BIOLOGISK INSTITUTT
ADMINISTRASJONEN
I. 4/2011

INNKALLING STYREMØTE

Instituttstyrets møte nr 4/2011 – 8.12.2011, kl.12.15, rom 1214 (skolelabbens møterom)
Det vil serveres lunch på møtet.

VEDTAKSSAKER:

V-SAK IS 13/2011 GODKJENNING AV INNKALLING
Forslag til vedtak: Innkallingen godkjennes

V-SAK IS 14/2011 GODKJENNING AV REFERAT IS 3/2011
Forslag til vedtak: Referatet godkjennes

V-SAK IS 15/2011 BUDSJETT 2012
Sakspapirer:
Saksfremlegg fra økonomiseksjonen/instituttleder
Budsjett 2012
Langtidsbudsjett 2012-2016 - ledelseskommentar
Forslag til vedtak: Det framlagte budsjettforslag 2012 vedtas og langtidsbudsjett 2012–16 med ledelseskommentar tas til etterretning

V-SAK IS 16/2011 ÅRSPLAN 2012-2014
Sakspapirer:
Saksfremlegg fra instituttleder/kontorsjef
Årsplan 2012-2014
Forslag til vedtak: Årsplanen for 2012-2014 vedtas

V-SAK IS 17/2011 UTLYSNING AV INSTITUTTLEDERSTILLINGEN
Sakspapirer:
Saksfremlegg fra instituttleder/kontorsjef
Utlysningstekst
Stillingsbetenkning
Forslag til vedtak: Utlysningstekst og stillingsbetenkning godkjennes

ORIENTERINGSSAKER:

O-SAK IS 11/2011 FAGEVALUERINGEN I BIOLOGI
Sakspapirer:
Saksfremlegg fra instituttleder/kontorsjef
Evaluation of Biology, Medicine and Health Research in Norway (2011), report of the principal evaluation committee

Ekstrakt fra rapporten Botany, Zoology and Ecology-related Diciplines, Panel 1

O-SAK IS 12/2011 **EVALUERING AV NORSK KLIMAFORSKNING: BIOLOGISK INSTITUTTS SELVEVALUERING**

Sakspapirer:

Saksfremlegg fra kontorsjef
Evaluation of Norwegian Climate Reserach, Self Assessment of the Department of Biology

O-SAK IS 13/2011 **UNDERVISNINGSSAKER**

Sakspapirer:

Saksfremlegg fra undervisningsleder og leder for studieseksjonen
Emneside BIO9905CEES1
Emneside BIO4160
Emneside BIO4170
Emneside BIO4600
Notat: Studieprogrammenes forankring og sammensetning

O-SAK IS 14/2010 **MØTEPLAN FOR INSTITUTTSTYRET 2012**

Sakspapirer:

Saksfremlegg fra kontorsjef

EVENTUELT

Blindern, 1.12.11

Trond Schumacher
Instituttleder

BIOLOGISK INSTITUTT
ADMINISTRASJONEN
I. 3/2011

REFERAT STYREMØTE

Instituttstyrets møte nr 3/2011 – 13.10.2011
Møtet ble formelt satt 12.25 og ble hevet kl. 14.35

Til stede: Trond Schumacher, Anne Brysting, Tore Slagsvold, Erik Framstad, Hanne Ballestad, Hans Borg, Nanna Winger Steen, Synnøve Botnen, Frode Nyborg
Fra administrasjonen: Maren Onsrud, Kjetil Bråthen

VEDTAKSSAKER:

V-SAK IS 7/2011 GODKJENNING AV INNKALLING
Vedtak: *Innkallingen godkjennes*

V-SAK IS 8/2011 GODKJENNING AV REFERAT IS 2/2011
Vedtak: *Referatet godkjennes*

V-SAK IS 9/2011 ØKONOMIRAPPORT 2. TERTIAL 2011, ÅRSPROGNOSE PR. 1.09.2011
Sakspapirer:
- Saksfremlegg fra økonomileder og instituttleder
- Økonomirapport for 2. tertial 2011
- Årsprognose pr. 1.09.2011

Vedtak: *Regnskap for 2. tertial 2011 og årsprognose for 2011 pr. 1.09.2011 tas til etterretning*

V-SAK IS 10/2011 VALGT ELLER TILSATT INSTITUTTLEDER?
Sakspapirer:
- Saksfremlegg fra instituttleder og kontorsjef
- Stillingsbeskrivelse (2004), instituttleder ved Biologisk institutt
- Notat fra den interne komitéen

Vedtak: *Styret følger de ansattes anbefalinger og vedtar å endre fra valgt til tilsatt instituttleder.*

V-SAK IS 11/2011 BIO 2020: BIOLOGISK INSTITUTTS OVERORDNEDE STRATEGI 2011-2020
Sakspapirer:
- Saksfremlegg fra instituttleder og kontorsjef
- BIO 2020: Strategisk plan 2011-2020

Vedtak: *Strategisk plan for perioden 2011-2020 vedtas*

V-SAK IS 12/2011 SFF-CEES ÅRSRAPPORT 2010

Sakspapirer:

Saksfremlegg fra kontorsjef

V**edtak***: Styret tar årsrapporten til etterretning*

ORIENTERINGSSAKER:

O-SAK IS 7/2011 BUDSJETTRAMMER MN OG BIO 2012

Sakspapirer:

Saksfremlegg fra instituttleder og fakultetets økonomikonsulent
Foreløpig budsjettfordeling 2012 til MN-instituttene

O-SAK IS 8/2011 MIDTVEISEVALUERING SFF-CEES

Sakspapirer:

Saksfremlegg fra kontorsjef
Midterm Evaluation of Eight Centres of Excellence: CEES-delen, s.12-15

O-SAK IS 9/2011 HMS – STATUS OG IMPLEMENTERING AV HANDLINGSPLAN 2011

Sakpapirer.

Saksfremlegg fra HMS-koordinator

O-SAK IS 10/2011 STUDIEPROGRAMMENES FORANKRING OG ANSVARSFORDELING

Sakspapirer:

Saksfremlegg fra kontorsjef
Fakultetets notat "Studieprogrammenes forankring og ansvarsfordeling"

EVENTUELT:

Fast tilsetting:

- Gry Gundersen har fått fast tilsetting som rådgiver fom 1.10.2011

Midlertidig tilsetting:

- Jostein Strand Henriksen har fått midlertidig tilsetting i 100% stilling konsulent, eksternt finansiert, fom 12.09.2011 tom 17.10.2011
- Sissel Jentoft har fått midlertidig tilsetting i 100% stilling som seniorrådgiver, eksternt finansiert, fom 1.09.2011 tom 31.08.2014
- Johnny Håll har fått midlertidig tilsetting i 100% stilling som vit.ass., eksternt finansiert, fom 15.07.2011 tom 2.10.2011
- Marcia Kyle har fått midlertidig tilsetting i 100% stilling som forsker, eksternt finansiert, fom 15.07.2011 tom 2.10.2011
- William Ryan Easterday har fått midlertidig tilsetting i 100% stilling som forsker, eksternt finansiert, fom 14.09.2011 tom 31.12.2011

- Jan-Erik Thrane har fått midlertidig tilsetting i 100% stilling som vit.ass., eksternt finansiert, fom 15.07.2011 tom 2.10.2011
- Kjetil Flydal har fått midlertidig tilsetting i 20% stilling som forsker, eksternt finansiert, fom 1.08.2011 tom 31.12.2011

Forlenget midlertidig tilsetting:

- Diress Alemu har fått midlertidig forlengelse i 100% stilling som forsker, eksternt finansiert, fom 1.01.2012 tom 31.12.2012
- Kari B. Rygg har fått midlertidig forlengelse i 100% stilling som rådgiver, fom 1.11.2011 tom 30.11.2011
- Maren Onsrud har fått midlertidig forlengelse i 100% stilling som kontorsjef, fom 1.11.2011 tom 30.11.2011
- José Hildago Roldan har fått midlertidig forlengelse i 100% stilling som forsker, eksternt finansiert, fom 10.10.2011 tom 31.12.2011
- Simon Diattami har fått midlertidig forlengelse i 100% stilling som forsker, eksternt finansiert, fom 1.03.2012 tom 3.06.2012
- Jason Whittington har fått midlertidig forlengelse i sin 100% stilling som forsker, eksternt finansiert, fom 1.06.2012 tom 30.09.2012
- Barbara Fischer har fått midlertidig forlengelse i sin 100% stilling som forsker, eksternt finansiert, fom 1.10.2011 tom 31.12.2011
- Florian Diekert har fått midlertidig forlengelse i sin 100% stilling som stipendiat, eksternt finansiert, fom 9.09.2011 tom 5.10.2011
- Anke Corinna Stüken har fått midlertidig forlengelse i sin 100% stilling som postdoktor, eksternt finansiert, fom 16.01.2012 tom 15.02.2012
- Surendra Kumar har fått midlertidig forlengelse i sin 100% stilling som stipendiat, fom 7.01.2012 tom 7.03.2012
- Steinar Øvrebø har fått midlertidig forlengelse i sin 20% stilling som professor II, eksternt finansiert, fom 1.08.2011 tom 31.07.2013
- Line Emilie Sverdrup har fått midlertidig forlengelse i sin 20% stilling som førsteamanuensis II, fom 1.08.2011 tom 31.07.2014
- Tristan Rouyer har fått midlertidig forlengelse i sin 100% stilling som postdoktor, eksternt finansiert, fom 1.09.2011-31.10.2011
- Ruben Alexander Pettersen har fått midlertidig forlengelse i sin 100% stilling som stipendiat, eksternt finansiert, fom 16.11.2011 tom 22.01.2012

Permisjoner:

- Christian Brinch har fått permisjon uten lønn fra sin 10% stilling som forsker, fom 28.06.10 tom 8.08.10
- Hanne Ballestad har fått permisjon uten lønn fra sin 100% stilling som stipendiat, fom 01.02.11 tom 28.02.11
- Antonieta Labra Lillo har fått permisjon uten lønn fra sin 100% stilling som post doc, fom 1.09.10 tom 31.03.11
- Torbjørn Ergon har fått 13 ukers permisjon med lønn fra sin 100% stilling som førsteamanuensis, som avvikles fom 17.09.2011 tom 31.10.2012
- Ingrid Johansen har fått 30% permisjon uten lønn fra sin 100% stilling som avd. ing. fom 1.01.2012 tom 31.12.2012

- Rita Amundsen har fått permisjon uten lønn fra sin 100% stilling som overingeniør, fom 1.01.12 tom 31.03.2012

Endring av stilling:

- Jonathan Colman har redusert sin stillingsprosent som forsker til 40%, eksternt finansiert, fom 1.09.2011
- Tristan Rouyer fratrer sin stilling som post doc 31.10.2011
- Jayne Lambrou fratrådde sin stilling som førstekonsulent 4.09.2011
- Eva Ingrid Grøttland fratrådde sin stilling som seniorkonsulent 11.09.2011
- Gunnar Dick fratrådde sin stilling som forsker 29.09.2011
- Mari Espelund fratrer sin stilling som senioringeniør 30.11.2011

Blindern, 17.10.11

Trond Schumacher
Instituttleder

Til: Instituttstyret ved Biologisk institutt

Sakstype: Vedtakssak

Saksnr.: V-Sak IS 15/2011

Møtedato: 08.12.11

Notatdato: 01.12.11

Saksbehandler: Kjetil Bråthen/ Trond Schumacher

Sakstittel: Budsjett 2012

Tidligere plandokumenter/henvisning til lovverk etc.:
Fakultetsstyret: V-sak 21/2011: Budsjettrammer MN 2012
Instituttstyret: IS 3/2011: O-sak 7/2011: Budsjettrammer MN og BIO 2012

De viktigste problemstillinger:
Budsjettframlegget tar utgangspunkt i styringsdokumenter og basistildeling fra UiO og MNF. Instituttet har utarbeidet langtidsbudsjett for perioden 2012-16 med budsjettkommentar som vedlegges saken.

Inntekter:

Biologisk institutt er gitt en basistildeling (post 50) på **81.256 mill**. I budsjett 2012 er småforskmidler fordelt i rammen, sammen med startpakke- og publiseringsincentiver (som 2011), hvilket representerer en inntektsreduksjon på ca. **0.7 mill** i forhold til 2011. Videre er husleien (et nullspill) økt med **0.3 mill.** Med en forventet lønnsvekst på 3.6% (**1.8 mill**.) innlagt i budsjett 2012, gir dette i realiteten en inntektssvikt på 2.8 mill i forhold til budsjett 2011 (81.356 mill.). I budsjett 2012 er rekrutteringsstillingene (stipendiater/post docs) fordelt med felles snittsats (a 753000 kr). Dekningsbidrag fra eksterne prosjekter/CEES er i budsjett 2012 estimert til **14.5 mill.** Med diverse ekstra lønns- og drifts-inntekter samt overføringer (fra prognose 2011) på **–** 5.4 mill., er inntektssiden gjort opp til **93.9 mill.**

Utgifter:
Fastlønn utgjør **59.9 mill.** I budsjett 2012 er tilført to nye årsverk til personale (senioringeniører) knyttet opp mot instituttets kjernefasiliteter. Det er avsatt **3.8 mill.** til drifting av undervisning og utdanning. Til drifting av masterstudentenes forskningsoppgave er som tidligere avsatt **0.8 mill**., dvs. 15.000 1. år og 5.000 2. år. Midlene innsettes på annumskonto til hovedveileder. Det foreslås (som tidligere) en engangstildeling på kr. 40.000 til Biologisk fagutvalg.

Intern driftsstøtte til forskning og forskere gis samlet til forskningsprogrammene/senteret og er lagt inn i budsjett med **1.2 mill.** (350.000 til hvert av programmene og 200.000 til CEES). Det er i tillegg avsatt publiseringsincentiver (**1 mill.**) til programmene/senteret (relativt etter antall publikasjoner), som fordeles når publiseringstall for 2011 foreligger. Programmene prioriterer selv interne prosjekter og faglige reiser som kvalifiserer for intern programstøtte i henhold til instituttets og programmenes faglige strategier. Programmene plikter å avsette minimum kr. 40.000 til drifting av gruppens lab. og forsknings-arealer med anvisningsrett til ansvarlig programingeniør.
Til drifting av interne rekrutteringsstillinger (16 stipendiater og 2 post docs) (2), er avsatt kr. 50.000 til hver, ialt **0.975 mill.** Beløpet er et driftstilskudd som skal dekke deler av PhD-prosjektstøtte, innkjøp av PC, software etc. CEES drifter selv sine interne stipendiater og post docs.
Til intern drifting av forskningsaktiviteter og forskere er avsatt **5.4 mill.**

Fellesavdelingene/båt regnskapsfører egne inntekter og utgifter. I budjett 2012 er foreslått ekstra driftsstøtte til avdelingene/båt med en samlet sum på **1.2 mill.**

Det foreslås avsatt kr. 200.000 til arbeidsmiljøtiltak, kr. 50.000 til kompetansetiltak for teknisk/administrativt personale, og kr. 50.000 til drifting av instituttleder. Innkjøp av ny husautoklav vedtatt i budsjett 2011 (**0.6 mill.**), er overført til utgift i budsjett 2012.
Til investeringer/vedlikehold og generell drift er avsatt **0.8 mill.**

Budsjettet er ført i balanse med et prognostert overskudd på 0.5 mill

Forslag til vedtak: Det framlagte budsjettforslag 2012 vedtas og langtidsbudsjett 2012–16 med ledelseskommentar tas til etterretning

Vedlegg: **-** Budsjett 2012
- Langtidsbudsjett 2012 – 2016 - ledelseskommentar

Budsjett BIO 2012

INNTEKTER	**Budsjett 2011**	**Prognose 2011**	**Budsjett 2012**
Overført fra forrige år	-4 190 073	-4 190 073	-5 390 052
Bevilgning post 50 (ekskl. CEES stip/ingeniør)	81 356 113	81 356 113	81 257 000
Likestillingsmidler gravide stipendiater		150 000	0
Tilbakeføring TA		605 324	0
Incentivmidler PhD stud Tøyen/NHM	-500 000	-882 050	-750 000
Stipendiat NHM - Ruben A. Pettersen	700 000	700 000	0
Ekstra rammetildeling		800 000	800 000
Dekningsbidrag prosjekter/CEES	12 000 000	11 800 000	14 500 000
Publiseringsmidler	i rammen	i rammen	i rammen
Småforskmidler	1 000 000	691 316	i rammen
Startpakker	i rammen	i rammen	
Kvinnelig II'ere - Sverdrup	50 000	50 000	50 000
Universitetet i Bergen for Finse	330 000	330 000	330 000
Stipendiatstilling (MLS)KJS	695 000	695 000	0
Stipendiatstilling (MLS)NCS	695 000	695 000	695 000
Stipendiatstilling (MLS)GPS	695 000	695 000	695 000
MLS KAMRAN - drift		400 000	400 000
Velferdspenger	10 000	10 000	10 000
Internasjonaliseringsmidler	50 000	50 000	50 000
Egenandel studenter feltkurs	130 000	130 000	130 000
IMBV1020 2010	160 000	160 000	160 000
Leie av Forskningsfartøy	1 300 000	1 300 000	
Leie av Fytotronen	200 000	200 000	
Leie av Drøbak	100 000	100 000	
Leie av Biologisk stasjon Finse	200 000	200 000	
Salg Skolelab	30 000	30 000	
Inntjening sentralverkstedet	300 000	300 000	
Felles-laber - service			1 000 000
Totale inntekter	**95 311 040**	**96 375 630**	**93 936 948**
UTGIFTER			
Fastlønn vit. ansatte/post.doc	-25 414 311	-25 586 365	-26 291 514
Fastlønn stipendiater	-11 792 277	-12 734 954	-13 299 063
Fastlønn teknisk ansatte	-12 026 454	-13 398 605	-13 899 650
Fastlønn administrasjonen	-5 939 692	-5 905 994	-6 459 097
Sum fastlønn	**-55 172 734**	**-57 625 918**	**-59 949 324**
Refusjon trygdeordninger:	1 800 000	1 800 000	2 200 000
Avsetning til life science satsning (Jakobsen)	-293 869	0	0
Overtid Fytotronen	-300 000	-300 000	-300 000
Overtid teknisk/administrativt	-100 000	-100 000	-100 000
Sum andre lønnskostnader	**1 106 131**	**1 400 000**	**1 800 000**
Sensorer bachelor/master	-250 000	-250 000	-250 000
Dr. disputaser	-700 000	-700 000	-700 000
Time/hjelpelærere bachelor/master	-700 000	-700 000	-500 000
Drift lab/feltkurs bachelor	-1 200 000	-1 200 000	-1 200 000
Drift lab/feltkurs master	-300 000	-300 000	-300 000
Masterstudenter	-800 000	-800 000	-800 000
Biologisk Fagutvalg	-30 000	-30 000	-30 000
Bachelorprogram i Biologi	-40 000	-40 000	
Sum drift undervisning/utdanning	**-4 020 000**	**-4 020 000**	**-3 780 000**

Drift 16 interne stip'er a 50 000 (ekskl. CEES)	-900 000	-900 000	-800 000
Drift nye stipendiater	-50 000	-50 000	-75 000
Drift interne post.docs a 50 000	-100 000	-100 000	-100 000
Startpakker nytilsatte (2 * 200.000)	-900 000	-900 000	-400 000
Drift forskningsprogrammer	-900 000	-900 000	-1 250 000
Småforskmidler	-1 000 000	-691 316	0
Drift forskere 30 a 10 000	-300 000	-300 000	0
Drift professor/amanuensis II 8 a 10 000	-80 000	-80 000	0
Publikasjonsstøtte a 8 000	-1 000 000	-1 000 000	-1 000 000
Faglige reiser : 40000 pr program + CEES	-160 000	-160 000	0
MLS-Jakobsen	0	0	0
MLS KAMRAN		-400 000	-400 000
MLS-NCS	-695 000	-695 000	-695 000
MLS-Sætre	-695 000	-695 000	-695 000
Internasjonalisering	-50 000	-50 000	
Sum drift forskning	**-6 830 000**	**-6 921 316**	**-5 415 000**
Egenandel vit.utstyr	-250 000	0	
Drift instituttleder	-100 000	-100 000	-50 000
Kompetansetiltak teknisk/admin	-100 000	-100 000	-50 000
Arbeidsmiljøtiltak	-300 000	-200 000	-200 000
Sum Kompetanse/Miljø/Egenandel	**-750 000**	**-400 000**	**-300 000**
FYTOTRONEN FYT	-190 000	-190 000	0
SKOLELABORATORIET SKO	-80 000	-80 000	-50 000
DRØBAK DRØ	-250 000	-250 000	-150 000
FINSE FIN	-400 000	-400 000	-200 000
BÅTPOOL BÅT	-2 000 000	-2 000 000	-700 000
BILPOOL	-100 000	-100 000	-100 000
SENTRALVERKSTEDET VER	-300 000	-300 000	0
FELLESDRIFT INSTITUTTET	-300 000	-300 000	
Sum drift fellesavdelinger	**-3 620 000**	**-3 620 000**	**-1 200 000**
Internhusleie	-28 278 448	-28 278 448	-28 574 000
Ny husautoklav	-600 000		-600 000
Investeringer/vedlikehold	-600 000	-1 500 000	-200 000
Felles drift inkl IT drift	-400 000	-300 000	-600 000
Generell reserve	-500 000	-500 000	
Sum utgifter	**-99 665 051**	**-101 765 682**	**-98 818 324**
Årets resultat	**-163 938**	**-1 199 979**	**508 676**
Resultat inkl. overført fra forrige år	**-4 354 011**	**-5 390 052**	**-4 881 376**

Budsjettkommentar for 2012-2016

Enhet: Biologisk Institutt	Stedkoder: 1521
Instituttleder: Trond Schumacher	Dato: 20.11.2011

Dokumentet omhandler grunnleggende vurderinger og forutsetninger for årsbudsjett for 2012 og prognose (LTB) for 2013-2016.

Totalt for virksomheten	2012	2013	2014	2015	2016
Overført saldo fra i fjor	-10.934	-11.245	-10.984	-10.615	-12.280
Bevilgning fra KD	-86.387	-85.208	-84.718	-86.066	-85.490
Andre inntekter	-94.512	-90.249	-89.410	-87.999	-88.250
Lønnskostnader	100.350	101.559	101.371	101.451	100.229
Andre kostnader	79.696	74.158	73.126	70.948	70.474
Totalt	-11.245	-10.984	-10.615	-12.280	-15.316

Bevilgningsfinansiert virksomhet	2012	2013	2014	2015	2016
Overført saldo fra i fjor	-1.000	-343	-549	30	-979
Bevilgning fra KD	-86.387	-85.208	-84.718	-86.066	-84.490
Andre inntekter	-26.153	-25.483	-25.695	-25.801	-25.665
Lønnskostnader	62.503	63.090	63.598	63.464	62.196
Andre kostnader	50.694	47.394	47.394	47.394	47.394
Total	-343	-548	30	-979	-2.544

Eksternt finansiert virksomhet	2012	2013	2014	2015	2016
Overført saldo fra i fjor	-9-394	-10.903	-10.435	-10.645	-11.301
Bidragsinntekter fra NFR	-63.796	-60.267	-59.070	-60.661	-60.000
Bidragsinntekter fra EU	-5.535	-4.519	-7.439	-7.000	-7.000
Andre inntekter prosjekt	-13.429	-14.212	-11.650	-9.088	-9.000
Lønnskostnader	37.847	38.469	37.773	37.987	38.033
Andre kostnader	43.405	40.997	40.177	38.106	37.495
Total	-10.903	-10.435	-10.645	-11.301	-11.773

Inntekter

1. Bevilgning KD (post 50).

Bevilgningen til instituttet over post 50 er siden 2006 blitt redusert hvert eneste år, etter justering for lønns- og prisvekst. Dette gjelder også fra 2011 til 2012. Det er ingen signaler om at dette vil endre seg i de nærmeste årene.

