
 - *Activities related to ECPGR Working group for in situ conservation*