Studiepoengsproduksjonen har vært stabil og med nåværende opptaksrammer (80) forventes ingen økning av denne komponenten.

Antall MSc kandidater som uteksamineres varierer mellom 40 og 45 årlig. Det forventes en beskjeden økning i antall MSc kandidater i perioden, til 50 kandidater årlig.

Instituttet har p.t. 22 KD-stipendiater, 2 MLS stipendiater, og 4 interne (på grunnbevilgningen)stipendiater og 3 post docs. Antall fullførte PhD grader har variert mellom 8 og 16 årlig, med forventet måltall lik 15 de nærmeste årene.

Det forventes ingen vesentlige endringer i publikasjonspoeng-tildelingen.

2. Inntekter utover bevilgning KD (post 50)

Utvikling av dekningsbidraget har de siste årene vært positiv, og inntektene forventes fortsatt å øke noe i 2012. Med nåværende bemanning vil dette trolig ikke fortsette å stige etter 2012.

Kostnader

Med faktisk (2011) og prognostert inntektsnivå i vil instituttet ikke kunne avsette nye midler til investeringer. Det har vært foretatt betydelige investeringer i ny forskningsinfrastruktur i perioden 2005-11.

Lønnskostnadene har vært og vil fortsatt være stigende. Det er liten turnover i bemanningen ved instituttet. Årsverk-utviklingen for teknisk og midlertidig vitenskapelig personale har frem til nå vært positiv og for de fast vitenskapelige negativ. Den negative utviklingen i bemanningen av fast vitenskapelig personale vil trolig resultere i en negativ produksjonsutvikling de nærmeste årene.

Instituttet har vært igjennom en periode med nødvendig oppbygging av teknisk infrastruktur for å møte utfordringene i forsknings-verdenen. Det er et klart samsvar mellom siste års satsninger og forventet kostnadsutvikling på lønn og drift.

Instituttet har p.t. ikke økonomi til å styrke bemanningen internt utover det som er gjort rundt teknisk infrastruktur (ingeniørstillinger etc).

Driftskostnadene til forskning og utdanning vil i all vesentlig grad måtte tas fra ekstern finansiert virksomhet, slik situasjonen har vært de siste 10 årene.

Eksternt finansiert virksomhet

Prosjektporteføljen er tilfredsstillende og bidrar til ekstra inntekter (dekningsbidrag) til instituttøkonomien, men medfører også økte kostnader til drifting av nødvendig infrastruktur. Det er ikke realistisk å regne med ytterlige økning av prosjektporteføljen og aktivitetsnivået de nærmeste årene. Aktivitetsnivået med nåværende bemanning er ikke forventet å øke.

Instituttet har i flere år fokusert på nødvendigheten av å skaffe gode og stabile rammebetingelser for eksperimentell forskning. Det er å håpe at forskerne får muligheter til å gå for "de gode pengene" i form av større prosjekter finansiert av EU. Det vil gi mer stabile og økte driftsinntekter til god forskning.

Bundne midler

Det er ingen forventede endringer på internt og eksternt bundne midler

Vurdering av handlingsrom og økonomisk utvikling for langtidsperioden 2012 – 2016

Instituttet har p.t. et svært lite økonomisk handlingsrom. En analyse av indre og eksterne faktorer tilsier at dette også vil være situasjonen i de nærmeste årene.

Til: Instituttstyret ved Biologisk institutt

Sakstype: Vedtakssak

Saksnr.: V-sak IS 16/2011

Møtedato: 8.12.10

Notatdato: 1.12.10

Saksbehandler: Trond Schumacher/Maren Onsrud

Sakstittel: Årsplan 2012-2014

Tidligere plandokumenter/henvisning til lovverk etc.:
V-sak IS 16/2010 - Årsplan 2011

De viktigste problemstillinger:
Styret ved UiO har besluttet at alle nivå i organisasjonen skal utarbeide en årsplan som skal følge budsjettbehandlingen. Vedlagt følger ledelsens forslag til årsplan for 2012-2014.

Forslag til vedtak:
Årsplanen for 2012-2014 vedtas

Vedlegg:
Årsplan 2012-2014

Årsplan 2012-2014
Biologisk institutt

INNLEDNING
Biologisk institutt får i 2012 – som i 2011 – en reell inntektsreduksjon over basis (post 50) på NOK 2.7 mill. Dette vil kreve stram økonomistyring også i 2012. Instituttet vil ha fortsatt fokus på de "gode pengene" i EU- og NFR- systemet til å finansiere forskningsaktivitetene på instituttet, dvs. større prosjekter som involverer flere av våre forskere. Dette vil være helt avgjørende for å bedre instituttets økonomi innen 2014. De økonomiske rammevilkårene er begrensende for instituttets aktiviteter i den forstand at belastningen på personalet på alle nivå blir for stor.

Instituttet forsetter arbeidet med styrking av instituttets programstruktur (nivå 4) og satsningsområder. Programledere og senterleder er aktive deltakere i instituttets faglige og strategiske ledelse. Instituttets utdannings- og forskningsprogrammer er kjerneaktiviteter i fakultetets Life Science satsning, og instituttet vil delta aktivt i fakultetets arbeid for å bedre utdanningstilbudet og styrke forskningen innen Life Science-feltet.

En av instituttets primæroppgaver er å utdanne høyt kvalifiserte kandidater innen et bredt spekter av biologiske disipliner – samtidig som våre kandidater gjennom bachelor-utdanningen skal gis et bredt biologisk og realfaglig grunnlag som utgangspunkt for videre faglig fordypning gjennom master- og PhD-studiene. Vi vil gi forskningsbasert undervisning av høy kvalitet på alle nivå i viktige områder av biologien og ønsker å rekruttere mange studenter med god realfagsbakgrunn. For å oppnå dette vil vi fortsette arbeidet med å synliggjøre instituttets aktiviteter på web og i annen formidling.

Instituttet bidrar aktivt til formidling av biofagets betydning i samfunn og kultur, bl.a. ved å gi tidsaktuelle forelesninger, seminarer, posters og stands på faglig-pedagogisk dag, Darwin Day, Åpen dag, BIO-dag og NFRs forskningsdager. Et utvidet samarbeid med realfagsbiblioteket – som startet opp i 2011 – vil fortsette, bl.a. gjennom aktiv deltagelse i forum for "Science Debate".

Instituttet skal ha en målrettet rekrutteringspolitikk og ta i bruk tilgjengelige virkemidler for å rekruttere og beholde attraktiv kompetanse. Som et av landets største og ledende institutter innen evolusjonsbiologi og økologi, er det viktig å ivareta vår sentrale rolle og deltakelse i nasjonale og internasjonale faglige nettverk. Instituttet vil fortsette arbeidet med å legge forholdene til rette for en god utnyttelse av instituttets personressurser.

Instituttet vil fortsette sitt systematiske HMS-arbeid for å sikre at forskrifter og krav til forsvarlig laboratorie- og feltarbeid ivaretas. Vårt arbeidsmiljø vil fortsatt være et fokusområde i perioden.

Et grensesprengende universitet

Mål 1: Universitetet i Oslo skal fremme grensesprengende forskning, utdanning og formidling og være en etterspurt internasjonal samarbeidspartner.

UiOs PRIORITERTE STRATEGIER:

1: Styrken i den faglige bredden skal utnyttes enda bedre gjennom tverrfaglig forskning og utdanning. Det skal utvikles gode finansieringsmekanismer for tverrfaglige aktiviteter og tidsavgrensede satsninger.
2: Det internasjonale engasjementet skal bli større, blant annet gjennom økt deltagelse i selektive, strategiske partnerskap og Det europeiske forskningsområdet.
3: Alle utdanningsprogrammer skal gis en internasjonal profil og samarbeidet med utenlandske institusjoner skal økes for større relevans og høyere kvalitet.

MN Strategier:

- Fakultetet skal gi landets beste realfaglige utdanning på universitetsnivå
- Fakultetet skal være Norges mest attraktive studiested for realfagsstudier på høyt internasjonalt nivå
- Fakultetet skal utnytte bredden i disiplinene ved å samle deler av forskningen under store overordnete temaer for å utnytte kompetanse og ressurser på tvers av faglige grenser.

BIO MÅL:

- **Biologisk institutt skal fremme god forskning og utdanning i biologi og være en etterspurt nasjonal og internasjonal samarbeidspartner. Biologisk institutt skal videreutvikle og tydeliggjøre instituttets kompetanseområder og satsninger innen Life Science.**
- **Biologisk institutt skal tilby forskningsbasert utdanning på linje med de fremste internasjonale læresteder.**

Delmål:

1) **Bistå våre forskergrupper til å nå et høyt internasjonalt kompetansenivå i sine fagområder**

Tiltak:

- Styrking av forskningsmiljøer som har fått status som toppforsknings-, utviklings- og nyetablering på institutt og fakultet
- Bistå instituttets forskningsprogrammer for å heve deres status i MN-fakultetets strategiske planer for neste styreperiode
- Fortsatt gi noe driftsstøtte og publiseringsincentiver til forskningsprogrammene/senteret. Utfordre forskerne i forhold til egen publiseringsaktivitet med et særlig fokus på å publisere i sentrale (høyt siterte) tidsskrifter innen sine fagfelter. Forskere som ikke publiserer skal følges opp spesielt.

2) Styrking av forskningsledelse og forskningsadministrativ støtte til programmene

Tiltak:

- Fortsette kompetanseutvikling for program- og forskningsgruppeledere
- Styrke det forskningsetiske innhold på bachelor- og masternivå
- Oppfølging av kvalitets- og tidsriktige økonomi- og forskningsadministrative tjenester rettet mot instituttets forskere og deres prosjekter

3) Styrke samarbeidet med prioriterte partnere nasjonalt og internasjonalt

Tiltak:

- Synliggjøre og videreutvikle igangsatte prosjekter innenfor instituttets kompetanseområder, og spesielt i større tverrfaglige Life Science satsninger
- Videreutvikle deltakelse i fakultære, inter-fakultære, nasjonale og internasjonale strategiske og biofaglige nettverk, slik som det Nasjonale Plantenettverket, "Norwegian-High-Throughput Sequencing Centre (NSC), EU-prosjekter, "Marie Curie" etc.
- Bistå forskerne i å utvikle nye, større EU-prosjekter sammen med nasjonale og internasjonale partnere

Målindikatorer og måltall:

- Registrering av publiseringskanaler
- Årlig antall publikasjoner i forskningsprogrammene/senteret
- Forskningspublisering pr. vitenskapelig årsverk
- Suksessrate i EU- og NFR-søknader og tildeling pr. vitenskapelig årsverk
- Antall avlagte doktorgrader

Læringsuniversitetet

Mål 2: Universitetet i Oslo skal tilby forskningsbasert utdanning på linje med de fremste internasjonale læresteder.

UiOs PRIORITERTE STRATEGIER:

7: Universitetet i Oslo skal tilby utdanninger som tiltrekker seg studenter som har forutsetninger for, og som engasjeres av studier ved et fremragende forskningsuniversitet. Studentene skal tilbys forskningsbasert undervisning som danner og utdanner, også på tvers av faggrenser.
8: UiO skal tilby landets beste læringsmiljø gjennom klarere forventninger, tettere oppfølging, bruk av varierte læringsformer, læringsfremmende evaluering og god pedagogisk kompetanse.
10: Forskerutdanningen skal videreutvikles og være fremtidsrettet. Den skal være internasjonalt attraktiv, og stipendiatene skal være integrert i aktive forskningsmiljøer.
11: UiO skal tilby landets beste lærerutdanning og øke rekrutteringen av gode studenter til realfag.

MN Strategier:

- Fakultetet skal ha en undervisningskultur som gir et godt og stimulerende læringsmiljø
- Fakultetet skal gi en grunnleggende, robust og fremtidsrettet utdanning
- Fakultetet skal legge til rette for bedre gjennomføring av studiene

BIO MÅL:

- **Utdanningsprogrammet i biologi skal være en faglig og sosialt stimulerende arena for tilegning av kunnskap og kompetanse innen biologi**
- **Biologisk institutt skal utdanne høyt kvalifiserte kandidater i biologi på alle nivå (bachelor-, master og PhD)**
- **Biologisk institutt skal gi studentene et godt grunnlag for videre faglig fordypning og gjøre dem konkurransedyktige i arbeidsmarkedet**

Delmål:

1) Sette læringsutbytte og kandidatenes kompetanse i sentrum

Tiltak:

- Opprettholde feltundervisning og laboratoriearbeid som sentrale elementer i kurstilbudet på alle nivå

2) Videreutvikle utdanningstilbudet

Tiltak:

- Legge til rette for økt grad av internasjonal studentutveksling
- Videreutvikle samarbeidet i nordiske nettverk/utdanningsprogrammer
- Støtte opp om etter- og videreutdanningen av lærere gjennom skolelaboratoriets programmer og virksomhet
- Ta aktivt del i fakultetets tverrfaglige utdanningstilbud i Life science

3) Videreutvikling av kvalitetssystemet for utdanning

Tiltak:

- Synliggjøre resultater og oppfølging av evalueringer

4) Rekruttere dyktige og motiverte studenter med fokus på realfag og biologi

Tiltak:

- Styrke undervisningsopplegget rundt 1.-årsstudentene

Målindikatorer og måltall:

- Studiepoengproduksjon pr. student
- Primærsøkere
- Antall utvekslingsstudenter
- Oppfølging av Phd-studentenes rapportering
- Undervisningsregnskap

Et samfunnsengasjert universitet

Mål 3: Universitetet i Oslo skal gjennom aktiv dialog og samarbeid bidra til at forskningsbasert kunnskap kommer til anvendelse for å løse det 21. århundrets store samfunnsutfordringer.

UiOs PRIORITERTE STRATEGIER:

13: UiO skal dele kunnskapen og styrke dialogen med samfunnet. Forskningsbasert kunnskap skal komme til anvendelse gjennom et tettere samarbeid med institutter, offentlige og private virksomheter.

MN Strategier:

- Fakultetet skal yte betydelige bidrag til verdiskapning og kompetansehevning i samfunnet gjennom forskningsbasert innovasjonsaktivitet
- Styrke forståelsen for realfagenes kulturelle og samfunnsmessige betydning og profilere virksomheten ved fakultetet

BIO MÅL:

- **Formidle biofagets betydning for vår natur og kultur**
- **Synliggjøre våre kandidaters kompetanse og nytteverdi for samfunnet**

Tiltak:

- Legge til rette for å dele kunnskap og styrke dialogen med samfunnet
- Sørge for bedre utadrettet kommunikasjon
- Oppfølging av instituttets nettsider

Et handlekraftig universitet

Mål 4: Universitetet i Oslo skal forvalte sine samlede ressurser offensivt slik at de bidrar til å understøtte kjerneaktivitetene.

UiOs PRIORITERTE STRATEGIER:

18: Ressursene skal fordeles på basis av kvalitet og relevans i aktiviteter og miljøer, og de faglige prioriteringene skal legges til grunn. Forskningsmiljøer og utdanningsmiljøer som utmerker seg med høy kvalitet skal ha gode betingelser.
19: UiO skal sikre at grunnfinansiering og ekstern finansiering virker gjensidig forsterkende, gjennom fokus på totalkostnadene og mer aktiv prioritering av områder for ekstern finansiering
20: For å kunne gi ansatte og studenter gode rammebetingelser og nødvendig utstyr, skal alle enheter ha en god balanse mellom lønnskostnader og driftskostnader

MN Strategier:

- Nytilsettinger skal bidra vesentlig til å styrke konkurransedyktighet og forskningsprofil
- Fakultetet skal ha en forvaltning som utnytter moderne prinsipper og ressurser til best mulig fordel for våre kjerneaktiviteter
- Fakultetets forskere skal ha høy aktivitet og god uttelling på søknader om stor nasjonal og internasjonal forskningsfinansiering

BIO MÅL:

- **Ha en ledelse og forvaltning som gir maksimal støtte til instituttets virksomhetsområder: forskning, utdanning og formidling av biofaget**
- **Forvalte egne ressurser målrettet og effektivt**
- **Øke det økonomiske handlingsrommet til instituttet**

Delmål:

1) Bedre samspillet mellom alle deler av instituttet

Tiltak:
- Initiere tiltak som fremmer god kommunikasjon, økt samhandling og ansvarliggjøring av alle medarbeidere

2) Arbeide for bedre samsvar mellom mål/oppgaver og bevilgninger

Tiltak:
- Bruke budsjett og interne/eksterne rammebetingelser aktivt som et styringsverktøy og et stimuleringsmiddel

3) Forvalte egne ressurser målrettet og effektivt

Tiltak:

- Arbeide for å utvide ressursgrunnlaget, i første rekke gjennom økt ekstern forskningsfinansiering
- Systematisk identifisere kandidater til EU- eller ERC-utlysninger. Motivere og coache kandidatene.

Det gode universitetet

Mål 5: Universitetet i Oslo skal legge til rette for at studenter og ansatte skal realisere sitt potensial i et godt arbeids- og læringsmiljø

UiOs PRIORITERTE STRATEGIER:

25: Universitetet skal utvikle lederfunksjonene med tydelige roller og ansvarsfordeling i alle deler av organisasjonen. Ansatte og studenter skal vite hvor beslutninger treffes og hvordan disse kan påvirkes gjennom medbestemmelse og universitetsdemokrati.
26: Universitetet i Oslos personalpolitikk skal ivareta alle grupper ansatte og tilby gode muligheter for faglig og profesjonell utvikling.
27: Arbeids- og læringsmiljøet skal prioriteres høyere, herunder den fysiske infrastrukturen
28: Universitetet skal ha en aktiv rekrutteringspolitikk med internasjonalt fokus og en tydelig profil for likestilling mellom kvinner og menn.

MN Strategier:

- Fakultetets organisering og støttefunksjoner skal bidra vesentlig til standarden på kjerneaktivitetene
- Fakultetet skal legge til rette for at den enkelte medarbeider skal utvikle sin faglige kompetanse og gi en økende merverdi for fakultetets kjerneaktiviteter

BIO MÅL:

- **Biologisk institutt skal gi studenter og ansatte et godt, utfordrende og trygt miljø med ansvar, innflytelse og reelle utviklingsmuligheter**
- **Ha en HMS-virksomhet som gir høyt sikkerhetsnivå, trygg helse og et godt arbeidsmiljø**
- **Ha en aktiv rekrutteringspolitikk med internasjonalt fokus og en tydelig profil for likestilling mellom kvinner og menn**

Delmål:

1) **Kombinere høye krav med god støtte og muligheter for videreutvikling**

Tiltak:

- Oppfølging av den enkelte medarbeider gjennom årlige medarbeidersamtaler
- Gi de ansatte mulighet for individuell kompetanseutvikling som styrker/samsvarer med UiOs og instituttets faglige og administrative behov
- Samarbeide med fakultetet om egnede virkemidler og tiltak for å øke andelen kvinner i faste vitenskapelige stillinger

2) **Legge forholdene til rette for optimalt samarbeid mellom faggruppene innad og utad på sentralverkstedet og med de andre verkstedene ved UiO**

Tiltak:

- Øke samarbeidet med de andre verkstedene ved MN- og MED-fakultetene
- Øke prosjektsamarbeid med eksterne brukere ved fellesavdelingene
- Ha fokus på – og prioritere arbeids- og læringsmiljø, herunder den fysiske infrastrukturen
- Videreutvikle felles standarder for arealdisponering for alle brukergrupper ved instituttet

Målindikatorer og måltall:

- Risikovurderinger
- Standard Operation Procedures (SOP)
- Vernerunder

Til: Instituttstyret ved Biologisk institutt

Sakstype: Vedtakssak

Saksnr.: V-SAK 17/2011

Møtedato: 8.12.2011

Notatdato: 1.12.2011

Saksbehandler: Trond Schumacher/Maren Onsrud

Sakstittel: Utlysning av instituttlederstillingen

Henvisning til lovverk, plandokumenter og tidligere behandling i styret:
IS3/2011 V-sak 10/2011

De viktigste problemstillingene:
En komité bestående av Dag O. Hessen (leder), Anne K. Brysting, Josefin Titelman og Bodil K. Pedersen fikk oppdraget med å lage forslag til en stillingsutlysningstekst og stillingsbetenkning.
Stillingsutlysningsteksten og stillingsbetenkningen skal etter godkjenning av instituttstyret behandles og godkjennes av fakultetsstyret. Det er fakultetet som lyser ut stillingen og tilsetter instituttleder.
Det er ønskelig at stillingen blir lyst ut i løpet av februar måned 2012.

Forslag til vedtak: Utlysningstekst og stillingsbetenkning godkjennes

Vedlegg:
- Utlysningstekst for instituttlederstillingen
- Stillingsbetenkning

Instituttleder ved Biologisk Institutt, Universitetet i Oslo

Biologisk Institutt søker instituttleder med ønsket tiltredelse fra 01.01.13. Instituttet har ca. 100 ansatte (derav 30 PhD-studenter og postdocs) og 400 studenter, se www.bio.uio. Instituttet er delt inn i forskningsprogrammer, hvorav et senter for fremragende forskning. Forskning og undervisning dekker et bredt felt innen økologi og evolusjon fra molekylære prosesser til økosystemer.

Instituttleder i skal samhandling med instituttets ansatte være en drivkraft i den faglige og organisatoriske utviklingen ved Biologisk institutt. Det forutsettes godt kjennskap til naturfaglig forskning. Den som tilsettes må ha dokumentert ledererfaring samt forskerbakgrunn med Dr. grad innen et relevant forskningsområde.

Vi ønsker en instituttleder som har evne til å motivere og utøve lederskap og tilrettelegge for samhandling og resultatoppnåelse i profileringen av instituttet. Tilsetting skjer på åremål for inntil fire år fra tiltredelse, med adgang til forlengelse for ytterligere en periode etter ny utlysning.
Universitetet ønsker flere kvinner i ledende stillinger. Kvinner oppfordres til å søke.
Søknadsfrist ……
Ref.nr.: **……**

Biologisk institutt:
Instituttleder ved Biologisk institutt,
Det matematisk-naturvitenskapelige fakultet, Universitetet i Oslo.

Instituttleder søkes til Biologisk institutt, Universitetet i Oslo.

Universitetet i Oslo har som ambisjon å være et fremragende europeisk forskningsuniversitet, og blant de beste universitetene i Europa når det gjelder studiekvalitet og læringsmiljø. Universitetet skal bidra med et aktivt samfunnsengasjement og fremtidig kunnskapsbasert verdiskapning. Universitetet i Oslo har i dag 33.000 studenter og 5.300 ansatte, hvorav ca 2.100 er midlertidig ansatte i rekrutteringsstillinger eller med prosjektoppgaver.

Biologisk institutt utdanner bachelor-, master- og doktorgradskandidater. Instituttet er landets største universitetsinstitutt innen biologi og har ca 100 ansatte (derav 30 PhD-studenter og postdocs) og 400 studenter, se www.bio.uio. Instituttet driver forskning på høyt internasjonalt nivå og mange av instituttets forskere og forskergrupper har et stort internasjonalt nettverk. Biologisk institutt har ambisjon om å være et ledende forskningsinstitutt både nasjonalt og internasjonalt. Instituttets forskning skal bidra til ny innsikt i grunnleggende og anvendt biologi på en rekke områder, blant annet innen klima, biodiversitet, molekylærbiologi, ressurs- og bestandsforvaltning. Det er et mål at instituttets forskning dermed kan bidra til en mer bærekraftig utvikling og kunnskapsbasert verdiskapning.

Forskningsaktiviteten ved Biologisk institutt er organisert i følgende programmer:

- Centre for Ecological and Evolutionary Synthesis (CEES)
- Integrativ biologi og toksikologi
- Marinbiologi
- Microbial Evolution Research Group (MERG)

Biologisk Institutt har siden 2005 hatt en ledelsesmodell som innebærer at instituttleder har ansvar for både den faglige og administrative virksomheten ved instituttet. Instituttleder er ansvarlig for instituttets virksomhet innenfor rammer satt av universitetsstyret, fakultetets planer og instrukser fra dekan og gjennom vedtak fattet i instituttstyret. Instituttleder har overordnet ansvar og myndighet med hensyn til alle oppgaver som ikke eksplisitt er tillagt instituttstyrets myndighetsområde, og har generell fullmakt til å avgjøre løpende enkeltsaker. Instituttlederen er leder av instituttstyret.

Instituttleder skal i tett samhandling med instituttets ansatte være en drivkraft i den faglige og organisatoriske utviklingen ved Biologisk institutt. Forskningsaktiviteter ved institutt av denne typen er i stor grad initiert av forskergrupper og enkeltforskere, og en viktig oppgave for instituttlederen er å støtte opp om initiativ og kreativitet ved å inspirere, tilrettelegge og motivere.

Instituttlederen skal ivareta den samlede økonomiske ramme som instituttet forvalter. Instituttleder har det lokale arbeidsgiveransvaret for alle ansatte ved instituttet, og skal sørge for at gjeldende lønns- og personalpolitikk ved UiO blir fulgt opp. Det samme gjelder helse-, miljø- og sikkerhetsarbeidet (HMS). Det er instituttleders ansvar å sørge for at de organisatoriske forholdene legges best mulig til rette for instituttets aktiviteter.

Instituttlederen skal ivareta faglig ledelse gjennom strategisk styring og utvikling av instituttets forskning, undervisning, formidlingsoppgaver og annen faglig basert virksomhet. Instituttleder tilsettes på åremål for inntil fire år, med adgang til forlengelse for ytterligere en periode etter ny utlysning.

Prioriterte oppgaver:

- Synliggjøre Biologisk institutt som sentral forsknings- og undervisningsinstitusjon innen biologi.
- Styrke og utvikle Biologisk institutt i henhold til oppsatte mål og strategier for instituttet og for UiO, både faglig og organisatorisk.
- Bidra til å styrke den finansielle situasjonen ved Biologisk institutt og forvalte ressursene best mulig.
- Legge til rette for et godt arbeidsmiljø som inspirerer, støtter og følger opp forskningsaktivitet, undervisning og andre oppgaver ved instituttet.
- Sørge for å utvikle kompetansen hos alle ansatte i organisasjonen.

Ønsket erfaring:

- Ledelseserfaring fra forsknings- og undervisningsinstitusjoner eller annen relevant virksomhet.
- Erfaring fra personalledelse og/eller ledelse av forskningsgrupper.
- God kjennskap til nasjonal og internasjonal forskning, utdanning og forskningsfinansiering.
- Evne til å bygge nettverk og allianser nasjonalt og internasjonalt.

Den som tilsettes skal ha doktorgrad eller tilsvarende relevant kompetanse innen naturvitenskapelige fagområder. Det legges stor vekt på personlig egnethet, og den som tilsettes forventes å ha gode evner til å kommunisere, motivere og utøve tydelig lederskap i den videre utviklingen av Biologisk institutt.

Universitetet ønsker flere kvinner i ledende stillinger, og kvinner oppfordres derfor til å søke.

Til: Instituttstyret ved Biologisk institutt

Sakstype: Orienteringssak

Saksnr.: O-SAK 11/2011

Møtedato: 8.12.11

Notatdato: 1.12.11

Saksbehandler: Trond Schumacher/Maren Onsrud

Sakstittel: Fagevalueringen i biologi

Tidligere vedtak i saken/Plandokumenter/Henvisning til lovverk etc.:
O-sak 8/2010: Fagevaluering av biologi, medisin og helsefag, inklusive psykologi
O-sak 2/2011: Biofagevalueringen

De viktigste problemstillinger:
Selvevaluering av instituttet (nivå 1) og forskningsprogrammene, inklusive CEES (nivå 2) ble oversendt Forskningsrådet ved Divisjonsstyret for vitenskap 15. desember 2010. Instituttet møtte fagpanelet (Panel 1) 1. april i år for gjennomgang og utspørring. Panelets rapport forelå 17. november.

CEES har fått vurderingen ”excellent” av panelet, Marinbiologiprogrammet ”very good”, og Integrativ biologi og MERG har fått vurderingen ”good to very good”.

Vedlegg:
- Evaluation of Biology, Medicine and Health Research in Norway (2011)
  Report of the Principal Evaluation Committee
- Ekstrakt fra rapporten Botany, Zoology and Ecology-related Diciplines, Panel 1

Hele rapporten fra panel 1 er tilgjengelig på denne siden: ”Evalueringsrapport panel 1”

The Research Council of Norway

Evaluation of Biology, Medicine and Health Research in Norway (2011)

Report of the Principal Evaluation Committee

Evaluation
Division for Science

The Research Council of Norway

Evaluation of Biology, Medicine and Health Research in Norway (2011)

Report of the principal evaluation committee

Contents

Executive summary

The draft human genome, published ten years ago, has already had a profound impact on research within biology, medicine and health. The focus has now shifted to human variation, where the exponentially declining costs world-wide will boost the sequencing of entire populations. This development will bring research within fundamental biology even closer to medicine and to health-related research. New types of molecular level data, originating from identifiable individuals, will be integrated with phenotypic data from the health-care sector in novel ways, and it will also increasingly find its way into the clinic, where it will impact treatment and the progression of the underlying research, needed to take advantage of this situation.

This joint evaluation report integrates the findings, conclusions and recommendations of seven independent review panels, covering biology, medicine and health at Norwegian universities, hospitals, university colleges and independent research institutes. As the above mentioned development will accelerate over the next ten year period, it is extremely important to pay attention to potential synergies between the different research areas covered by the review panels. In Norway, the integration of the different research disciplines is far from optimal and this is one of the themes commented on by the principal committee. The rapid development makes it necessary to create more flexible organizational schemes and infrastructures than Norway has implemented presently. The previous evaluation reports have also touched on these problems. In fact, when reading the earlier review reports from evaluations of Norwegian research in 2000 and 2004, it is remarkable how many of the previously identified weaknesses still seem to represent major issues in the Norwegian research environment.

The principal committee has made a number of recommendations, covering funding, career tracks, institutional freedom to operate, the lack of multi-disciplinarity, infrastructures in research, and needs within knowledge management. The committee recommends that:

- a larger fraction of the funding of biomedical research should be available for researcher-driven proposals, with a corresponding decrease of the restricted, thematic research programmes. At the same time, RCN should reserve dedicated funding streams for young scientists. Researchers should be encouraged more to apply for EU, US National Institutes of Health and other international funding, as it also contributes to the internationalization of Norwegian research;
- in order to create better opportunities for the coming generations of scientists, more postdoc positions, as well as a tenured track for postdocs and mid-career positions should be established. The existing MD/PhD and DDS/PhD programs introduced at several universities should be expanded;
- institutional core funding to a much higher degree should be used strategically;
- critical mass within research teams more often is achieved through collaboration across institutions. This will at the same time secure the level of

multi-disciplinarity needed in modern research. A strengthening of research infrastructures is also a way forward to secure critical mass;

- new knowledge management methodology, such as joint data-discovery portals and data integration techniques transcending the molecular and clinical levels, should be considered in future initiatives;
- the research institute organization is reviewed with the possibility to better integrate the institute research with the universities.

4

Preface by the Research Council of Norway

The Research Council of Norway (RCN) is given the task by the Ministry of Education and Research to perform subject-specific evaluations. According to the plan for these evaluations the RCN carried out a comprehensive evaluation of Norwegian research within biology, medicine and health in Norwegian universities, hospitals, university colleges and independent research institutes during 2010 and 2011.

Norwegian research within biology, medicine and health has a large span. There has been an expressed wish from research institutions to have all the disciplines evaluated in the two former evaluations encompassed in a joint evaluation. Due to the large span in disciplines and the number of scientific groups involved, seven international panels of experts were established;

Panel 1	Botany, Zoology and Ecology-related Disciplines
Panel 2	Physiology-related Disciplines
Panel 3	Molecular Biology
Panel 4a	Clinical Research – Selected Disciplines
Panel 4b	Clinical Research – Selected Disciplines
Panel 5	Public Health and Health-related Research
Panel 6	Psychology and Psychiatry

The disciplines were placed in different panels according to Norwegian Classification of Scientific Disciplines which is a standard decided by the Norwegian Association of Higher Education Institutions (UHR) in 1994 to classify scientific research. Using this standard was not optimal as it led to splitting of university institutes and independent research institutes into different panels, but was judged to be the best approach to enable comparison between disciplines at the various institutions.

The assessments and recommendations from the seven panels are compiled in seven separate reports. The reports will give important input to the individual research institutions, to the Research Council and to relevant ministries and to any other bodies involved in the development of Norwegian research.

The Principal Evaluation Committee was requested to compile a report based on the assessments and recommendations from the seven independent panel reports. The principal Evaluation Committee consisted of the seven leaders of the panels. This principal report offers an overall assessment of the state of the research involved and is presenting a set of overall recommendations concerning the future development of research in biology, medicine and health in Norway.

Oslo, November 2011

Hilde Jerkø (sign.)
Director
Division for Science

Mari K. Nes (sign.)
Director
Division for Society and Health

The mandate for the principal evaluation committee

As Principal Evaluation Committee we were requested to compile a report based on the assessments and recommendations from the seven independent panel reports. The report should offer an overall assessment of the state of the research involved and present a set of overall recommendations concerning the future development of this research.

The Committee was requested to summarize:

1. The overall scientific quality and relevance of Norwegian research within biology, medicine and health. Identify which research areas have a particularly strong scientific position, in a national and international context, and which are particularly weak.
2. The societal impact of the research. To what extent does the research meets the demand for interdisciplinary research and future societal challenges?
3. General assessments related to the institutional structure and situation for Norwegian research in these fields, calling attention to any areas that need special attention. Are there specific institutional features that may enhance or hinder growth and development of Norwegian research and Norway's contribution to the international knowledge base?
4. How the research institutions have followed up former evaluations
5. And comment on any other important aspects of research within biology, medicine and health that ought to be given special consideration.

The committee's conclusions should lead to a set of recommendations for the future development of research in biology, medicine and health in Norway.

These conclusions and recommendations are presented on the following pages.

General comments on research areas

The principal committee summarizes below the findings of the specialized panels covering subareas within biology, medicine and health at Norwegian universities, hospitals, university colleges and independent research institutes. For each of the specialised panels, research areas that have a particularly strong scientific position, in a national and international context, or which are particularly weak, are identified below.

Panel 1 Botany, Zoology and Ecology-related disciplines

Several research groups have international strengths in the areas of ecology, biodiversity and conservation biology as well as the synthesis of ecology and evolution. These combined strengths are important for coping with future challenges in environmental management including the prevention of habitat degradation, controlled harvesting, population conservation, and climate change.

The museums contain collections that constitute both national and international resources, including specimens and type specimens. It is not clear what role those resources will play in the future, or the extent to which they are being catalogued using DNA barcoding technology to constitute a national database or to fit into international databases. A review to clarify the future roles of museums in research should be undertaken.

Panel 2 Physiology-related disciplines

Several fields of neuroscience are with no doubt excellent areas and include research groups at the absolute frontline internationally. There are some advanced groups in developmental biology, especially in marine developmental biology, which is unique for Norway. Fish health is of tremendous importance for aquaculture and there are indeed examples of very good fish health research. However, Norway could play an even more dominant role if several smaller and geographically separated groups in the area of host-pathogen interactions in fish and aquaculture science were forming centers or being merged. Groups within nutritional research and environmental toxicology are performing well with a unique profile which deserves to be highly appreciated.

Panel 3 Molecular Biology

Molecular biology continues to play an immense role in basic biological research, disease etiology investigation, disease prevention and diagnostics, systems biology, environmental biotechnology, plant sciences, veterinary sciences, industrial biotechnology, chemical biology, nanobiotechnology and related fields. It forms the basis for innovation and industrial exploitation and it is clear that its importance will not decline in the foreseeable future. Several institutes host groups working within molecular biology, which carry out research at the highest international level of excellence – truly outstanding research programs. These groups are carrying out either basic research or medically oriented research; however none of the more applied areas belong to the highest quality category. The strong research groups are well distributed

across Norway and could provide a solid base for helping to lift other groups to a higher standard.

It was a general concern that so many groups did conduct research at the level of good, or lower. This indicates that the research is of medium quality often representing incremental work advancing science slowly. The poor state of applied research within molecular biology is a worry given the economic importance of this type of research.

Panel 4A and 4B Clinical Research

The number of Norwegian publications in clinical medicine has steadily increased during the last decade and, more importantly; also the number of citations of Norwegian publications has increased. During the last three decades the citations of Norwegian papers in clinical medicine has increased from the level of the world average to well above. One reason for this compared to the previous evaluations could be the observed trend to form larger research groups performing very good to excellent research in different areas including cardiovascular and respiratory, inflammation and rheumatology research, cancer biology/oncology, orthopedics and neurology.

The evaluation panels are optimistic about the future development of clinical research in Norway provided that some structural changes are implemented. These include improved recruitment and career possibilities for young clinical researchers, increased research time for clinical professors and increased research collaboration and competition for funding at the national level.

Panel 5 Public Health and Health-related Research

In the area of etiological epidemiological research, several Norwegian groups have produced excellent results during long time. They have made successful use of possibilities available in Norway, mainly in terms of personal identities, large, repeatedly screened, population-based cohorts with databanks and biobanks, and high-quality registries of health outcomes. They have established extensive collaboration networks and produced cutting-edge information, which has been published in most prestigious scientific journals.

Some Norwegian research groups in the area of global health are also excellent. In particular, they are impressive with regard to their strategic planning, long-term commitments, choice of important research questions, close cooperation with partners in low- and middle-income countries, and ability to implement their findings in preventive activities in the collaborating countries.

The Norwegian health-care system has been extensively reorganized during the last decade. This could offer good opportunities to evaluate effects of the changes. However, the attempts to study these have not been sufficient to obtain the conclusive information that is needed by the Norwegian and international societies.

In an aging society like the Norwegian, there is a strong need for evidence-based information on care/nursing practices. However, the present Norwegian research in

this area can, with few exceptions, not be expected to supply such information. This is a young and immature research area. However, a strengthening of the research infrastructure, in order to obtain critical mass and stronger focus, are ways forward to secure the supply of high-quality knowledge.

Panel 6 Psychology and Psychiatry

The successful area in Norwegian research in psychology and psychiatry lies within neuroscience, with a special focus on cognition or psychiatric disease presentation, studied with brain imaging methods in normal and psychiatric populations. Thus, the world-wide interest and expansion of neuroscience, with brain imaging techniques becoming increasingly available to researchers, allowing research questions previously not investigated to be studied, is also evident in Norway. These factors have contributed to attracting young researchers, facilitating competition, and, in turn, to excellent scientific quality. To maintain the high scientific quality is not only important from a scientific viewpoint, but also from a practical perspective as it generates critical clinical knowledge concerning brain function, plasticity, and rehabilitation. The future should also be bright for research units utilizing the impressive longitudinal population-based databases and biobanks, which together with national health population registries provide possibilities to do research not possible to do elsewhere. It is important that these assets are fully utilized, maintained, and protected.

Weaker areas of research within psychology and psychiatry are less readily identified. What is evident, however, is that the common features of these are that they are small, lack strong scientific leadership, conduct research with little or no collaboration with other groups, have diffuse and wide research interests, and often are burdened by heavy teaching obligations. Clearly, the fragmentation of research into small research constellations conducting research with unclear focus and objectives is not a successful concept in this area.

Recurring themes from the panel reports

The principal committee assessed the institutional structure and situation for Norwegian research and identified a number of themes, which have relevance across essentially all areas covered by the seven specialized panels. The themes were identified independently of the scientific area and included funding situation, career track, institutional freedom to operate, gender, the lack of multi-disciplinarity, infrastructures in research, and needs for bioinformatics, biostatistics and novel knowledge management portals.

National funding issues

The panels frequently heard complaints that the basic funding for biomedical research in Norway is insufficient and decreasing. However, the panels could not verify that this really is the case. Rather, the resources are higher *per capita* than in most other countries, and have been stable over time. Nonetheless, it seems that the costs for basic facilities and administration are high and increasing. Thus, the funding available for research activities may have decreased.

Compared to most other countries, the funding of research in Norway is to a much higher extent distributed within thematic research areas or programs, which are predefined by mainly ministries and/or RCN. Hence, only 10-20% is an open arena for researcher-driven proposals. The principal committee considers this to be a much too small fraction that will restrict the possibilities to take advantage of the creativity of researchers, which is a major driving-force for scientific development.

As discussed elsewhere, there is a structural problem regarding lack of postdocs/middle position researchers in Norway. One explanation is the lack of predestined funding of such positions.

Most of the funding for clinical research is channeled via regional funding instruments and not through national competition. Regional funding is intrinsically less competitive than national funding and does not necessarily promote the highest quality clinical research in Norway. The different health regions are the major funders and offer "bottom-up"-funding while a majority of the RCN funding is within thematic areas or programs. The differences in the local funding of clinical research at the hospitals, and the national funding of basic research performed at the universities, are prone to decrease collaboration, sharing and optimal use of techniques, research infrastructures, knowledge and other resources necessary for successful translational research. The present strategy of funding clinical research predominantly through grants from the regional health authorities should be redesigned so as to encourage competition and collaboration between groups at a national level and not at a regional level.

Specific recommendations:

- RCN should improve its information to the Norwegian research community of the funding situation, to obtain a better understanding how the resources are distributed and used.

- A larger fraction of the funding of research should be available for researcher-driven proposals, with a corresponding decrease of the restricted, thematic research programs.

- RCN should reserve dedicated funding streams for young scientists.

- A significantly larger part of the funding of research in national and other institutes should be transferred to RCN and distributed in competition; all or some of these resources may be earmarked.

General low level of international funding

Across the scientific areas and the organizations being reviewed, there is a general awareness of the importance of international collaboration and exchange. However, this awareness does not seem to have resulted in an increased number of external grants from international funding bodies. Rather few units reported having applied for grants and even fewer had received grants from, for example, EU or US NIH (US National Institutes of Health). Researchers should be encouraged to apply for international funding, as it would not only have the potential to increase the research budget, but also contribute to the internationalization of Norwegian research. The

grant offices should promote their services and support researchers to enhance the likelihood of successful application efforts. Other incentive programs should also be considered.

Specific recommendations:

- Researchers should be encouraged to apply for international funding, as it would not only have the potential to increase the research budget, but also contribute to the internationalization of Norwegian research.

- The grant offices should promote their services and support researchers to enhance the likelihood of successful application efforts.

- Other incentive programs should also be considered.

The career system

It is of great concern, and also mentioned in several previous evaluations, that there is a lack of a transparent career development schemes with positions in-between postdoc and professor levels, either at the universities or the university hospitals.

The academic staff of the departments and institutes is aging, and a large part of them will retire within the next decade. Very few of the departments and research units have a clear strategy how to handle this problem by recruitment.

There is a general lack of organization of career paths for young scientists in Norway. It is a notable and profound lack of an active system for selection and mentoring of the best junior staff as senior postdocs for the next generation of faculty. Postdocs seem to suffer from this most, with appointments for a maximum of four years. In addition, the funding of post-doctoral and sub-professorial research positions is almost non-existent.

It is a major concern that there is, with some exceptions, a low national and particularly international mobility of researchers at all parts of the research career. The majority of tenured researchers have been recruited locally, and most were awarded their university and PhD degrees from the university where they currently work. Although several of the units provide evidence of actions aimed to improve the situation, these do not appear to be sufficient. It is also evident that international mobility is not regarded as a priority. Efforts to actively recruit new researchers should be encouraged and incentives for both the researchers and the universities for increased mobility should be introduced.

Specific recommendations

- To create successful career structures and opportunities for the coming generations of scientists, it is advised to meet the general need of establishing more postdoc positions as well as a tenured track for postdocs and mid-career positions.

- In parallel, the fraction of the research budget that is earmarked for younger scientists should be increased.

The PhD model

It has been an ambition in Norway during the last decade to increase the number of PhD candidates, and PhD-training is prioritized by most research institutions. Indeed, the number of PhD exams has increased, but the allocation of resources may emphasize the PhD 'production line' too much, resulting in less focus on quality, and effects on research output and career prospects.

The effective time available for completing a PhD, and the requirements for completing a thesis, clearly influences the publication strategy. The over-reliance on PhD students to perform research, coupled with the need to publish many papers for a PhD thesis, is resulting in short-term research goals. In some departments, reporting scientific findings in several acceptable publications is preferred over one high-quality paper. Combined with the heavy focus on PhD students performing research, this reduces the standard of the publication of the whole department.

Another problem is the age of the PhD candidates upon completion of the PhD. In certain areas, the average age when awarded the PhD is too high, which shortens the number of active years as a researcher. This is, for example, the case in clinical medicine (42 years on average) and care sciences.

The quality assurance of PhD training varies between institutions and needs to be harmonized. There is a lack of monitoring of PhD completion rates, and no guidance on the appropriate duration of the PhD study period. There is no clear national system in place to enforce and maintain the quality of PhD degrees. This could be accomplished by introducing or increasing the number of graduate schools at the faculty level, with a clear set of rules for education and training of PhD students.

Earlier completion of PhDs by clinicians could be improved by increasing full-time PhD positions, and 50%/50% PhD/specialist training positions during or directly after MD/DDS graduation, for instance by expanding the existing MD/PhD and DDS/PhD programs introduced at several universities.

The introduction of the industrial PhD programs is also a welcomed addition to the PhD model.

Specific recommendations:

- Preference for quality rather than quantity with regard to publications should be encouraged.

- It is recommended to introduce or increase the number of graduate schools at the faculty level, with a clear set of rules for education and training of PhD students.

- Earlier completion of PhDs by clinicians should be improved by increasing full time PhD positions and 50/50 PhD/specialist training positions during or directly after MD/DDS graduation.

The gender issue

It appeared that most institutions' goal was an equal sex ratio at all levels. The expected proportion of each gender in a unit can be estimated from availability pools. There is a need to introduce an action to ensure that the gender balance at the PhD student level is reflected at subsequent career levels. A disproportion means most likely a waste of research talent. Data on availability pools must be made accessible during recruitment, to provide evidence-based expectations of the sex ratio for units, which can respond accordingly.

The proportion of women who pursue careers in science tends to decrease as seniority increases. The drivers of this pattern are complex. Policies allowing flexibility to care for children and other family members are important, but so is the awareness of the potential for biases on selection committees and among other reviewers. These inadvertent biases may include a tendency for letters of recommendation to refer to future potential of male candidates versus past accomplishments of female candidates. Those involved in recruitment and management should be trained to identify and rectify such biases, and in the implementation of family-friendly policies. Employment for partners is an issue when hiring professionals and, although there is no simple solution, this needs to be confronted by the institutions.

If the gender composition of the recruitment pool does not differ when a position advertisement notes that women are strongly encouraged to apply, protocols must be developed to address the issue. If they are not, the proportional representation of women in Norwegian science may not change over the next decade.

The goal of at least 40% women on university panels is a good one, but if only 20% of professors are women, this must not be achieved by overburdening women with administrative responsibilities, so that available research time is reduced.

Specific recommendations:

- Whereas the principal committee applauds having many women on university boards, we recommend that this is not achieved by overburdening the few women in research with administrative responsibilities and tasks.

Institutional core funding not used strategically

Across the different areas reviewed by the panels, it was frequently encountered that research departments and research units did not continuously undergo restructuring in response to new national or international research trends. The core funding to research institutions in Norway is not low, but the freedom to use these funds is either lower than in many comparable countries, or the freedom given to the institutions is not exploited sufficiently. Countries vary in their research-funding schemes, but Norway seems to have incorporated many constraints, which limit the restructuring needed in order to secure the performance and competitiveness of modern research. It is recommended that analysis is made, clarifying why the institutional management – in practice – has less freedom to operate than in many other comparable countries in Europe and in the US.

An area of particular concern was human resource management. Often there did not seem to be procedures in place for personnel management, in the form of mechanisms

to present and implement alternatives to staff that do not perform in terms of their ability to attract research funding or publish in higher impact journals. Such alternatives could include stimulation to new research directions, repositioning to work under the leadership of another principal investigator or shift to other tasks in the academic system. The leadership does not appear to have sufficient power or competence to deal with such situations.

Worldwide, overheads resulting from external grants are resources which contribute to securing internal freedom to research departments making it possible to act strategically. The panels noticed many cases where it became obvious that researchers did not have a clear picture of how their institutions handled overheads resulting from the external funding received. The principal committee recommends that transparent processes be established in this area.

Specific recommendations:

- The principal committee recommends an analysis to clarify why the institutional management – in practice – has less freedom to operate than in many other comparable countries in Europe and in the US.

- Underperforming staffs should be stimulated and encouraged to explore new research directions, reposition to work under the leadership of another principal investigator or shift to other tasks in the academic system.

- The principal committee recommends that transparent processes be established for distribution of overhead resulting from external grants.

Critical mass in research group organization

In general, most of the successful units were typically large, having researchers at different levels of their career. However, far too often, the research landscape was fragmented and many units lack critical mass.

Critical mass can be achieved through collaboration, often at the same time securing the level of multi-disciplinarity needed. In some cases, collaboration has been increased by merging units, but this has not always changed the way research is carried out. Many researchers still continue as individuals. Effective merging, which increases productivity, requires strong scientific leadership. Such leadership should be in place before mergers are undertaken.

The Norwegian research system contains a larger fraction of national research institutes than most other comparable countries. This could be an advantage in some respects, but it may create limited interaction with other disciplines and competition thus preventing the formation of large, creative research environments with critical mass.

Specific recommendation:

- To a greater extent than is done today critical mass should be achieved through collaboration, which in many cases at the same time will secure the level of multi-disciplinarity needed in modern research.

Bioinformatics, biostatistics and knowledge management infrastructure

Even if Norway via recent programs has made investments in the area of computational analysis of biological data, many other countries have made even more investments in bioinformatics and the related areas of computational systems biology, computational chemical biology and neuro informatics. Consequently, the current situation in Norway is comparatively weak – leaving Norwegian life science research in a suboptimal position. Going forward it is recommended to expand in this area, but at the same time secure a better interface to the general areas of biostatistics, epidemiology and registry-based research. Biobank-associated databases need to be incorporated, and in a sustainable manner maintained better. New knowledge management methodology, such as meta-databases, data integration techniques transcending the molecular and clinical levels, as well as joint data-discovery portals, should be considered in future initiatives.

As more and more data resulting from new experimental high-throughput techniques in the future will be produced locally, training in this area should be a clear priority, not only in bioinformatics, but also within epidemiology, where there is no formal training in the area of methods. The Norwegian research environments should prepare for more decentralized data analysis, integrated into their own data producing environments. Such broadening should obviously be combined with centralized, hub-like efforts, where these are advantageous.

The general area of data repositories, data management and tool integration is also a theme at the European level, for example in the emerging ESFRI infrastructures (European Strategy Forum on Research Infrastructures, http://ec.europa.eu/research/infrastructures/index_en.cfm?pg=esfri), not only within bioinformatics, but also in many other biomedical areas. These efforts should be taken into account in new initiatives, such that Norway can benefit from these developments.

Specific recommendations:

- New knowledge management methodology, such as meta-databases, data integration techniques transcending the molecular and clinical levels as well as joint data-discovery portals, should be considered in future initiatives.

- The Norwegian research environments should prepare for more decentralized data analysis, integrated into their own data producing environments.

- Data repositories, data management and tool integration, also a theme at the European level, should be taken into account in new initiatives, such that Norway can benefit from these developments.

Clinical research and university education

Due to high demand and budget restraints, clinical and educational duties have higher priority than research at the university hospitals and at some university departments. This restrains clinicians and university teachers with shared responsibilities (e.g. Professor II) from devoting time to do research to the extent that their contracts stipulate. It was evident that often both the clinical and educational duties are prioritized over research. As noted also in previous evaluation, the relative increased

load of routine clinical work and lack of research time is a major obstacle for further development of clinical research. There is an urgent need to develop new and flexible models to reallocate time between clinical work, teaching and research, and to allocate substantial amounts of time dedicated to research. This process should be done in close collaboration between universities and university hospitals. The relevance of present Professor II positions (100:20) must be reconsidered.

Specific recommendations

- The role of Professor II positions should be reconsidered.
- New and flexible models for time allocation should be implemented in close collaboration between universities and university hospitals.
- The possibility to focus resources and share expertise for educational programs should be considered.

University research versus research at public institutes

The Norwegian research system contains a substantially larger number of research institutes independent of universities than in other countries. This fact has been discussed in several previous evaluations.

These institutes have a more flexible core funding for research that in practice is lacking at the university departments. It was also clear that there was a redundancy in several research areas between universities and institutes. The organization may prevent the formation of large, creative research environments with critical mass. It is recommended that the institute organization be reviewed with the possibility to better integrate the institute's research with the universities' as has been done in Denmark and Sweden. This may not be relevant in all cases, but it should be ensured that the collaborative links between universities and institutes are strong.

Specific recommendations

- The principal committee recommends that the institute organization be reviewed with the possibility to better integrate the institute research with the universities.

Impact on society

All research of high quality reviewed by the principal committee will have an impact on society, though the time perspective and the part of the society affected will vary widely. Thus, it may take a long time before the results of some aspects of basic research will cause changes, while it will be possible to make use of applied research even in a rather short perspective.

Some of the research reviewed by the panels has had clear impact on the Norwegian and international societies. Examples are aspects of the research in clinical medicine and dentistry, and etiological epidemiological studies, which have supplied scientific

basis for prevention. Also, activities within global health have impacted on the health practices in low- and middle income countries.

To give too high priority to research with a perceived immediate impact on society may, in the long run, be an unwise strategy. Instead, it is important to focus on research quality rather than the type of research.

The principal committee was surprised by the fact that a large proportion of the Norwegian research community was not sufficiently aware of their Technology Transfer Offices. Technology Transfer Offices can play an important role in dissemination of research results and facilitate industrial collaborations in order to better meet future societal challenges.

Specific recommendations:

- The changes in the research infrastructure discussed elsewhere, and better dissemination of results, are needed to increase the societal impact of the applied research, and – in the long run – of basic research.

- The Technology Transfer Office model should be made better known to the researchers and other university stakeholders.

Follow-up on previous evaluations

Two previous evaluations (2000 and 2004) of these research fields listed a number of recommendations. It is clear that considerable efforts have been (and are being) made to respond to these recommendations. Following the last evaluation, the reviewed units addressed the lack of scientific leadership and fragmentation of the research. In some cases, the units responded by merging smaller research groups, strengthening the leadership structure, and developing and implementing strategic plans. This included identifying directions for development and allocating resources (financial and human) accordingly. The implemented changes implied a bottom-up process of formation of flexible and effective research groups.

A lot of strategic decisions were also reported to have been taken, aiming to focus the research, create strong centers and develop strategic leadership. Extensive structural changes have taken place especially in clinical and medical research since the health-care system has undergone major reorganization over the last decade.

However, some of the suggested actions and recommendations have not resulted in notable change, or remain as challenges-like demands for enhanced international collaborations and interaction, increased research time for clinically active physicians, increase of the number of postdoc research positions, and postdoc positions for trained basic scientists to work in a clinical setting, as well as establishing laboratory core facilities in the hospitals**.**

The recommendations of previous evaluations have been followed up closely at the local level of research organizations. By contrast, the Ministry and the RCN have so far only undertaken minor actions in relation to structural problems, flexibility of internal funding, career tracks, funding schemes, and the role of the research-institute-sector.

Unique research possibilities in Norway

Finally, during the overall assessment of the state of research in biology, health and medicine in Norway the principal committee identified the following as examples of unique research possibilities in Norway:

Sustainable aquaculture products. Norway has the expertise and track record for producing aquaculture products for the world. Norway can indeed take the global lead in demonstrating best practices in economically and environmentally sustainable ways. The National Research Institutes are a not fully utilized opportunity for carrying out long-term studies, otherwise impossible to fund under short-term time horizon of RCN, e.g. in the area of environmental toxicology in relation to the global climate change.

Epidemiological research and biobanks. Norway has succeeded in creating large, important and very impressive longitudinal population-based databases and biobanks, which, together with national health registries and the personal identification number, constitute unique possibilities to do excellent research in an international perspective. Some of these facilities are present in other countries, but the combination is unique for the Nordic countries. As said above, in Norway, there is a long-time tradition of using the information in excellent, mainly etiological, epidemiological research.

It is important that this great asset is fully utilized, maintained, and protected, also in the post-genome era, where numerous other types of molecular-level data, characterizing the individual, will become available. Long-term financial support to the infrastructure around these databases would facilitate the utilization of their data and secure maintenance and to develop new registries of health outcomes and intervention approaches.

Knowledge management. The general areas of biology, biotechnology and medicine are in a state of rapid development, characterized by the inability of the infrastructure to keep up with the demands of the science. High-throughput experimental techniques have enabled a wide range of new approaches, which have altered the ways data are produced within biology and medicine. An integrated component in this development has been the adoption of computational methods in almost all phases of wet-lab research projects, from the planning of assays, through to data collection and to data interpretation and dissemination. The necessary knowledge management associated with the analysis of life science related data has become a major bottleneck hindering optimal use of the data produced. The opportunities for recycling, sharing and reuse of data produced by the scientific community are enormous. The 2010 Molecular Biology Database Collection includes well over a thousand databases, many of which describe millions of biological records. This data congestion development obstructs discovery in both the public and private sectors. When attempting to solve these problems, in particular when aiming for obtaining a competitive advantage, it is a must that novel computational tools and data integration infrastructures – in a coherent fashion – interface to infrastructure frameworks created internationally, often as world-wide collaborative efforts covering the US, Europe and Asia. Due to the unique situation in Norway (described above) on registries and biobanks, this area is of strategic importance and represents a major opportunity.

Appendix – Members of the Principal Evaluation Committee

The Committee consisted of the leaders of the seven panels:

Søren Brunak, Technical University of Denmark & University of Copenhagen, leader of the Committee and panel 3

Paul Harvey, University of Oxford, leader of panel 1

Ulf Lerner, Umeå University and University of Gothenburg, leader of panel 2

Kalervo Väänänen, University of Eastern Finland, leader of panel 4a

Håkan Billig, University of Gothenburg, leader of panel 4b

Staffan Skerfving, Lund University, leader of panel 5

Agneta Herlitz, Karolinska Institutet, leader of panel 6

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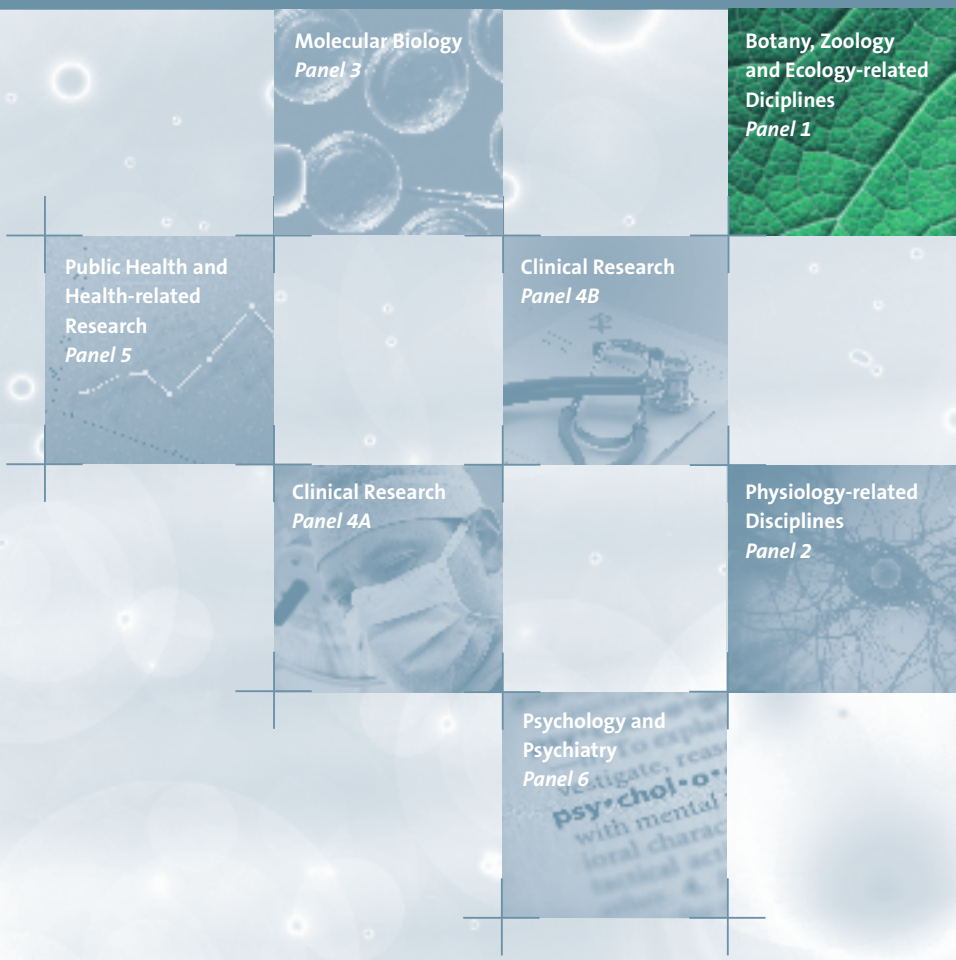
The Research Council of Norway

Botany, Zoology and Ecology-related Diciplines

Panel 1

Evaluation
Division for Science



The Research Council of Norway

Botany, Zoology and Ecology-related disciplines – Panel 1

Evolutionary biology, ethology, marine biology, limnology, plant physiology, systematics and agricultural sciences

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Preface from the Research Council of Norway

The Research Council of Norway (RCN) is given the task by the Ministry of Education and Research to perform subject-specific evaluations. According to the plan for these evaluations the RCN carried during 2010 and 2011 out a comprehensive evaluation of Norwegian research within biology, medicine and health in Norwegian universities, hospitals, relevant university colleges and relevant research institutes. Evaluations have previously been performed within these subjects/fields, in biology in 2000 and medicine and health in 2004.

Due to the large span in disciplines and the number of scientific groups involved in the evaluation, seven international panels of experts were established; each of them reviewed one of the following subfields:

Panel 1	Botany, Zoology and Ecology-related Disciplines
Panel 2	Physiology-related Disciplines
Panel 3	Molecular Biology
Panel 4a	Clinical Research – Selected Disciplines
Panel 4b	Clinical Research – Selected Disciplines
Panel 5	Public Health and Health-related Research
Panel 6	Psychology and Psychiatry

The Research Council of Norway would like to thank the panel for the comprehensive work the panel has performed.

Oslo, October 2011

Hilde Jerkø (sign.)	Mari K. Nes (sign.)
Director	Director
Division for Science	Division for Society and Health

Statement from the Panel

To the Research Council of Norway

The members of the research evaluation panel (hereafter referred to as 'the Panel') submit the following report, which is based on the self-evaluation documents submitted by each research unit, the bibliometric analysis provided by the RCN, and the Panel's meetings with group leaders that took place in Oslo on 28th March to 1st April 2011. The report represents the consensus opinions and recommendations of the Panel.

Prof Marie-Christine Van Labeke of Ghent University contributed to the initial evaluation of the submitted self-evaluation documents but did not attend the Panel hearings in Oslo and has not signed the report.

Paul Harvey
University of Oxford
England
Chair

Geoffrey Gadd
University of Dundee
Scotland

David Groman
Univ. of Prince Edward Island
Canada

Marlene Zuk
University of California Riverside
USA

Peter Burkill
Sir Alistair Hardy Foundation for Ocean Science
England

Pedro Crous
Dutch Academy of Science
the Netherlends

Erica Fleishman
University of California
USA

Dr Oliver Pybus, University of Oxford, England, was secretary to the committee

Executive summary with general conclusions

The Panel met with representatives from twelve university departments, one University Centre (UNIS), and seven research institutes. The twelve departments that were assessed by the Panel were drawn from seven universities: UMB, NTNU, and the Universities of Adger, Bergen, Nordland, Oslo and Tromsø. The research institutes that took part in this evaluation were the Institute for Marine Research, the Norwegian Forest & Landscape Institute, Bioforsk, NINA, NIVA, the Norwegian Polar Institute, and SINTEF Fisheries & Aquaculture.

It appeared that many recommendations resulting from the evaluation undertaken in 2000 have been acted upon. We see this report as part of an ongoing process of evaluation and recommendations.

There are, however, a number of issues that appeared to be almost universal or were raised independently by a number of institutions. We discuss these trends below, in the section titled General recommendations, and in most cases do not revisit them in our reports and recommendations for individual units, departments, or institutes. Consideration of these common themes forms the substance of our general conclusions. The issues we highlight include (i) the status of, and attitude towards, gender equality in Norwegian biology, (ii) the inadequate provision of small grants or seedcorn funding, (iii) the consequences of offering four-year contracts, (iv) the cost of biological research in Norway and its impact on competitiveness, (v) the provisional of technical support, and (vi) the importance of considering a diverse array of indicators of research success.

The Panel also considered the research quality of the various biological disciplines and research topics that were within its remit, with the aim of identifying strengths and noting areas that require attention. These conclusions are presented in the section below, titled General description of the field.

General description of the field

Several research groups have international strengths in the areas of ecology, biodiversity and conservation biology as well as in the synthesis of ecology and evolution. These combined strengths are important for coping with future challenges in environmental management including the prevention of habitat degradation, controlled harvesting, population conservation, and climate change.

Marine resources and aquaculture are of economic importance to Norway and a number of research groups are undertaking high quality research in fields relating to marine ecology, including plankton biology, arctic marine systems, and marine genomics and biodiversity.

For most other disciplines, the number of relevant research groups submitted to this Panel for evalutation were too small for general conclusions to be drawn. Bearing that caution in mind, we note that a pair of research units that study microbiology and microbial ecology were rated highly.

The Museums contain collections that constitute both national and international resources, including specimens and type specimens. It is not clear what role those resources will play in the future, or the extent to which they are being catalogued using DNA barcoding technology to constitute a national database or to fit into international databases. A national review to clarify the future roles of Museums in research should be undertaken.

General Recommendations

Gender equity

We noted that each institution or department was asked to describe briefly its policy for gender equity and the balance between men and women in academic positions. Almost all of them reported the sex ratio among the members of their units, with most indicating a highly male-biased ratio at relatively senior levels but a more balanced or female-biased ratio among PhD students and postdoctoral fellows. Most institutions presented the male-biased ratio at senior levels and the discrepancy between senior and junior ratios as problems to be solved. It appeared that the institutions' goal was an equal sex ratio at all levels. The institutions' most common suggestion was an effort to reach out and extend invitations to women to apply for vacant positions. A few institutions offered mentoring programmes for women to provide guidance in career development. Some institutions suggested, either in their self-evaluations or in their conversations with the panel, that the sex ratio would become more even given sufficient time as the higher proportions of women in junior positions moved through the system and the senior scientists retired.

We would like to share our reactions to this information and presentation with the Research Council. First, it is unclear what the goal of each unit should be with respect to gender balance; in some countries, the proportion of men and women expected to be employed in a unit are calculated on the basis of availability pools, that is, the proportion of each gender that were awarded PhDs during a given time period. This expectation is field- or discipline-dependent, such that fewer female applicants are expected in, for example, engineering than in the life sciences, simply because fewer PhDs currently are awarded to women in the former. Then, if the sex ratio of applicants for a given position deviates from the expectation, or if the proportion of applicants is consistent with the availability pool but the set of finalists is not, the unit knows where to focus its recruiting efforts. If data on availability pools are available in Norway, they could be made accessible to departments and other units during recruitment so the unit could develop evidence-based expectations of the sex ratio for their group and respond accordingly.

Second, the Panel thought that the units were not provided with tools to address any inequities that do exist. There is ample evidence that simply waiting for cohorts with a higher proportion of women to move through the system and thus passively correct the imbalance is ineffective. The proportion of women who pursue careers in science tends to decrease as seniority increases, so proportions of male and female PhD students may be roughly equal, but cohorts become more male-biased over time. The drivers of this pattern are complex. Policies allowing flexibility to raise children and take care of other family members are important, but so is the awareness of the potential for biases on selection committees and among other reviewers. These inadvertent biases may include, for example, a tendency for letters of recommendation to refer to future potential of male candidates versus past accomplishments of female candidates. We recommend that those involved in recruitment receive training in identifying and rectifying such biases, and in

how family-friendly policies can be implemented. Accommodation for spouses or partners is always an issue for hiring professionals, and although there is no simple solution, this will need to be confronted by the institutions.

It was not apparent to us that institutions or the Research Council responded to efforts of the units with regard to gender equity. If the gender composition of the recruitment pool does not differ whether a position advertisement notes that women are strongly encouraged to apply, are institutional or national protocols in place to address this issue? Again, institutions may lack tools to effect change, such as realistic goals, incentives, and means to accomplish the goals. If tools are not provided, then despite the best of intentions, it seems likely that the proportional representation of women in Norwegian science will be unchanged in another ten years time.

Small grants

Opportunities to receive funding from the Research Council are restricted, but in particular we noted the paucity of opportunities to apply for small grants, up to about US$30,000. Such grants can be extremely useful for initiating a comprehensive project and for small projects. Furthermore, junior researchers that successfully compete for funds can build their confidence and motivation to apply for more substantial funding, both nationally and internationally. The administrative burden associated with a small-grants programme can be low. For example, a review committee can be appointed and short applications, say two pages long, can be evaluated by email. Several of us have experience in reviewing and receiving such grants and believe they provide a high return on investment from both the Research Council's and the recipients' perspectives.

Professor II

We felt the judicious appointment of Professor II positions was quite effective when particular research areas needed strengthening. Such visiting professors are committed to play a larger and more intensive role in a unit than, say, members of a scientific advisory board who make occasional very short visits to a unit.

Four-year positions

Many of the institutions and departments we met with indicated that the requirement to offer a permanent contract or terminate a postdoctoral contract after four years was a challenge to productivity and morale. Although we appreciate there is a trade-off between continuity and turnover, we suggest that this particular situation be reviewed. Alternatives that might be considered are offering a four-year contract with an optional two-year renewal or offering a five-year contract with an optional three-year renewal before a final decision is made to offer a permanent position or terminate the contract. The renewal process is likely to require an evaluation of progress by both the employer and employee. If a contract is renewed for two or three years, either targets for permanent employment can be set or the employee can have some job security while searching for a new position.

High cost of research in Norway

Several institutions and departments indicated that research costs are high, particularly in the institute sector. We were told these costs sometimes prevent application for and acceptance of grants provided by the European Union and other international funding agencies, some of which presumably are financially supported in part by Norway. As a result, research on some topics that might best be conducted in Norway is performed

elsewhere. If this situation continues, it may result in a deterioration of the research base in Norway.

Technicians

The self-evaluations and conversations with institutions and departments suggested that technical support is quite limited within many of those organisations. The drivers of this situation were not clear. We speculated that perhaps when directors or heads of department have freedom to allocate funds, they tend to support faculty, research staff, or administrators rather than technicians. Regardless of the cause, it seemed likely to us that research output per scientist would increase, considerably in some cases, if additional technical support were available. This situation may warrant a general assessment by the Research Council.

Diversification of measures of success

Many institutions differentiated between basic and applied research. Research traditionally has been classified along a gradient or axis from basic to applied, with different motivations driving each end of the gradient. In this schema, basic research produces new knowledge (i.e. it establishes fundamental principles) in a scientific or technological discipline. It is often theoretical and intended to increase understanding of certain phenomena or behaviour. This research may or may not be driven by a practical application to management or social priorities. According to the same schema, applied research is research that aims to address practical, often widespread challenges and develop or implement innovative technologies; it is reliant on established basic principles.

Research activities also may be mapped in two dimensions, according to the degree to which research is pursued to satisfy scientific curiosity versus a practical application, and the degree to which the research is intended to advance fundamental scientific knowledge. No matter the initial motivation, multiple phases ultimately are involved in the development and use of knowledge from initial concept to implementation. Louis Pasteur emphasized that there does not exist a category of science which one can name applied science. Instead, there is science and there are applications of science. Whether research is driven by curiosity or practical needs for information does not affect the quality of the work.

A number of institutions further implied that research motivated by practical needs is less amenable to high-quality publication than curiosity-driven research. We disagree with this suggestion. Instead, rigorous science generally is publishable in highly respected journals regardless of motivation. Nevertheless, we recognize that scopes of work and budgets for projects supported by contracts may not encompass preparation of manuscripts for submission to peer-reviewed journals. The quality of research does not depend on where – or if – the work is published. Reliable, objective information, analyses, and inferences have the potential to inform decision-making whether they be communicated in a journal, a report, or verbally. Accordingly, our evaluations of research quality encompass interaction with national and international bodies that render decisions or pass legislation (see following section).

Additionally, several institutions identified concerns over the current national publication rankings that are organized and run by the Norwegian Association of Higher Education Institutions, noting that for some disciplines journals that would be considered high

impact in a given discipline were ranked lower in the Norwegian system overall. It may be helpful to re-evaluate the current journal impact factors in Norway.

We encourage institutions and the Research Council to formalise recognition of outreach or collaboration with decision-makers as measures of success equal to publication in journals with high impact factors. Nevertheless, we encourage institutions to include publication within contract agreements whenever feasible. Because publication often confers greater credibility to a given research project, publication may be in the best interests of the sponsor. Numerous examples exist of successful publication despite the need or desire to withhold proprietary information from the public.

A Note from the Panel on Grades of Assessment

The Panel were asked to grade each research evaluation unit (level 2) according to the following five categories, which were supplied and defined by the Research Council of Norway.

Excellent

> *Research at the international front position: undertaking original research of international interest, publishing in internationally leading journals. High productivity.*

Very good

> *Research with high degree of originality, but nonetheless falls short of the highest standards of excellence. A publication profile with a high degree of publications in internationally leading journals. High productivity and very relevant to international research within its sub-field.*

Good

> *Research at good international level with publications in internationally and nationally recognised journals. Research of relevance both to national and international research development.*

Fair

> *Research that only partly meets good international standard, international publication profile is modest. Mainly national publications. Limited contribution to research.*

Weak

> *Research of insufficient quality and the publication profile is meagre: few international publications. No original research and little relevance to national problems.*

Before undertaking this report, the Panel decided that a range of adjacent categories would be used, when appropriate, to represent the diversity of research activity generated within a single research unit. Evaluations of individual researchers are not given in this report.

Although the Panel adhered to the categories stipulated by the research council, it is mindful that no one set of criteria can wholly capture the quality and impact of the diverse range of activities undertaken by Norwegian biologists. Several Departments or Institutes have a clear service-orientated mandate, which means their output is difficult to measure

directly using numbers of peer-reviewed research papers, numbers of students, or by impact factor. Similarly, units located in museums have a unique mandate that includes education and public outreach. The Panel appreciated these issues and noted that the time allocated to research varied among groups and institutions. For the next evaluation, the Panel recommends that a clearer indication is given of the approximate percentage of time that each unit allocates to research versus service and/or outreach.

University of Oslo

Department of Biology

Description of institution

The Department of Biology was formed from a number of research groups that existed before 2007, at which time the department was reorganised into three research programs and one interdisciplinary centre of excellence, the Centre for Ecological and Evolutionary Synthesis (CEES). Oslo University as a whole was also reorganised in 2005 into its current structure; each department has a head who serves for four years and, with the assistance of the head of administration, works with the department and university board to plan for the future. The research programs each have a chair and a vice chair who report to the head of department. The research programs are deliberately limited in scope and teaching undergraduates is not their primary mission.

The composition of personnel in the department has changed rapidly over the last several years. The number of PhD students increased from nine at the beginning of 2005 to 23 at the end of 2009. The total number of PhD students enrolled at the department in 2009, including both internally- and externally-funded fellowships, was 60. At that time there were 32 permanent scientific staff members. Women are well represented among PhD students and post-doctoral researchers but the department becomes more male-biased at senior levels.

General evaluation & recommendations

The department is making excellent progress towards its goals, and the Panel were impressed by the degree of substantive change in the department over the last several years. The rate and quality of publications increased following the reorganisation, and we noted that the productivity of many of the members of the department is extremely high.

A concern we had, which seems to be shared to some extent by the members of the department as expressed in the self-assessment and the panel meeting, was to prevent domination of the department by the CEES, which currently has the largest number of researchers by far in the department. The CEES secures much of the research funding, and has high visibility. The work of this centre is excellent, as detailed below, but for the overall health and viability of the department, it is essential to make strategic decisions about growth in the other research groups as well. In particular, the Marine Sciences group is rather small. We recommend developing an explicit succession plan for the group in terms of its leadership and continued funding.

We recommend appointing one or two people to help members of the department assess international opportunities for basic research, particularly EU funding, so that individual researchers can take advantage of as many calls for proposals as possible. The creation of small grants or discretionary funds for exploratory research is also a potential solution.

Follow up of previous evaluation

The department responded to the previous evaluation by undertaking the reorganisation described above, with an emphasis on research groups excelling in particular areas rather

than a more generic group of biologists. Although some of the changes are still in progress and hence difficult to assess, it appears that the majority of the restructuring has been beneficial. Other recommendations included increasing active collaborations within and between groups, which seems to be occurring due to the more focused nature of the research areas.

The previous evaluation had recommended that some of the members of the Oslo Museum transfer to the University. Although the department evinced willingness to accept researchers from the museum, this move has not taken place.

Evaluation of individual research units

Integrative Biology

Grading of scientific quality

Good to Very Good

Description of unit

The unit has 11 professors, associate professors, and postdoctoral fellows, with three women. It was formed in 2007 and has a research emphasis in environmental and ecological toxicology, with some members in the group working in various areas of ecology. As one of the units offering a Masters degree, the toxicology group is responsible for supervising research by a number of students each year. Some members of the unit have substantial teaching responsibilities at both the graduate and undergraduate levels. Outreach and dissemination of science to the public is also a significant component of the work of some of the members of the group.

General evaluation & recommendations

Several members of the group conduct internationally significant and highly visible research, most notably in environmental toxicology. Others have research programs that, from the outside at least, appear to overlap with those in CEES. The rationale for the constitution of the group and its relationship to CEES is not always apparent. Integrative biology is difficult to define, and the group members are active in a variety of fields. We recommend that the unit develop a more coherent definition of its mission and a strategic growth plan that emphasises the strengths of the group. As members retire, there is a risk that the group will be seen as a unit of individuals who share little beyond not fitting into one of the other units in the department. We appreciate that the restructuring of the department was relatively recent and that all aspects may not be optimal, but we encourage this and other units to continue to assess the success of the reorganisation.

We also recommend that the unit develop a mechanism for acknowledging and rewarding contributions other than publications in peer-reviewed journals, including teaching and outreach.

Societal impact

Research in toxicology has obvious importance for society, and the group's broader efforts to examine the effects of environmental factors on species, ecosystems, and human

affairs are also relevant. Environmental monitoring continues to provide a scientific basis for policy decisions.

Centre for Ecological and Evolutionary Synthesis (CEES)

Grading of scientific quality

Excellent

Description of unit

The centre consists of 18 core members, 46 researchers and postdoctoral fellows, 20 technical and administrative personnel, plus PhD and Masters students. Its director maintains a flat management structure. There is extremely high overall productivity and a fine training environment for younger scientists. The average age of scientific staff is low, about 42 years. The centre nominally has three themes: (i) the role of population structuring in adaptive evolution, (ii) the potential for adaptation, and (iii) the evolution of reproductive isolation. In fact the themes are well integrated. The centre is well equipped and capable of raising extramural support as required.

General evaluation & recommendations

The CEES needs continuity into the future and that is not guaranteed. We recommend that the centre be integrated into the university and longer-term funding made available. Much of the centre's research is motivated and driven by its highly successful director who is both an excellent scientist and a visionary scientific administrator. We recommend succession and contingency planning, perhaps by the appointment of two associate directors. We echo the recommendation of the 2000 report to move the behavioural ecology group from Oslo Museum to a university. The centre might be the ideal location.

Societal impact

The centre has considerable societal impact. We present four of many possible examples. The centre examines effects of climate change marine ecosystems and resource economics. It has initiated successful start-up companies and commercial enterprises, and become part of a Strategic Institute Programme on the effects of fishery harvest. The centre also sequenced the cod genome, which will allow its population structure to be analysed in the future.

Microbial Evolution Research Group (MERG)

Grading of scientific quality

Good to Very Good

Description of unit

MERG was initiated through a strategic program at the Faculty of Mathematics and Natural Sciences, University of Oslo. The rationale behind the creation of MERG was to establish a larger and more coherent research group capable of applying to be a Centre of Excellence in Norway in 2012. The Department of Biology is the host institution because most of the participants are affiliated with this department.

MERG includes eight professors, four associate professors, seven post-doctoral fellows, four engineers, and one administrator. The unit is interdisciplinary with staff affiliated

with five institutions: Department of Biology, Department of Molecular Life Sciences, Oslo Natural History Museum, The Veterinary Institute, and Norwegian Institute for Water Research. The latter two are outside Oslo University. At the Department of Biology, four research groups are represented in MERG.

General evaluation & recommendations

The extensive inter-disciplinarity of the unit creates a challenge but also potentially generates interactions that can lead to excellent research and education. It appears there are some good synergies, joint positions, and re-localisation steps that have helped MERG develop. Analysis of low output groups or groups below critical mass could be examined as part of strategic reorganisations. In addition, the obligations of some staff to other institutions might be assessed and clarified, so that the clear benefit to MERG can be realised. The nature of collaborative relationships could be assessed with a view to focusing on those that result in productive output. Relationships with the other units within the Department of Biology could be enhanced.

Efforts are being put into achieving Centre of Excellence status but receiving this status is not guaranteed. There was reference to limited success in obtaining research grants from the Research Council of Norway and the EU, but potential reasons for this were not discussed with us.

We could not discern any obvious needs for the group, although recruitment strategy could be examined in anticipation of future retirements and the potential for development or acquisition of new skills (e.g. molecular analyses, bioinformatics). We felt that there was potential for greater coherence, which may require some strong leadership to achieve. We also queried why evolution is in the unit's name, because its research extends beyond microbial evolution.

Societal impact

Much of the unit's research is of relevance to society, including work on toxic cyanobacteria and dinoflagellates, mycorrhizas, climate change, fragmentation of species' habitats, deep sea metagenomes of oil reservoirs, and abundance of parasites and harmful organisms. Two staff members are affiliated with the Veterinary Institute and the Norwegian Institute for Water Research. The unit's activities receive some exposure through the media and in popular scientific articles.

Marine Biology

Grading of scientific quality

Very Good

Description of unit

This research unit, which is the only one of its kind in eastern Norway, has undergone significant reorganization since the last evaluation. As a result, marine biology within the University has been strengthened and the responsibilities for conducting research and teaching in marine biology and ecology have been consolidated. Within the unit, there are four Professors, five other faculty and five Emeritus Professors. These staff are supported by just two technicians.

General evaluation & recommendations

The unit's research is strong and generates internationally significant publications. The staff's CVs are either internationally or nationally significant. The unit is well run and organised, strategically sound, and disseminates knowledge effectively. The group is using the algal cultures effectively, particularly for taxonomic research. The research on harmful algal blooms is commendable. Research facilities are good and the group's input into pelagic ecology and benthic ecology is notable. Collaborations at both national and international levels are strong. There are weaknesses in technical support and relatively few staff given the wide range of topics covered. A focus on genomic research might increase collaboration with other units within the department.

The unit has handled change well but may need to recruit technicians and retain staff. Stronger collaborations with other units may have this effect. We think it is essential to support the research infrastructure (ships and research labs) and to recruit high-calibre staff.

Societal impact

The unit's dissemination strategy is both theoretically and practically sound with a wide range of public outreach.

University of Oslo Natural History Museum

Department of Research & Collections

Description of institution

The Natural History Museum, University of Oslo derives from the previous Zoology, Geology & Botanical Museums and the Botanical Garden. Research is carried out in the Department of Research and Collections, which has a Director who reports to the Director of the Museum. We were charged with assessing research in three of the five research groups: (i) National Centre for BioSystematics, (ii) Interpretation & Modelling of Biodiversity, and (iii) Freshwater Ecology & Inland Fisheries Laboratory. The latter two groups were submitted for consideration as a single unit. The National Centre for BioSystematics contains 19 senior academic and postdoctoral staff, and the latter two groups contain a total of seven senior scientific staff and a Professor II.

General evaluation & recommendations

The Botanical and Zoological activities of the museum have been administratively combined. There is a Department of Research and Collections. The suggestion in the 2000 report that an increasing proportion of research should leverage the museum's collections did not appear to have been implemented.

The vision and coherence of the National Centre for Biosystematics and the Centre for Biodiversity Mapping and Modelling were unclear. Further, the logic of grouping the Centre for Biodiversity Mapping & Modelling and the Freshwater Ecology & Inland Fisheries Laboratory was not apparent. We therefore treated the two centres and the laboratory separately. Consequently in this general evaluation we describe areas of strength or potential strength, and how they might be developed inside and outside the Museum.

We noted the museum conducts research of very high quality on (i) Arctic and Afro-Alpine Plants, (ii) barcoding of permafrost DNA, (iii) sexual selection in birds, and (iv) population structure of Arctic marine mammals. The museum also conducts research of good quality on speciation in a particular taxonomic group of parasites.

Given that collections are a central resource for research in a natural history museum, and this museum's collection includes about six million objects, we suggest that the museum consider how to expedite recording of the collection into a central digital archive. It did not appear that the museum's substantial insect collections are being curated or that research is capitalising on that collection. The lack of maintenance seems like a potential liability, and the lack of research to be a potentially-unrealised opportunity.

DNA analysis is a strength of the museum's research. The museum currently is engaged in both barcoding for identification purposes and analysis of ancient DNA. A successful major-grant application would be necessary for the museum to become the hub of Norwegian barcoding (Nor-BOL). It may be worthwhile to develop a contingency plan for funding and for barcoding new acquisitions in the event that the grant application is

unsuccessful. The extent to which the initiative is actively integrated with EU and international barcoding efforts (European Consortium for the Barcode of Life, Network of European Leading Laboratories, and International Barcode of Life) was unclear. It would also be useful to clarify how the DNA barcoding pipeline in the museum would be established to handle new acquisitions.

The museum's strength in ancient DNA analysis has the potential to grow. However, Eske Willerslev's operation in Copenhagen seems to be of much greater magnitude than the one in Oslo. It is generally accepted as best practice to replicate all ancient DNA analyses at an independent laboratory and to establish formal agreements with appropriate institutions. Hiring a palynologist might increase the museum's capacity to analyze DNA in permafrost.

Some members of the Panel questioned whether research that was not based on collections was consistent with the organisation's mission. Systematics and taxonomy increasingly apply molecular biology, so it may be worthwhile to develop DNA facilities. To some extent, such facilities might support research that is not based directly on collections.

Aquarium research on parasites may need to move to a secure Level 3 biosafety facility. The Freshwater Ecology & Inland Fisheries Laboratory (which was established in 1969 to investigate the effects of hydroplants) generates some income through indirect costs, but the connection of its work to the organisation's mission was unclear.

We recommend that the museum consider the following.

i) Establish a strategic plan for the Department of Research and Collections to strengthen institutional research coherence.

ii) Consider restructuring current research groups and strengthening some, particularly entomology.

iii) Consider transferring high quality research and personnel not closely associated with collections, such as sexual selection in birds (as noted in the 2000 report) and the Freshwater Ecology & Inland Fisheries Laboratory, to a university department.

iv) Develop a strategy to integrate reconstruction of past ecosystems on the basis of ancient DNA with other new areas of museum expertise, for example, the collection and curation of a pollen bank.

v) Develop a plan for ensuring compliance of a potential national barcoding centre with international standards. Metadata on barcodes should be linked with that of the museum's holdings via an online, open access data archive.

vi) Develop a contingency plan for curation if the barcoding centre is not funded.

Follow up of previous evaluation

Botanical activities: The 2000 evaluation panel recommended that collections be used as much as possible for research. The current strategic plan does not address this recommendation, but a new six-year strategic plan is being prepared.

Zoological activities: Except for parasitology, the research groups are small. It might be worthwhile to explore whether efficiency would be increased if the groups combined their activities with the Department of Biology at the University of Oslo. Mammalogy in particular has few resources and might benefit from pooling activities. It was clear that the current research of the behavioural ecology group was not related to the collections and seemed more closely aligned with typical activities of a university department. The museum does not currently appear to have an effective plan for filling positions vacated by retiring professors. Consistent with the mission of the museum, there might be opportunities to enhance the quantity of taxonomic research conducted by the zoology groups.

Evaluation of individual research units

National Centre for Biosystematics

Grading of scientific quality

Good

Description of unit

Then unit contains nine full professors and three associate professors, with a high proportion of late-career researchers. The self-assessment states it aims "to become a nationally leading and internationally influential research and education centre in biosystematics in order to meet society's need for knowledge in taxonomy and biodiversity." In fact, we think its best research to date is in Arctic and Afro-Alpine plants, the barcoding of permafrost DNA, sexual selection, and Arctic marine mammals.

General evaluation & recommendations

The Panel recognised a high proportion of nationally- or internationally-significant research carried out by members of the centre. However, integration of the work into what might really be called a National Centre for Biosystematics was not apparent. Bringing a disparate group of research workers together and claiming that they constitute a National Centre is unconvincing. We noted that some research projects are relevant both to the museum's mission and to development of a nascent National Centre for Biosystematics. In particular, the barcoding initiative may have potential. There is a real need to focus vision if the centre is to develop coherently.

Societal impact

If the centre developed to become a national resource for knowledge in taxonomy and biodiversity, it would have great societal impact. Currently, its lack of cohesion limits its social role.

Freshwater Ecology & Inland Fisheries (LFI)

Grading of scientific quality

Fair to Good

Description of unit

LFI was established in 1969 and undertakes research on how human activities, such as the generation of hydropower, affect species occurrence, with the goal of informing management of freshwater ecosystems and fisheries. The unit is staffed by three principal scientists and one senior scientist who is jointly employed by the University College of Telemark. All staff are male and close to retirement age, and all but one are Norwegian. External contracts fund salaries and operating costs, with the museum providing office space, consumables and technical support.

General evaluation & recommendations

Essentially this group is a contract research division of the museum and through contract research provides funding to the general operating budget. We recommend considering whether the group will be sustained and, if so, where it should be located. Some members of the panel felt the unit's relevance to museum activities was unclear. One option would be to affiliate the LFI with a university department.

Societal impact

See the impact statement below for the Modelling of Biodiversity (IMB) group.

Modelling of Biodiversity (IMB)

Grading of scientific quality

Good to Very Good

Description of unit

This unit was established in 2008 and undertakes research and statistical modelling with data obtained through the museum's Global Biodiversity Information Facility node. The goal of the group's research is to develop predictive models of changes in species occurrence due to factors such as climate change. During the assessment period, the unit contained one principal scientist and three research scientists (one of the latter left the unit and is based at the Norwegian Institute of Forest and Landscape). All staff are male Norwegians. The unit is funded primarily through external contracts, with the museum providing a portion of staff salaries, space, some consumables, and technical support.

General evaluation & recommendations

The self-assessment notes that separation of academic and technical staff is an organisational weakness that may limit output. It also has the potential to create a hierarchical culture with a negative effect on morale. The rationale for such a separation was not apparent to us.

Unpublished reports and policy documents may have limited credibility. Peer-reviewed publications may be regarded with greater confidence by decision-makers than non-reviewed outputs. It may be helpful to keep in mind that journals with high impact factors may have little impact in the real world. If the unit aims to inform practice, then publications in, say, regional or taxon-specific journals that typically are read by people

taking action on the ground may have high actual impact. The reward structure within the unit and department could be adjusted to reflect this situation.

Evidence is equivocal as to whether open-access publications are more likely to be cited than publications that are not. Most major journals are made available to individuals in low-income countries through consortia. It may be worthwhile to think strategically about potential users of the information who do not have access to the publications, and how access can be facilitated in other ways that do not violate copyright laws.

Biological diversity encompasses all levels of life and structure, composition, and function. All units within the department are interpreting biological diversity, hence the rationale for splitting biological diversity from other departments, and for the consideration of "biodiversity modelling" as a discipline, was not apparent. If there is a historical reason or a current rationale, making this explicit in future self-assessments would be helpful.

The unit could consider in a strategic manner whether and how its collective research efforts are transferable outside Norway.

Societal impact

Both the LFI (above) and the IMB provide recommendations and advice to national resource managers and conservation groups (corporate or government fisheries and freshwater managers and advocates) through both formal reports and public presentations. As such, the work of each unit is of moderate societal impact, as they both provide third-party evaluations that assist the implementation of national and regional policies. It could be argued that the LFI works on a contractual basis and as such provides more socially-relevant data and advice to clients than does the IMB.

Til: Instituttstyret ved Biologisk institutt

Sakstype: Orienteringssak

Saksnr.: O-SAK 12/2011

Møtedato: 8.12.11

Notatdato: 1.12.11

Saksbehandler: Maren Onsrud

Sakstittel: Evaluering av norsk klimaforskning: Biologisk institutts selvevaluering

De viktigste problemstillinger:
Biologisk institutt ble plukket ut av NFR til å gå videre til fase 2 i evalueringen av norsk klimaforskning. Fase 1 var en kvantitativ rapportering, og fase 2 er en kvalitativ rapportering som går i dybden av klimaforskningen ved instituttet.

Instituttet er invitert til å møte evalueringspanelet 14. desember.

Vedlegg:
- Evaluation of Norwegian Climate Research, Self Assessment of the Department of Biology

Evaluation of Norwegian Climate Research 2001-2010

Self-assessment report

University of Oslo

Faculty of Mathematics and Natural Sciences

Department of Biology

Table of Content

SELF-ASSESSMENT
Department of Biology, University of Oslo (UiO)

1. Quality of research

The Department of Biology has during the period 2001–2010 published a very extensive list of papers that has relevance to eco-gradients, temperature effects or implicitly climatic issues. At least 247 papers are climate related: these are listed in Attachment I. The number so far in 2011 (from January to the beginning of November) is 53. There has been a steady increase of the number of such publications since 2001 (Fig. 1 and 2).

The Department generally aims at publishing in the most appropriate peer-reviewed international journals of the highest quality; i.e. both journals of general character (like Nature, Science, Proceedings of the Natural Academy of Science and Proceedings of the Royal Society), but also more specific journals (like Marine Ecology-Progress Series, Limnology and Oceanography, Journal of Animal Ecology, Ecology, Functional Ecology, Oikos, Oecologia, Global Change Biology and Climate Research). In 2010[1] 34 % (15 out of 44) of the publications were published in the highest ranked journals (level II in the Norwegian journal rank system). The average Impact Factor[2] (from ISI) for the journals in which we published our climate-related papers was 3.6 in 2010. The corresponding Impact Factor is 5.3 for 2011 so far. The average number of citations per publication from 2001–2010 is currently 24.3.

Out of the 44 climate-related papers published in 2010, 43 % were published with national cooperation (i.e. outside the Department), and 84 % with non-Norwegian cooperation (ref. the addresses for the affiliated authors). The total numbers of unique national (outside the Department) and international collaborators for 2010 were 31.5 and 159.5[3], respectively. Our international co-authors originated from institutions in 28 different countries (6 continents). See Attachment III for an overview of our international institution collaborators, based on co-authorships, for the period 2008-2011.

[1] We are using 2010 as an example for different statistics due to the time consuming process of generating some of these numbers
[2] From ISI Web of Knowledge. Impact Factor for 2010 used for both 2010 and 2011
[3] Persons with both national and international affiliation: counted as 0.5 in both categories

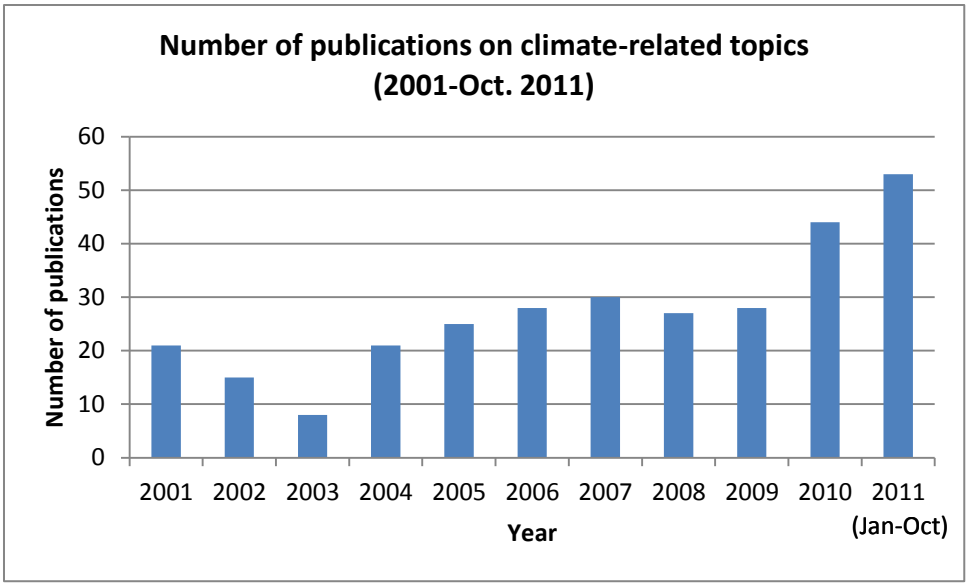

Figure 1. Number of publications on climate-related topics from 2001 to October 2011.

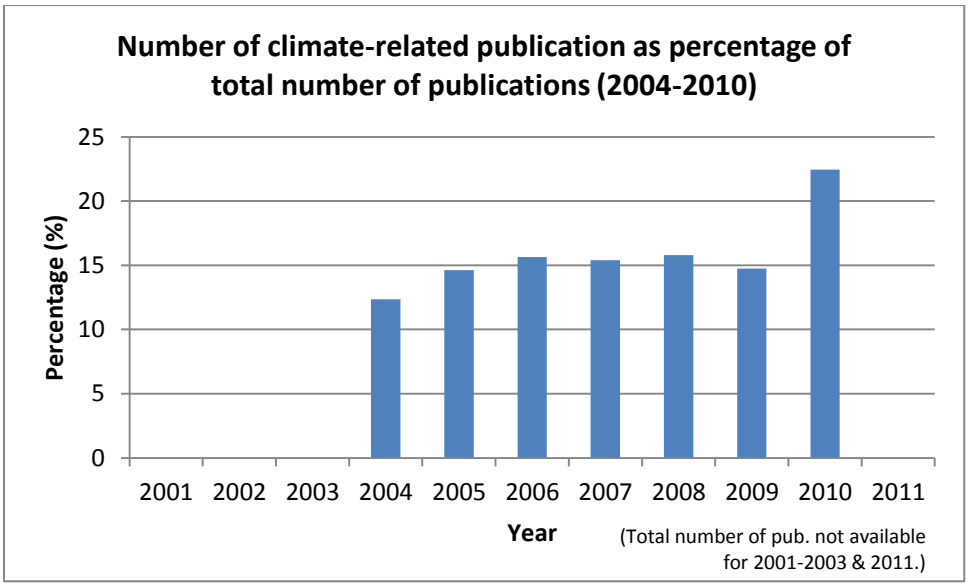

Figure 2. Number of publications published on climate-related topics given as a percentage of the total number of publications produced at the Department of Biology from 2001 to 2010.

A selection of our 10 most important research articles is presented in Attachment II.
The articles are chosen because we believe they influence science, either because they are highly-cited reviews or introduce novel concepts, approaches or extraordinary data.

1) In northern Scandinavia, lemming outbreaks historically occurred once every three to four years. Lately, outbreaks have either stopped or occurred less frequently. We show first that climate change means a higher frequency of rain-on-snow events, destroying the subnivean space - the gap between ground and snow where lemmings feed during dry winter conditions. Warmer temperatures mean that snow melts and refreezes, producing a sheet of ice that prevents lemmings from feeding. We then go on to show that winter weather and snow conditions, together with density dependence in the net population growth rate, account for the observed population dynamics of the rodent community dominated by lemmings in an alpine Norwegian core habitat between 1970 and 1997, and predict the observed absence of rodent peak years after 1994. The

reduction in the frequency of lemming outbreaks has knock-on consequences for the northern ecosystems through trophic interactions, including cascading effects on ptarmigan.

2) Climate change affects the relative timing of food requirement and food availability for various organisms and by doing so influences their reproduction and survival. The match/mismatch hypothesis, which is the focus of this paper, seeks to explain recruitment variation in a population by means of the relation between its phenology—the timing of seasonal activities such as flowering or breeding—and that of species at the immediate lower level. The hypothesis has been well known in the marine literature for quite some time. The paper is important as it is the first to discuss the match-mismatch hypothesis across both aquatic and terrestrial ecosystems and expands it to take into consideration issues such as overall prey abundance and spatial distribution.
3) In this paper, we have demonstrated that the onset of spring reproduction in passerine birds has advanced by a week or two due to recent changes in climate over much of North America and Europe. The study was among the first to suggest evolutionary change in the timing of migration as a more parsimonious explanation than change through phenotypic plasticity, contrary to the 'conventional wisdom' in the field. It contributes significantly to the understanding of phenology-related challenges faced by migratory birds under climate change. In particular long-distance passerine migrants may face severe problems through earlier spring arrival in northerly regions. The paper was the result of a collaborative effort involving the universities of Oslo, Lund and Helsinki, as well as Italian researchers and representatives from Scandinavian bird observatories.
4) Human cases of bubonic plague (*Yersinia pestis*) infection originate, ultimately, in the bacterium's wildlife host populations. The epidemiological dynamics of the wildlife reservoir therefore determine the abundance, distribution and evolution of the pathogen, which in turn shape the frequency, distribution and virulence of human cases. Earlier studies have shown clear evidence of climatic forcing on contemporary plague abundance in rodents and humans. In Central Asia, where human plague is still reported regularly, the bacterium is common in natural populations of great gerbils. By using field data from 1949-1995 and previously undescribed statistical techniques, this paper shows that *Y. pestis* prevalence in gerbils increases with warmer springs and wetter summers: A 1 degree Celsius increase in spring is predicted to lead to a > 50% increase in prevalence. Climatic conditions favouring plague apparently existed in this region at the onset of the Black Death as well as when the most recent plague pandemic arose in the same region, and they are expected to continue or become more favourable as a result of climate change.
5) The ability to predict ecological responses to climate has often been hampered by our rather limited understanding of trophic interactions. Indeed, it has proven difficult to discern direct and indirect effects of environmental change on animal populations owing to limited information about vegetation at large temporal and spatial scales. The rapidly increasing use of the Normalized Difference Vegetation Index (NDVI) in ecological studies changed this situation. In this review, we provided the first overview of the use of the NDVI in ecological studies and outlined its possible key role in future research of environmental change in an ecosystem context.
6) An apparent paradox in the climate effects literature is the fact that global scale climate indices such as the North Atlantic Oscillation (NAO) index may better explain animal performances than the local weather variables biologists often select. In this conceptual paper, we provide an overview of three different mechanisms that might

explain this paradox: (1) the time window; (2) the spatial window; and (3) the weather composition component of climate.

7– 9) Through papers 7, 8 and 9, together with co-editing and writing several chapters in the books "The North Atlantic Oscillation – Climate significance and environmental impact" and "Marine ecosystems and climate variation" UiO Bio established ourselves as a leading group within studies of impacts of large-scale climate fluctuations on population dynamics and ecology. It should be noted that most of this work involved cooperation between marine and terrestrial biologists, an expert statistician (Chan) and an internationally renowned climate scientist. Our cooperation with James Hurrell still continues to bear fruit. To our knowledge it is still unusual that leading climate scientists work together with biologists to such a degree.

10) Winter climate variables may affect performance of herbivores in two contrasting ways. Clearly, deep snow may increase energetic costs of movement during winter as well as reduce access to forage. However, delayed melting of large snowfens in summer also creates a mosaic of newly emerged vegetation of high quality to herbivores. By comparing the red deer and domestic sheep, the latter being indoor during winter, we were able to show similar responses to winter climate variables (the NAO) providing the first clear evidence of such indirect effects of winter climate on summer foraging conditions, as the only way sheep can be affected by winter climate is this indirect pathway. Further, we showed that the responses to the NAO were nonlinear and nonmonotonic, i.e., that the relationship between performance and the NAO changed in direction from low, via intermediate to high values.

We have 7[4] climate-related papers published from 2001-2011 which have been highlighted by Faculty of 1000.

In addition we would like to mention that we have been heavily involved in editing a book and four special journal issues on climate effect studies:

Stenseth, N.C., Ottersen, G., Hurrell, J.W. & Belgrano, A. (eds). 2004. Marine Ecosystems and Climate Variation. The North Atlantic. A comparative perspective, Oxford University Press, 252 pp.

Berteaux, D. & Stenseth, N.C. (eds) 2006. Ecological effects of climatic variability: studies on mammals. Climate Research 32 (2), 95-158.

Jonzén, N., Ergon, T., Lindén, A. & Stensth, N.C. (eds.) 2007. Bird migration and climate. Climate Research 35, 1-180.

Pertoldi, C., Kristensen, T.N. & Stenseth, N.C. (eds.) 2010. Climate and evolutionary physiology. Climate Research 43, 1-147.

Perry, R.I., Barange, M., Hofmann, E., Moloney, C., Ottersen, G., & Sakurai, Y. (eds.) 2010. 3rd GLOBEC Open Science Meeting: From ecosystem function to ecosystem prediction Preface. Progress in oceanography 87 (1-4) 1-356.

[4] Tian et al. 2011, Ohlberger et al. 2011a, Saraux et al. 2011, Ohlberger et al. 2011b, Stenseth et al. 2006, Haugen et al. 2006, van der Wahl 2009

2. Capacity

At the Department of Biology at least 26 professors, researchers, postdocs and doctoral students currently perform climate-related research, corresponding to at least 14 man-years. Seven of these are working full time on climate-related topics. The number of researchers focused on climate has increased through the last decade, as reflected in the number of climate-related papers produced (see Fig. 1). From 2006-2011, 15 PhD students graduated and wrote their theses on climate-focused topics.

The interdisciplinary focus at the Department, and in particular at CEES, helps to train a new generation of biologists, some of which will work on climate-related issues. Within the Nordic Centre of Excellence (NorMER, see below) this is formalized by candidates being trained by specialists within their respective fields.

Master programmes at the Department of Biology

The master program at the Department can currently offer several highly relevant courses having climate effects as an important part. The most relevant are listed below:

BIO4140 - Life-history Strategies and Climate Effects
BIO4150 - Conservation and management biology
BIO4230 - Biogeography and Biodiversity
BIO4310 - Limnology I
BIO4331 - Marine environmental issues
BIO4371 - Fish Ecology
BIO4400 - Marine Pelagic Ecology

All courses have a credit value of 10 (one year of full-time studies corresponds to 60 credits).

PhD programmes at the Department of Biology

Within the NorMER network a series of Nordic climate-related courses will be organized. These will be held at various locations in the Nordic countries but will give credits at all Nordic partners. The first course will be held May 7-11, 2012.

Involvement of PhDs and post-doctoral research fellows

The Department, especially through the CEES, attracts a large number of highly talented young people, and many of these work on climate-related topics. From the collected papers presented in the reference list (Attachment 1) we see that 11 of the Department's PhD students were co-authors on a total of 14 out of the 44 climate related papers published in 2010.

Through the newly established Nordic Centre of Excellence on "Climate Change Effects on Marine Ecosystems and Resource Economics" (NorMER; 2011-2016, ~70 mill NOK), administered at CEES at the Department of Biology, 16 PhDs and at least 8 post-docs will be trained. The PhDs and postdocs will address interrelated research questions on how climate affects cod-dominated ecosystems in the Nordic Seas. Two of the PhDs and three of the post-docs will have CEES as their base institution, but all PhDs and post-docs will travel extensively between the collaborating Nordic institutions (10 in total). This joint, cross-Nordic education programme is expected to be highly instrumental in facilitating collaboration among the established research groups.

CEES has also previously chaired another Nordic Centre of Excellence: "The Dynamics of Ecological Systems under the Influence of Climatic Variation" (EcoClim) from 2003 to 2008. The project was funded by the Nordic Centre of Excellence Program at the Nordic Research

Council, and led by a research team spatially distributed in Norway, Sweden and Finland. Four post-docs and five PhDs were trained within the program.

CEES has also chaired a mono-site Marie Curie Early Stage Training (EST): "Ecological and Evolutionary Response to Climatic Variation" (CEES-MCO) from 2006 to 2009. The project was funded by the EUs sixth Framework Programme (FP6). Four full-time and seven short term PhDs were trained within the training programme. All of these 11 students have now successfully graduated with a doctoral degree.

Core funding vs. external programme/project funding
The main funding schemes for the Department are the various programs in the Norwegian Research Council (RCN). Regarding climate-related work, the marine program within the RCN has been a main source of funding. Some funding for such work has also been obtained from Norklima.

Climate research at the Department of Biology is mainly funded through external grants, except for ~3 man-years in salaries paid from basic funding (in 2010). For the last 4 years (projects that started in 2008 or later) the Department has been granted 43 research projects (>1 mill NOK), and 19 of these could be categorized as projects with a climate focus. Of these 19 projects, seven were funded by the EU Commissions 7th Framework, six from the RCN directly to the Department of Biology and two from the RCN via governmental contributors. One is funded from industry and commercial partners, one is funded from private organizations, one from the Nordic Council of Ministries (NordForsk) and one from foreign organizations (see Table 1).

Project title	Funding	Duration from-to
Spatial Heterogeneity of Resources: a mediator of large herbivore population stability?	EU 7th Framework	01.01.2009-05.07.2011
Ecological and evolutionary dynamics of juvenescent marine populations	EU 7th Framework	20.05.2009-31.05.2011
Demographic strategies under climate variation: a study on Arctic and Antarctic seabirds	EU 7th Framework	11.01.2010-10.01.2012
Timing of bird migration under climate change: phenotypic plasticity, microevolutionary response or both?	EU 7th Framework	01.05.2011-30.04.2013
Evolutionary response of two African Rodent species (Hystrix sp) to climate changes: the study of the past as an estimate of the future	EU 7th Framework	01.02.2011-31.01.2013
International Network for Terrestrial Research and Monitoring in the Arctic	EU 7th Framework	01.01.2011-31.12.2014
Climate-induced phenological change and its consequences for bird populations	EU 7th Framework	01.09.2011-31.03.2014
Modelling ecosystems under climate change: Windermere as a model lake system	RCN (NORKLIMA)	01.01.2008-31.07.2012
Match-mismatching on trophic levels as a structuring force of ecosystems	RCN (FRIBIO)	01.01.2008-30.04.2011
The ecology and economy of sheep production under climate change	RCN (MATPROGRAMMET)	01.04.2009-31.03.2012
Flexibility and constraints in animal movement patterns: ecology, evolution and annual cycles	RCN (FRIBIO)	01.04.2010-31.05.2014
Phytoplankton size: Climatic adaptation and longterm evolution	RCN (FRINAT)	01.06.2010-31.12.2013
Fisheries induced evolution in Atlantic cod investigated by ancient and historic samples funding (FIE)	RCN (HAVKYST)	01.11.2011-31.05.2014

LAND: Partial migration of red deer and tick distribution at the altitudinal colonization Border	RCN (MILJO2015)	01.04.2011-31.03.2014
Genome size, cell size and growth; searching for the causal links (GENOME)	RCN (FRIBIO)	01.06.2010-31.05.2013
Marine phylogeographic structuring during climate change: the signature of leading and rear edge of range shifting populations	RCN - via governmental contributor	01.01.2009-31.12.2011
Adaptive management of living marine resources by integrating different data sources and key ecological processes (ADMAR)	RCN - via governmental contributor	01.04.2010-31.03.2015
Constructing an integrated modelling framework for decision support in ecosystem-based management: case study Lofoten/Barents Sea	Industry and commercial partners (Oil companies and RCN)	01.07.2011-31.12.2014
Arctic and Sub-arctic system and ecological response to the early 20th century warming (ARCWARM)	Private organization, foundations (NERCS)	01.01.2009-31.07.2011
Nordic Centre for Research on Marine Ecosystems and Resources under Climate Change (NorMER)	Nordic Council of Ministers + Institution contributions	01.01.2011-31.12.2015
Biodiversity of Marine Eukaryotes (BIOMARKS)	Foreign organizations (Ministére de l'Écologie)	01.02.2009-30.09.2013

Table 1. Climate research projects (>1 mill NOK) awarded to the Department of Biology from 2008 – Oct. 2011.

Short-term funding vs. long-term funding
Most of the obtained funding is short term (projects lasting from 3 to 5 years, see table 1). The only long-term funding we have, apart from the core funding to the Department, is the Centre of Excellence funding to CEES which is funded for 5 + 5 years.

Participation in national and international research infrastructure
The Alpine Research Center Finse is a part of an existing and proven effective network of 33 terrestrial field bases throughout the Arctic called SCANNET. SCANNET is a network of field site leaders, research station managers and user groups in northern Scandinavia and Europe that have been collaborating since 2001 to improve comparative observations and access to information on environmental change in the North. The Director of Finse, Assistant Professor Torbjørn Ergon is a partner through SCANNET (www.scannet.nu) in the EU project INTERACT (International network for terrestrial research and monitoring in the Arctic), started in 2011. One of its goals is to establish or increase the cooperation with other relevant projects and networks in the European Arctic, as for example the ESFRI projects SIOS, LIFE WATCH and ICOS. Several initiatives have been taken by the EU in recent years to build/enlarge the scientific infrastructures in the Arctic. Most of these infrastructure initiatives are still in their preparatory phase.

The Department is an active partner in the National network for plant biology research (www.plantnorway.no) established in 2007 as a joint initiative between universities in Norway to strengthen the quality of Norwegian plant research through coordinated actions and utilization of resources. The network has been granted support from RCN to a pre-project for a large infrastructure research proposal in 2011 called "BIOKLIMA– Large Scale Facility for Studying Climate Effects in Natural Ecosystems and Agroecosystems". BIOKLIMA will gather the entire research environment of Norway in a unified "theme" and is a major achievement in plant sciences, regardless of the final outcome. The BIOKLIMA-facility will measure the effect of climate change on plants, soil and water, as well as climate gases in both natural and agricultural ecosystems and will merge molecular and field scale studies to obtain more reliable data on the effects of climate changes to improve economic and social

investments. It will gather the entire research environment of Norway in a unified "theme" and will be a major achievement in plant sciences.

The RCN-project "Flexibility and constraints in animal movement patterns: ecology, evolution and annual cycles" have initiated a cooperation with ten different bird observatories in the Nordic countries and in Italy. The observatories are Jomfruland observatory, Lista observatory, Jerstad Wildlife Management, Mandal Ringing group in Norway, Ottenby observatory and Falsterbo observatory in Sweden, Hanko observatory in Finland, and Capri, Ventotene and Ponza bird observatories in Italy. The observatories are well spread over the Nordic breeding grounds for many bird species and the Italian ones are well situated on the migratory route for many long-distance migrants. The bird migration data from the numerous bird observatories will form a basis for studying large-scale environmental control of movement patterns across a range of species and life histories, and for constructing coarse-scale predictive models from observatories with long time data sets. Together these will enable CEES to study climate effects and phenology on a broad scale spatially and in time.

Infrastructure relevant for climate research at the Department
The *Phytotron* offers advanced facilities for plant research under controlled climates. It can simulate all kinds of climate types from tropical to arctic. In addition the phytotron provides facilities for simulating air and soil pollutions, and light and nutrient conditions. The facility offers 900 m^2 of area for plant breeding within greenhouses and controlled climate chambers. The Phytotron also offers teaching facilities and laboratories. It mainly serves the Department of Biology and the Department of Molecular Biosciences, but also other universities, research institutions and private industry.

The *Alpine Research Center Finse* has laboratories, a temperature regulated room with cages for small rodents, aquarium facilities, a small library and a workshop. With easy access to glaciers, and a wide range of alpine habitat types, the research centre attracts biologists, geologists, geophysicists and other researchers from a wide range of Norwegian and international institutions. Seminars and meetings, as well as university field courses, are regularly held in the conference unit. Several long-term data series with relevance to climate change have been collected; recently a high-profile paper on the effect of climate on the lemming cycle with data from Finse was published in *Nature*[5].

The University of Oslo have a *Marine Biological Station* in Drøbak that includes a research station (Biologen) and a lodging and conference centre (Tollboden). The research station is mainly used for experimental work, and for hosting courses and conferences. Further, the university has two research vessels, F/F Trygve Braarud (70 ft) and F/F Bjørn Føyn (40 ft). The vessels are used in research and education. The Department of Biology are in charge of the daily running of the vessels. F/F Trygve Braarud is very well kept and equipped for research in fjords, with instrumentation such as CTDs, ROV, closable trawls and advanced echo-sounders. As an example, detailed studies on the effect of ice cover on fish and plankton behaviour and interactions have attracted attention.

The Department is well equipped for DNA-studies. There are several labs for standard DNA work. The *CEES DNA Lab* has an infrastructure consisting of an isolation lab, separate PCR facilities, post PCR, DNA sequencing labs and a lab for class 2 security research. It contains all the basic instrumentation of a modern molecular biology laboratory as well as automated

[5] Kausrud et al. 2008

nucleic acid purification and gel electrophoresis systems. The *Marine Molecular Biology Lab* is equipped for PCR, DNA/RNA isolation, probe development, cloning, and microarray analysis and is run by the Marine Biology program. The *ABI lab* is a shared facility between the Departments of Biology and Molecular Biosciences. It is equipped with two ABI 3730 capillary electrophoresis sequencers, each with 48 capillaries providing DNA sequencing and fragment analysis. It is a service lab for various research groups and institutes at the university, as well as affiliated institutions nationally and internationally. These facilities are useful for research on adaptive processes, such as the adaptation to different temperatures.

The *Ultra-high Throughput Sequencing Platform (UTSP)* at CEES was established in 2008 (with a 454/Roche) under the FUGE and AVIT programmes. The platform was strengthened through a new Infrastructure Programme grant from RCN in 2009 and consolidation with the Illumina sequencing platform at Institute of Medical Genetics (IMG), Oslo University Hospital, establishing the *Norwegian High-Throughput Sequencing Centre*. The majority of the sequenced samples are from Norwegian research institutes (83% of the total samples), though the number of international users is increasing (the remaining 17% of total samples are from Austria, Sweden, the Netherlands, France and Switzerland). As an example, the cod genome was sequenced (with a high-profile publication in *Nature* in 2011). Several groups now focus on sequencing and genotyping data sets to investigate the long-term genetic effects of climatic change as well as other environmental changes.

The Department is the project leader and initiator of the development of the ***Bioportal.***
Bioportal is a web-based biocomputing service at University of Oslo, www.bioportal.uio.no. This infrastructure is currently the most used bioinformatics service in Norway and represents the largest HPC (high performance computing) community across any research area in Norway. Bioportal has users from all continents. The service is connected to the 454-sequencing lab at UiO, ensuring that produced data are automatically transferred from the sequencing facility to the users' Bioportal accounts.

In collaboration with the Department of Molecular Biosciences we have access to an *Experimental Animals Facility*, containing special rooms for keeping both terrestrial and aquatic organisms. Both units contain facilities for performing experiments under controlled climatic conditions. In the aquatic part of the facility it is possible to work on both marine and freshwater organisms. The terrestrial animal part contains facilities for clean experimental animals, and a smaller part for maintaining wild animals. Here, more mechanistic studies can be performed (physiology, behaviour, quantitative genetics). In addition to this more large-scale facility, there is access to a number of dedicated climate-controlled rooms for small scale.

The recently upgraded CEES '*Ecoflux*' lab for analysing basic food-web related parameters consist of a flow-through analyser for total and dissolved nutrients (N and P), a Shimatzu analyzer for total organic carbon and total organic nitrogen, and a Thermo-Finnegan analyzer for particulate C,N,P and S. We also have a FacsCalibur Flow Cytometer for estimating cell numbers and DNA quantification, as well as facilities for running chemostats under various light and temperature regimes. There is an automatic plate-reader equipped with Nano-Drop to study fluorescence from a large number of biological samples plus DNA and RNA quantification. The climate-relevance of this facilities is related to water quality analysis for water-climate related projects, and in particular the Flow Cytometer is literally instrumental for current, experimental studies on genome-size and cell size responses to ambient temperature (RCN - Genome project).

3. Strategic focus

The Department of Biology, established in its present form in 2007, is organized in 3 research programs and one interdisciplinary Center of Excellence (CEES). The present organization results from following up The Research Council of Norway (RCN)'s Evaluation of Biological Research in 2000 and advice given by RCN ("Fagplanutvalget") in 2003.

The Department of Biology is a large "Department of organismic and evolutionary Biology". Over the last five years, the Department (and UiO) has shifted hiring policies from the traditional focus on education (i.e. keeping a large and diverse scientific staff to be able to teach a wide range of subjects) to focusing on performing high-level research. The policy is thus shifting towards choosing a small number of core areas for research, and establishing a more specialized educational profile based on quality and strength. By this, we increase our researchers' ability to stay abreast of the international developments within their fields of research.

The thematic focus of our climate research
The climate-related work is a very important component of the research conducted at the Department. It was identified as one of the four research areas of the Department in our recently (November 2011) released self-evaluation report for RCN's "*Evaluation of research in Biology, Medicine and Health in Norway 2010-2011*". The international experts from Panel 1 (on botany, zoology and ecology-related disciplines) stated that, "The centre [i.e. the CEES] has considerable societal impact… The centre examines effects of climate change on marine ecosystems and resource economics." The climate-related work at the Department falls within the second thematic area of the mandate for the evaluation committee: "Impacts of, and adaptation to, climate change and variability". Specifically, most of the Departments research is on how species and ecosystems react to or are affected by climate impacts. Effects of climate variability and change is a significant focus of many of the research groups in ecology and evolutionary biology in the Department that have over the recent 10 years or so gained significant knowledge on this field (Attachment I). Study systems include a range of organisms and habitats, such as rodents, marine pelagic systems, and plague, to mention only the most used systems for climate-related studies at the Department.

Part of the research conducted at the Department aims at understanding how climate variations have affected ecosystems in the recent past – which we believe is a prerequisite for predicting how climate change may affect ecosystems in the future. Predictions about climate effects remain difficult, or at least highly uncertain, as long as we have little knowledge about the underlying ultimate causes of the observed changes that are associated with past and current climatic change at all levels of organization. To better understand the Department's approach to the study of climate effects, some examples from a variety of biological systems are given below[6]. The list of published papers should further make clear that our work is both broad-ranging and, partly, cutting edge.

- In a collaboration with researchers from Institute of Marine Research (IMR) Flødevigen, we are studying how the survival, growth, and recruitment of cod on the Skagerrak coast are affected by changes in climate, and in particular the warming of the ocean during the last few decades[7]. Present development involves a novel

[6] We have put most weight on ongoing research and therefore mostly cite papers from 2009-2011
[7] Rogers et al. 2011

application of a complex statistical tool (Bayesian state-space modeling) that will be an important contribution for the scientific community. Similar studies are being conducted for fish stocks in the Barents Sea[8]. These are examples of research that is of both basic and applied importance, and the findings will bear directly on the future outlook for fisheries.

- In a newly funded project by RCN (Havet og Kysten) we plan to investigate the impacts of climate and human-induced selection pressures on the evolutionary potential of Atlantic cod through whole genome sequencing approaches. Historic and contemporary genomic data will be analyzed in a multi-disciplinary framework, and will include both phenotypic and climatic parameters. The recent publication of the Atlantic cod genome allows the cost-effective sequencing of old, degraded DNA that is typically associated with historic or ancient samples. We will use state-of-the-art genomic tools and statistical time-series analysis to unravel the impact of both climate changes over time in addition to fisheries-induced selection on several cod populations. This research may uncover neglected impacts that alter the ecology of important marine fisheries.

- We aim to extend the knowledge on ecological effects of climate by seeking a better understanding of the *evolutionary* consequences of climate change and human activities. Climate change and human activities (such as harvesting through fishing or hunting) cause demographic responses, plastic phenotypic responses as well as genetic change; ongoing work on migratory birds[9], marine[10] and freshwater[11] fishes at the Department has a great potential for unraveling the interplay between these mechanisms.

- We have combined ecological and evolutionary perspectives in a study on effects of climate change on passerine birds. In particular, one research group works on "Climate, migration and reproduction in birds" using several long time-series (3 series of >20 years) and genetic material.

- We are also working in close collaboration with a French research team (CNRS Strasbourg / IPEV) to evaluate the capacity of populations of penguins[12] to adapt to global changes through the study of functional mechanisms and microevolutionary processes.

- We are conducting research linking life history to effects of environmental variation by combining studies of tolerance to climate stress (ecophysiology[13]), phenotypic plasticity in life history traits (acclimation, thermal reaction norms), temperature adaption[14], quantitative genetics[15], genome- cell-size and body size responses to temperature[16], phenology and spatial heterogeneity with population dynamics and

[8] Stige et al. 2010, Hjermann et al. 2010
[9] Jonzen et al. 2007, Knutsen et al. 2011
[10] Rouyer et al. 2011; also see the NORMer Nordic Centre of Excellence below
[11] Edeline et al. 2009, 2010, Ohlberger et al. 2010a,b, Langangen et al. 2011
[12] Le Bohec et al. 2008, Saraux et al. 2011
[13] Labra et al. 2010
[14] Kavanagh et al. 2010
[15] Serbezov et al. 2010 (J. Evol. Biol.)
[16] Several current experiments plus 2 submitted papers under the NRC-Genome project (Hessen)

species interactions. Studies are done in experimental model systems as well as in the field, with terrestrial arthropods[17] and in freshwater systems[18].

- Since 2001, a long-term project at the Department is studying climate change impacts on the Arctic and sub-Arctic soil systems, with a focus on physiological ecology and soil biology, e.g., effects of climate change and habitat fragmentation, combined with experimental investigations on soil fauna, plant and microorganism interactions, decomposition processes and food web complexity. Another important aspect of this research is to determine how such changes may affect the abundance and relationships between indigenous and introduced species[19].

- The research project "Modelling ecosystems under climate change: Windermere as a model lake system", funded by NORKLIMA, has a clear climate change focus with the goal of understanding, and ultimately predicting, the effects of global warming on temperate lake ecosystems. We have started by investigating long-term effects of increasing temperatures on fish population dynamics and life-history evolution. Currently, we are investigating climate impacts on the dynamics and structure of fish populations and communities in freshwater ecosystems. We are using age-structured population models and stage-structured community models that we link to fish population data and available data on climate variables, particularly temperature. We think that assessing climate impacts at the level of entire communities is becoming more important in climate research, and that this is a promising approach towards a science-informed ecosystem management under current and future climate change[20].

- Recently, researchers at the Department have studied phenology and fruiting patterns in fungi[21]. By relating climate variability to fruiting seasons, we have, through statistical analyses, revealed that major shifts in fungi temporal fruiting patterns have occurred during the last 50 years.

- We are studying how climate variability affects the ecology and economy of sheep production in ecosystems differing in productivity and stocking rates. A major objective of this study is to enable prediction and understand how a change in the climatic regime can best be met by management actions. The project will perform analysis of extensive (>8 million lambs) and long-term (21 yrs) data on autumn lamb body mass and litter size from the whole of Norway coupled with (full coverage) satellite data on climate, local weather and plant development to determine the links by which climate affects sheep production.

- Earlier studies have shown clear evidence of 'climatic forcing' on contemporary plague abundance in rodents and humans. A department-led study concludes that Central Asian climate fluctuations appear to have had significant influences on regional human plague frequency in the first part of the 20th century, and probably over the past 1500 years[22]. Since plague activity in Central Asia seems to have followed climate fluctuations in past centuries, we expect global warming to have an

[17] Janion et al. 2010
[18] Otero et al. 2011, Gregersen et al. 2011, Junge et al. 2011, Ohlberger 2011a, 2011b, Vøllestad et al. 2009
[19] Chown et al. 2007, Janion et al. 2010
[20] Langangen et al. 2011, Ohlberger et al. 2011 a,b
[21] Büntgen et al. 2011, Kauserud et al. 2008, Kauserud et al. 2010
[22] Kausrud 2010

impact upon future plague epidemiology, probably sustaining or increasing plague activity in the region with a direct influence on human society[23].

- The Institute has for a long time been involved in stoichiometrically explicit ecosystem models related to climatic drivers in the Baltic Sea (the joint Baltic Sea Research Programme (BONUS), led by Prof. Tom Andersen). These models are capable of predicting the climate-driven export fluxes of organic carbon and nutrients and how this might affect recipient waters. For this study on the Baltic Sea system we focus on the functioning of eutrophied food webs under climatically-forced runoff scenarios, through analyzing experimental and modeled trophic cascades within the planktonic ecosystem. This research will help to understand how ecosystems react to nutrient discharges and as such it is an important step towards reaching an ecosystem approach to management [24].

- We have also recently been in charge of a large, climate- and biogeochemistry-related project involving modeling based on water analysis, catchment properties, climate (temperature, precipitation and nitrogen deposition) as well as GIS-data on vegetation density (NDVI-index). This project has generated several papers predicting export fluxes of organic C and nutrient (N, P, Si) and ecosystem responses in relation to catchment properties, N-deposition and climate predictions[25].

- In order to understand future climate effects on populations it is often useful to investigate responses during earlier periods of large climatic changes. We have for example modeled the distribution of a range of marine and freshwater fish species during the last glacial maximum, showing how ranges contract and move depending on sea temperature[26].

- We have studied organic carbon in freshwater and the changing role of nutrients under climate change[27].

- Plant-pollinator interactions are under threat from several environmental stress factors, including climate change. At the same time there is an increasing appreciation of the ecosystem service pollinators provide to food crops and consequently an increased concern related to the potential effects of pollinator declines. We were asked by the Food and Agricultural Organization of the United Nations (FAO) to assess the potential effects of climate change on crop pollination on a global scale. As a response to this we wrote a report published in July 2011 ("Potential effects of climate change on crop pollination", M. Kjøhl et al. 2011).

The disciplinary and methodological approaches used in our climate research

The Department's work includes both experimental design and mathematic/statistical modeling, with model systems ranging from cell cultures to population assemblages. For example, some department researchers are using telemetry techniques (GPS collars) or automatic identification systems (electronic tags and antennas) to analyze the behavioral responses to climate change in ungulates (red deer, moose and Svalbard reindeer) or seabirds

[23] Heier et al. 2011, Ben Ari 2008, 2011
[24] Andersen et al. 2009
[25] Hessen et al. 2009, Larsen et al. 2011a, b, c , Persson et al. 2011, Elser et al. 2010
[26] Kettle et al 2011, Bigg et al 2008
[27] Larsen et al. 2011a, 2001b, Persson et al. 2011, Elser et al. 2010

(penguins), while others are studying the change of competition equilibrium due to global warming between two passerine species (blue and great tits). At the same time other researchers are modeling multispecies population dynamics in fish stocks, and by linking models across disciplines (i.e., linking ecological models with climate and bio-economical models), they are able to account for management consequences over a wide range of policy objectives and climate scenarios. Further, several groups try to link phenotypic responses to various climatic forces, using experimental studies in combination with modern molecular methods. The use of functional genomics and related approaches is planned to be an integral part of the future work at the Department.

One of the Department's main contributions to climate impact science is the use and development of novel statistical methodology. Much of this work has been in the area of population dynamics, focusing on systems of intrinsic ecological interest. Many outstanding long-term datasets are used to understand how ecological systems respond to climate change. One of the main areas of interest has been to understand how density-dependent processes interact with climate variability and change to affect fluctuations in the abundance, size, or growth rate of organisms, and this has driven the development of new methodology. An example is the expanded use of Threshold Generalized Additive Models, which allow the study of nonlinear changes in ecosystems associated with climatic thresholds. Another example involves a novel application of a complex statistical tool, Bayesian state-space modelling.

Additionally, we would also like to mention that the establishment of the *Norwegian High-Throughput Sequencing Centre* (mentioned above) has enabled the department to be in the forefront of genomics research. Over the past five years the development of high-throughput sequencing technologies has provided opportunities to accelerate biological research tremendously. The advent of next-generation sequencing technologies, such as pyrosequencing from 454 LifeSciences (www.454.com), HiSeq 2000 (www.illumina.com) and ABI/SOLiD (www.appliedbiosystems.com), has made the comprehensive analysis of genomes and transcriptomes affordable, routine and widespread. Profound ecological knowledge, inexpensive genotyping chips and the possibility to do large-scale sequencing efforts, in combination with robust statistical genetics and bioinformatics tools, would provide a hitherto unforeseen link understanding the genetic impact of climate change in a large range of organisms.

Our experiences with, and need for, interdisciplinary climate related research
Our research on biological effects of climate fluctuations is augmented by strong collaborations between biologists of different kinds and researchers of other disciplines, in particular statisticians, but also economists (in particular in our research on fisheries-related questions), climatologists/oceanographers or computer/electronic engineers. Such collaboration is facilitated by statisticians and economists holding adjunct positions at CEES, as well as by joint research projects with other research institutions. Several of the Department's overall most cited papers and book chapters are within climate impacts on ecology and were a result of collaboration with renowned climatologists (James Hurrell, NCAR) and statisticians (Kung-Sik Chan, Univ. Iowa). Finding roots in this philosophy, interdisciplinary research is the core idea of the large, newly funded Nordic Centre of Excellence (NCoE): "Climate Change Effects on Marine Ecosystems and Resource Economics" (NorMER), lead by CEES. NorMER addresses both the biological and societal consequences of global warming, and involves scientists from usually separated scientific fields from all Nordic countries. Even across different sub-fields of biology there are

thresholds that need to be passed to allow for fruitful interdisciplinary collaboration. While the broad scope of climate-impact related research at the Department is a strength, it is also a challenge. While cooperation within established disciplinary groups functions smoothly, a need to foster closer collaboration across these groups has been detected. Towards this means a climate-impact Action Group was formed in December 2010. This Action Group is an arena for learning about colleague's climate-related work through short presentations and discussions, sharing data, ideas and exchanging knowledge on methods, software, literature, journals, and web resources. The long-term goal of the Action Group is to provide the environment for establishing cross-disciplinary/cross-habitat teams working on common papers.

Our main contribution to addressing climate research policy priorities with regard to the gaps defined by the IPCC

Although the activities at the Department have not been specifically tailored towards the knowledge gaps and research priorities defined by the IPCC, much of our research and contributions to the scientific literature is directly relevant. Our studies on how climate change is affecting inorganic carbon and nutrients in catchments and lakes[28] contribute to an improved understanding of the biogeochemical cycles and address the "inadequate representation of the interactive coupling between ecosystems and the climate system", a key uncertainty according to the IPCC (chapter 4.8[29]). CEES-researchers (e.g. Hessen) have also been partners in project headed by institutions like the Norwegian Polar Institute via the NRC-project *Cleopatra* and the Bjerknes Center project *Merclim*. The former project has addressed ice-retreat and mismatch aspects in the high-Arctic marine ecosystems, while the latter has addressed climate, nutrient cycling and marine acidification. These issues have been put forward as current knowledge gaps and research priorities by the IPCC. Another key uncertainty, that "adaptation research has failed to provide generalized knowledge of the adaptive capacity of FFFF [food, fibre, forestry, and fisheries] systems across a range of climate and socio-economic futures" (chapter 5.8.2) has been addressed by our work on the fish stocks of the Barents Sea, where we both model the ecosystem's response to climate change as well as different harvesting strategies[30]. For instance, we have shown that the narrower age structure due to heavy fishing has made the cod stock less resilient to climate variation[31]. We also participate in a new project on "Combined effects of ocean acidification, climate change and oil related discharges" lead by IRIS, Stavanger, which is another prioritized research area (chapter 4.8). Finally, the IPCC also points to the need for attributing adverse health outcomes to observed climate trends using longitudinal health data, in particular in low- and middle-income countries (chapter 8.8); our work on how long-term plague dynamics is shaped by climate fluctuations is relevant for this.

Our contribution to strengthening the knowledge base that informs climate policy

In our view, the Department contributes relatively much to the knowledge base, for a large part by improving our general knowledge of how the living world reacts to and adapts to climate fluctuations and change, but in some cases also by making studies that are directly related to climate policy (see e.g. our results on fish dynamics and bio-economic studies). Many of our studies are based on analyses of long-term observational data on populations, ecosystems and climatic variability. We thus have to rely on past climatic variability to study

[28] Larsen et al. 2011, Persson et al. 2011

[29] all references to IPCC are to "Climate Change 2007: Working Group II: Impacts, Adaptation and Vulnerability"

[30] e.g., Stige et al. 2010, Diekert et al. 2010

[31] Rouyer et al. 2011

effects on ecological systems, whereas we may in the near future see temperature ranges not recorded in the past, thus requiring extrapolation. However, we also use approaches where we in larger detail investigate the mechanisms of the observed demographic responses, for instance studies on stoichiometry, behavior, quantitative genetics and functional genomics.

The importance of NORKLIMA for our research
The Department of Biology has as from 2007-2011 submitted as project owners 13 NORKLIMA applications to the RCN. Two of them have been funded: "*Biogeochemistry in Northern Watersheds, a Reactor in Global Change*" (165139/S30, Prof. D. Hessen) and "*Modelling ecosystems under climate change: Windermere as a model lake system*" 185000/S30, Prof. LA. Vøllestad). We are awaiting the response of three new applications to NORKLIMA as we write this report: "*Strengthening the adaptive capacity of institutions in fisheries*" (Prof. N.C. Stenseth), "*Plankton size responses to increased ocean temperature (PLOT)*" (Prof. D. Hessen) and "*Climate change effects on arctic fungal communities - a metagenomic approach*" (Ass. Prof. H. Kauserud). In addition to this, several of our researchers have taken part in NORKLIMA projects owned by other institutions. NORKLIMA has hence not been a large contributor to the Department's climate research. The limited success towards NORKLIMA does partly reflect a bias towards geophysical sciences on one side, and social sciences on the other hand, leaving comparatively less to core biological issues (species and ecosystem responses). It also reflects that the magnitude of the program as such has not been very extensive, and there has been very strong competition from grants within NORKLIMA (demonstrating a potential for increased efforts within climate research). We have however ongoing cooperations both with geophysicists and socio-economists, and we seek to strengthen our cooperation with social scientists through NorMER. A major part of the national climate funding has also been directed towards industrial and technical aspects, e.g. more energy-efficient use at various levels, means of CO_2-sequestration, etc., which is outside the research areas of CEES and the institute as a whole.

Understanding the effects of climate is fundamental to understanding the dynamics of the ecosystems, and much of our climate-related research has been funded through programs where climate is typically one of several focus areas. RCN programmes funding our climate-related research include FRIBIO, HAVKYST, and PROOFNY.

The importance of IPY for our research
The International Polar Year has not had a significant impact on research at the Department. As project owners the Department has not engaged in any IPY project but has participated in three IPY projects: one project owned by the Norwegian Polar Institute (NRS-project Cleopatra), one owned by Institute of Marine Research and another by French CNRS which have been important to their polar research.

The administration of climate research by the Research Council of Norway in general and by NORKLIMA specifically.

4. Research partnerships – national & international

Within the University of Oslo
The Department has well-developed collaborations with statisticians both at the Department of Mathematics and the Department of Economics. This collaboration is developed particularly in the field of time-series analysis. The focus of many of these projects is the effect of climatic variables (covariates) on various population parameters. Through this close link staff at the Department, and particularly the graduate students, become well trained in quantitative methods. This collaboration is very important for much of the climate research at the Department. Further, staff at CEES is involved in the proposed new CoE called "Centre for Mathematics and Statistics in the Life Sciences".

The facilities for molecular analyses (see section 2) are highly relevant for some of our climate projects, especially for studies investigating adaptation processes and functional genomics.

Within a national setting
At the personal level our staff collaborate widely with researchers within Norway. At present our main climate collaborators are at the Institute of Marine Research (IMR). This collaboration links to long-term climate-related research in the Skagerrak and the Barents Sea. Statistical modeling of long-term data is of focal interest in this collaborative work. We also entertain a long-term collaboration with the Norwegian Meteorological Institute, for the same reasons. One of the major projects we are involved in with IMR is "Adaptive management of living marine resources by integrating different data sources and key ecological processes (ADMAR)". Our participation in this project is strongly supported by the Ministry of Fisheries and Coastal Affairs as well as the Ministry of Foreign Affairs.

The Finse Alpine Research Center (mentioned under facilities), located in the northwestern part of the Hardangervidda mountain plateau, belongs to the Faculties of Mathematics and Natural Sciences at the Universities of Bergen and Oslo. The Department is in charge of running the centre.

The Department is an active partner in the National network for plant biology research (www.plantnorway.no) established in 2007 as a joint initiative between universities in Norway to strengthen the quality of Norwegian plant research through coordinated actions and utilization of resources. The network has been granted support from RCN to a pre-project for a large infrastructure research proposal in 2011 called "BIOKLIMA– Large Scale Facility for Studying Climate Effects in Natural Ecosystems and Agroecosystems". BIOKLIMA will gather the entire research environment of Norway in a unified "theme" and is a major achievement in plant sciences.

In general, there is well-developed collaboration with several research institutes (Norwegian Institute for Water Research (NIVA), Norwegian Institute for Nature Research (NINA), The Norwegian Veterinary Institute (VI), The Institute of Marine Research (IMR), The Norwegian Polar Institute (NPI)) on various climate-related projects. Especially our collaboration with NIVA is strong, and several researchers at NIVA hold adjunct positions at UiO. Collaboration with the different universities is less formalised, and usually occurs at a more person-to-person basis. We also have some collaboration with industrial partners – one such project aims to create a collaborative research training programme for climate effects on emergent

infectious diseases, focusing on plague and tick-borne disease dynamics; we anticipate such model systems will apply to other infectious diseases.

National competition for funding
Since Norway is a small country with few researchers within each field it is not always easy to find national partners that fit into a planned/proposed project. Further, there tends to be strong competition among various research groups and institutes. This can, if collaborative projects are funded, lead to disagreement over how to split the funding. This has particularly been the case in collaborations with IMR. This may stem from the strong competition that generally exists in the field and the wish of some to "own" a particular research topic.

Nordic collaboration
Collaborations at the Nordic scale are mainly driven by the usefulness of such collaborations, and are generally not different from collaboration at the international scale. NorMER and EcoClim (both presented in Section 2) deserve specific mention. In addition we are involved in several smaller-scale Nordic collaborative projects.

International cooperation outside Nordic countries
The Department has a very wide international partnership, involving collaboration with partners on most continents. This international cooperation is reflected in the large proportion of co-authorship with international partners. More than 80% of our journal articles in climate research have international co-authors. Some examples of this type of collaboration are mentioned here.

The Department is a core member of the EUR-OCEANS (European Research on Ocean Ecosystems under Anthropogenic and Natural Forcings) multi-site Consortium. The Consortium is comprised of 27 institutional core members from the European Union and additional 4 invited members from non-EU countries. The CEES has been given the responsibility of leading one of the Flagship projects of the consortium. CEES is also involved in a pending proposal submitted to the ERA-Net RUS program: "Impact of climate change on performance of marine fauna: Implications for species interactions with consequences for ecosystem functioning in the sub-Arctic environment" (other partners are Alfred Wegener Institute for Polar and Marine Research, Bremerhaven, University of Hamburg, Hamburg and the Zoological Institute of the Russian Academy of Sciences, St. Petersburg).

The ecological stoichiometry group has from the start had close collaboration with key researchers in this field from USA, Europe, and Japan, a collaboration that has also resulted in exchanges of PhD students and reciprocal exchange of sabbaticals for scientific staff. This has also been the case for the fish ecology group – where collaborative projects focusing on the environmental impacts on life history includes partners in Scandinavia, Canada and USA – involving extensive exchange of students and co-authorships.

Through a Norway-South Africa collaborative framework on terrestrial arthropods there has been close integration of projects between Norway, South Africa, Sweden and France with a focus on climate adaptation, life history, population biology and biodiversity of springtails. The main partners are Centre for Invasion Biology, Stellenbosch University, Department of Ecology, Swedish University of Agricultural Sciences and Museum National d'Histoire Naturelle, Paris. There is also close collaboration with the University of Copenhagen and the Danish National Environmental Research Institute within the fields of soil food web

dynamics, climate change effects on the soil system, and research on combined effects of toxic and climatic stress in arthropods.

Through a collaboration with the French CNRS in Strasbourg on population dynamics in polar seabirds, the Department is involved in numerous projects and working groups (IPEV-Program 137 'Adaptive strategies and population dynamics of penguins under environmental constraints', and ANR-PICASO 'Penguins as Indicators of Climate Anomalies in the Southern Ocean').

Researchers at Department of Biology participate in a European-wide network for research at the interface of fungal ecology and climatology (EUfunclim), with the aim of trying to link fungal phenology, productivity and biogeography to climate variability. This network has recently been established and includes biologists, climatologists, ecologists, and statisticians from Austria, Finland, Norway, Switzerland, Spain and the UK.

The microbiology research group (MERG) is heading the Nordforsk research network *'Fungi in boreal forests'*, focusing on implementation of high-throughput sequencing technologies and identification arrays for fungal ecology research, including projects on climate effects on fungal communities. About 15 North European research groups are participants in the network, including ca. 100 researchers and students.

Through the Marie Curie Early Stage Training (EST) on "Ecological and Evolutionary Response to Climatic Variation" (presented under Section 2) we trained 4 full-time PhDs and 7 part-time PhDs (doing their PhD degree at another host institution).

Attachment III provide a list of our international institutional collaborators (data collected from co-authorships on our climate publications from 2008 to 2011).

Participation in international global change research programmes (WCRP, IGBP, IHDP, DIVERSITAS, IPY)
Senior Research Scientist Dr. Ottersen chaired the ICES (International Council for the Exploration of the Sea) / GLOBEC (Global Ocean Ecosystem Dynamics, sponsored by IGBP) Cod and Climate Change working group 2006-2009. He was a member of the Scientific Steering Committee of international GLOBEC for two terms, 2000-2005.

5. Communication with stakeholders

Public agencies or policy makers at national, regional or local level
We interact – both directly and indirectly – with the Institute of Marine Research (IMR) which is responsible for providing scientific advice on the management of the living marine resources in Norway. In particular, CEES is IMR's partner in "Adaptive management of living marine resources by integrating different data sources and key ecological processes – ADMAR", a strategic institute program at IMR that aims to facilitate sustainable management of harvested marine populations. CEES has also represented in the Norwegian Committee on Sea Mammals (Sjøpattedyrutvalget) since it was established by the Government in 2009, for a large part in response to the large effects of current climate change on sea mammals. We are furthermore present at meetings where politicians and decision makers are present. We also invite politicians and decision makers to our meetings, most recently when we launched the NorMER – a meeting which was covered broadly in various media. Through our collaboration with IMR Flødevigen we provide much information to local decision makers. We communicate our results in newspapers, radio and other media, including blogging (Nils Chr. Stenseth has a blog at forskning-no; Stenseth also writes on science, including our climate-effect work, in Dagens Næringsliv, the Financial Times of Norway).

CEES is represented by Dag Hessen on the board of Concerned Scientists Norway (www.cs-n.org/), and he also contributes to a range of public discussions in various forums (newspapers, broadcasting) and has contributed several popular papers, chapters in books, as well as own books that address climate- and biology related issues. Hessen is also a member of the ethical council for The Government Pension Fund of Norway (www.regjeringen.no/nb/dep/fin/dep/underliggende_etater/statens-pensjonsfond---utland.html?id=270410).

Specific groups which might be highly exposed to climate change, or which might be instrumental in implementing adaptation actions
In the project "The ecology and economy of sheep production under climate change" and in similar projects on wild ungulates (such as red deer), CEES has formal agreements and a tight cooperation with the Norwegian Farmer's Association (Norges Bondelag), Norwegian Forest Owner's Association (Norges Skogeierforbund), and Norwegian Sheep and Goat Farmer's Association (Sau og Geit).

The private sector
As part of NorMER we are specifically involving the private sector through workshops where students are being trained in communicating with the private sector. Through such interactions the communication of actual results will also be done. Professor Kjetill S. Jakobsen is furthermore involved as Chair of the MareLife, a meeting place between science and the private sector. Some results may impact on local cod stocks around the coast of Norway, and these will be discussed in publications that specifically target the relevant groups (e.g. industry and local communities). Hessen is also member of Yara Norway working group for sustainable development (www.yara.com/about/where_we_operate/norway.aspx)

Non-governmental organisations
We are present at meetings organized by such organizations. Professor Dag Hessen is board member of WWF-Norway as well as Concerned Scientists Norway (cf. above)

6. Relevance to society

Our work, to a large extent based upon the analysis of historic data, is very relevant for our understanding of how the ecological systems might respond to climate changes. The following examples can illustrate this relevance:

- Our work on **plague** investigates how climate influences the occurrence of plague through the natural hosts or the vectors of the plague bacteria (*e.g.*, several papers by K. Kausrud, T. Ben Ari, L. Heier, N.C. Stenseth and others, for example, Stenseth et al. *PNAS* 2006, Kausrud et al *PRSB* 2007, *BMC Biol.* 2010, Samia et al. *PNAS* 2011, Xu et al. *PNAS* 2011, Heier et al. *PRSB* 2011). This work has much applied value, and is recognized as such; the climatic and ecological niche models we have produced have real world application in predicting seasons and landscapes where the risk for plague is great, and helping proactive allocation of resources and the prevention of plague epidemics. The published models from our group can be used for predicting the plague threat to humans from year to year in Kazakhstan. This is desirable, as the labour-intensive plague monitoring programme from the time of the Soviet Union is no longer sufficiently sustained. Kazakh researchers are currently testing an early version of the models.

- Locals and veterinarians in Scandinavia report a spread of ticks and increased tick densities during the last few decades (Jore et al. *Parasites Vectors* 2011). Ongoing studies at CEES on **tick ecology** contribute to reveal to which extent this is a climate-induced phenomenon (A. Mysterud, H. Viljugren, L. Quiller et al., RCN *Miljø 2015*: "LAND: Partial migration of red deer and tick distribution at the altitudinal colonization border"). As ticks are vectors for serious infectious diseases in both man and livestock, our research may contribute to predict and possibly mitigate future climate-driven changes in tick borne diseases.

- CEES is working with industrial partners to create a collaborative **training programme** for climate effects on emergent infectious diseases, focusing on plague and tick-borne disease dynamics; we anticipate such model systems will subsequently be applied to other infectious diseases.

- In our work on **marine ecosystems** we explore how climate and other forcing factors influence fish populations, sea birds and zooplankton (*e.g.*, several papers by D.Ø. Hjermann, G. Ottersen, J. Durant, L.C. Stige, N.C. Stenseth and others, for example Hjermann et al. *PNAS* 2004, *PRSB* 2007, *CJFAS* 2004, 2010). The results of this work are of high relevance to the society to be able to dissociate climate effects from fishing effects. The same holds for works on ice retreats, loss of ice-algae and mismatch of algae and grazers in high Arctic ecosystems (e.g. Leu, Hessen and others). For example, in the past climate was often ignored in models of stock recruitment. Collapses of fish stocks, such as the ones of the capelin in the Barents Sea, were often blamed solely on overfishing. By analyzing how climate and fishing in combination affect fish populations, the insights from our work suggest how we might adapt to future climate changes.

- This relevance aspect is most fully developed in the **NorMER** program, where both ecological and socioeconomic effects of climate change are studied. As part of these studies we assess the utility of alternative management options under climate change,

including both "traditional" catch restrictions such as quotas and mesh size limits, and "newer" measures such as marine protected areas.

- CEES' research on the ecological and evolutionary effects of harvesting has resulted in the Ministry of Fishery and Coastal Affairs instigating a partnership between CEES and the Institute of Marine Research (IMR) in a **Strategic Institute Programme**, focusing on adaptive management of marine resources.

- We also model the effects of climate on **freshwater food webs** to better understand how ecosystem functioning is affected by global warming (*e.g.*, Ohlberger et al., *Am. Nat.* 2011, and several papers by L.A. Vøllestad and D.O. Hessen). Not the least the use of lakes as *sentinels* of climate change has been suggested for surveillance and management of ecosystem responses (Adrian, Hessen and others). Such an understanding is crucial to assess and predict our environmental impact, and ultimately to improve the management of our vital resources. Finally, on the predictive side, several recent papers have addressed the couplings of nitrogen deposition and climate change on CO_2-release, nutrient load and water quality at the catchment level (several papers by Hessen and coworkers).

- In studies in **terrestrial ecosystems** on large mammalian herbivores we have focused on how much meat of domestic sheep lambs, semi-domestic reindeer and wild deer species is produced depending on annual variation in climate, what is the extent of regional synchrony, and to what extent we can understand the mechanisms underlying such variation by linking climate to behavioural responses (*e.g.*, Mysterud et al. *Nature* 2001, *Phil. Trans. R. Soc.* 2008; Pettorelli et al. *Biol. Lett.* 2005, *PRSB* 2005; ongoing work by A. Nielsen, A. Mysterud et al.). In Norway, some 2 million sheep are each year grazing mainly in alpine habitats, and harvesting of red deer and moose are in the range of 35-40000 individuals each year. The meat production is thus substantial, and how climate change will affect future production is important knowledge to both adapt to and to buffer such changes.

- In our report on crop pollination and climate change we outline explicit recommendations for future research as well as a protocol for assessing vulnerability to pollinator loss in developing countries. The report is part of the FAO's "Extension of knowledge base" and will be actively used in the design of future management regimes.

Relevance of our research for the international scientific community
Through our publications, which are mostly appearing in highly visible international journals, we are significantly contributing to the development of the scientific understanding of how climate variation might affect the ecological systems. The CEES researchers are involved in several international consortia working on climate change issues, and are also involved in international assessment projects such as North Sea Region Climate Change Assessment (NOSCCA) (www.hzg.de/institute/coastal_research/projects/noscaa/index.html) where Hessen is lead author on the freshwater chapter and Ottersen is contributing author on the marine chapter.

Application of our research results by target user groups
We interact closely with institutions involved in management and public health nationally and internationally (through joint projects and through scientists at Institute of Marine Research,

Norwegian Veterinary Institute and Norwegian Institute for Water Research holding adjunct positions at CEES). We therefore believe our published results are being known to and used by managers.

We also communicate with other stakeholders. For example, the fishing industry is represented in the Centre Advisory Panel of NorMER. For our marine work linked to IMR Flødevigen we have much interaction with the local community.

Extent to which our research has contributed to (or resulted in) any changes to policy standards, plans, or regulations
We are not aware that any changes to policy standards, plans or regulations can be directly accredited to our climate research. However, our research is referred to, for example in the management plans developed for the Norwegian and Barents Seas.

Participation in national and international climate-related policy processes
CEES contributed to a new policy document for marine research in European Science Foundation, Marine Board. Also the NOSCCA assessment work (cf. above) clearly has relevance for climate policy.

Possible conflicts or synergies between relevance and scientific quality
There is indeed potential conflict between these two foci: the relevance issue tends to limit which topics that can be addressed and thus implicitly who can apply for funding – which affects the quality of the work being done in Norway on climate issues. A focus on the relevance issue from a narrow point of view also put constraints the novelty of proposals.

On the other hand, it is our experience that high-quality basic research tends to generate results of applied interest. Whilst CEES is a basic curiosity-driven unit focusing upon the integration of ecology and evolution, much of our work still has an applied value and is funded through various (more applied) funding programmes within the RCN. From a basic ecology point of view, however, there seems to have been a strong emphasis on either the geophysical and societal impacts, with correspondingly less funding (e.g. by Norklima) to ecosystem responses.

7. What next?

In the coming years we (and particularly CEES) will continue addressing how climate variation affects ecological and evolutionary processes. We will increasingly be focusing on how climate variation might interact with other effects (such as harvesting). We will do so for a broad spectrum of systems, both terrestrial and aquatic. A main objective of our work (and particularly so for CEES) is to combine ecological/evolutionary work with genomics in an effort to try to understand adaptation to changing climate. We will also increasingly bring in economic and management considerations in our work – aspects that are fully developed with the NorMER network-centre.

Topics to be focused on in the coming years will include: the study of how microbial systems and plant communities are affected and can adapt to climate changes (using transcriptomics and metagenomics approaches to the study of individuals and specific species assemblages). We have green houses and indoor chambers (phytotron) ideally suited for such studies. Furthermore, within of the field of fungal biology we would like to ask, and answer, the simple question of "what happens to such fundamental, important systems when climate changes?"

In order to achieve this we will continue seek for funding for our work, both nationally and internationally.

We will as part of this work further develop our cooperative network, both nationally, within the Nordic countries and beyond. We will also continue training a new generation of interdisciplinary scientists, candidates that are being trained by specialists within the respective fields. Again this is most fully done in the NorMER network-centre. Our aim is also to develop similar approaches specifically for non-marine systems.

We will in the future, as has been in the past, not interact extensively with stakeholders. This is because our focus is on basic science – much of which is of relevance for the climate issues. That being said, we will continue to communicate results from our work to a broad spectrum of people.

A brief assessment of the professional, financial and organizational strengths and weaknesses of the Department is:

Strengths/opportunities

- The Department of Biology, and in particular CEES, has a very broad spectrum of highly relevant expertise for climate research.
- Staff at the Department of Biology entertain a large network of scientists and research units all over the world.
- Within the NorMER network-centre the Nordic – and international interaction beyond the Nordic region – has been formalized so as to address issues of common interest for different and complementary perspectives.
- The Department of Biology has many highly relevant infrastructural facilities (including both field stations and genomic sequencing facilities).
- CEES attracts and hosts a large number of senior and junior scientists representing various disciplines (both tenured and temporary staff) relating to ecology and evolution, facilitating the integration of these two fields and helping to secure additional external funding.

- Through its size and dynamic structure, CEES is able to adjust to new scientific challenges with relative ease.
- CEES has the manpower and facilities to grasp opportunities emerging within the fast-moving field of biology.

Weaknesses/threats/challenges

- The low level of interaction between CEES and the rest of the Department is a weakness: if we had interacted more we would have been stronger.
- In order to take full advantage of the expertise now housed within CEES, the CEES needs to be properly integrated into the university structure; if not the centre may, in effect, in the future be split into smaller sub-units. This would counteract our efforts to create teams to synthesize and integrate ecology and evolution and to perform interdisciplinary work
- The lack of permanent funding and that essentially all our work requires external funding (much of which is short term) make it difficult to plan with a long-term horizon.
- That many funding openings require collaboration with social scientists makes it difficult to obtain funding for ecological and evolutionary projects – many of which are of high relevance to the climate issue.

8. Recommendations

Although interdisciplinary work across natural science and social science are of great value they should also be more open to fund pure natural science as well as pure social science projects. Hence, we strongly recommend that there is more focus on quality over relevance – this will match the Minister of Science's ambitions to allocate increasingly more to curiosity-driven projects. The field will benefit from this.

We will also point to the fact that climate research funding at the national level has not held up with the expressed ambitions. A major part of the national climate funding has been directed towards industrial and technical aspects, e.g. more energy-efficient use at various levels, means of CO_2-sequestration, etc., which is outside the research areas of the Department and by and large there is an urgent demand to strengthen the organism- and ecosystem-oriented research. This is partly because society ultimately depends on the ecosystem services provided by biodiversity and ecosystem processes. Finally, various issues related to biodiversity, diseases and human well-being at large also depend on biological processes at various levels, and ought to be attended to.

Publications in peer reviewed journals (Nov. 2011-Jan. 2001)				
		Title	**Authors**	**Source**
2011				
	1	Challenging claims in the study of migratory birds and climate change	**Knudsen, E** (Knudsen, Endre); Linden, A (Linden, Andreas); Both, C (Both, Christiaan); Jonzen, N (Jonzen, Niclas); Pulido, F (Pulido, Francisco); Saino, N (Saino, Nicola); Sutherland, WJ (Sutherland, William J.); Bach, LA (Bach, Lars A.); Coppack, T (Coppack, Timothy); **Ergon, T** (Ergon, Torbjorn); Gienapp, P (Gienapp, Phillip); Gill, JA (Gill, Jennifer A.); Gordo, O (Gordo, Oscar); Hedenstroom, A (Hedenstrom, Anders); Lehikoinen, E (Lehikoinen, Esa); Marra, PP (Marra, Peter P.); Moller, AP (Moller, Anders P.); **Nilsson, ALK** (Nilsson, Anna L. K.); Peron, G (Peron, Guillaume); Ranta, E (Ranta, Esa); Rubolini, D (Rubolini, Diego); Sparks, TH (Sparks, Tim H.); Spina, F (Spina, Fernando); Studds, CE (Studds, Colin E.); **Saether, SA** (Saether, Stein A.); Tryjanowski, P (Tryjanowski, Piotr); **Stenseth, NC** (Stenseth, Nils Chr.)	BIOLOGICAL REVIEWS **Volume:** 86 **Issue:** 4 **Pages:** 928-946 **DOI:** 10.1111/j.1469-185X.2011.00179.x **Published:** NOV 2011
	2	Linking climate variability to mushroom productivity and phenology	Büntgen, U (Büntgen, Ulf); **Kauserud, H** (Kauserud, Håvard); Egli, S (Egli, Simon)	FRONTIERS IN ECOLOGY AND THE ENVIRONMENT **DOI:** 10.1890/110064 **Published:** Online NOV 2011
	3	Emergence, spread, persistence and fade-out of sylvatic plague in Kazakhstan	**Heier, L** (Heier, Lise); **Storvik, GO** (Storvik, Geir O.); Davis, SA (Davis, Stephen A.); **Viljugrein, H** (Viljugrein, Hildegunn); Ageyev, VS (Ageyev, Vladimir S.); Klassovskaya, E (Klassovskaya, Evgeniya); **Stenseth, NC** (Stenseth, Nils Chr.)	PROCEEDINGS OF THE ROYAL SOCIETY B-BIOLOGICAL SCIENCES **Volume:** 278 **Issue:** 1720 **Pages:** 2915-2923 **DOI:** 10.1098/rspb.2010.2614 **Published:** OCT 7 2011
	4	Shifting dynamic forces in fish stock fluctuations triggered by age truncation?	**Rouyer, T** (Rouyer, Tristan); **Ottersen, G** (Ottersen, Geir); **Durant, JM** (Durant, Joel M.); **Hidalgo, M** (Hidalgo, Manuel); **Hjermann, DO** (Hjermann, Dag O.); **Persson, J** (Persson, Jonas); **Stige, LC** (Stige, Leif Chr.); **Stenseth, NC** (Stenseth, Nils Chr.)	GLOBAL CHANGE BIOLOGY **Volume:** 17 **Issue:** 10 **Pages:** 3046-3057 **DOI:** 10.1111/j.1365-2486.2011.02443.x **Published:** OCT 2011
	5	Effect of temperature and dietary elemental composition on RNA/protein ratio in a rotifer	**Wojewodzic, MW** (Wojewodzic, Marcin W.); Rachamim, T (Rachamim, Tamar); **Andersen, T** (Andersen, Tom); **Leinaas, HP** (Leinaas, Hans P.); **Hessen, DO** (Hessen, Dag O.)	FUNCTIONAL ECOLOGY **Volume:** 25 **Issue:** 5 **Pages:** 1154-1160 **DOI:** 10.1111/j.1365-2435.2011.01864.x **Published:** OCT 2011
	6	Causes and Consequences of Past and Projected Scandinavian Summer Temperatures, 500-2100 AD	Buntgen, U (Buentgen, Ulf); Raible, CC (Raible, Christoph C.); Frank, D (Frank, David); Helama, S (Helama, Samuli); Cunningham, L (Cunningham, Laura); Hofer, D (Hofer, Dominik); Nievergelt, D (Nievergelt, Daniel); Verstege, A (Verstege, Anne); Timonen, M (Timonen, Mauri); **Stenseth, NC** (Stenseth, Nils Chr.); Esper, J (Esper, Jan)	PLOS ONE **Volume:** 6 **Issue:** 9 Article Number: e25133 **DOI:** 10.1371/journal.pone.0025133 **Published:** SEP 22 2011
	7	Plague and Climate: Scales Matter	Ben Ari, T (Ben Ari, Tamara); Neerinckx, S (Neerinckx, Simon); Gage, KL (Gage, Kenneth L.); Kreppel, K (Kreppel, Katharina); Laudisoit, A (Laudisoit, Anne); Leirs, H (Leirs, Herwig); **Stenseth, NC** (Stenseth, Nils Chr.)	PLOS PATHOGENS **Volume:** 7 **Issue:** 9 Article Number: e1002160 **DOI:** 10.1371/journal.ppat.1002160 **Published:** SEP 2011
	8	Reconstruction of a 1,910-y-long locust series reveals consistent associations with climate fluctuations in China	**Tian, HD** (Tian, Huidong); **Stige, LC** (Stige, Leif C.); Cazelles, B (Cazelles, Bernard); **Kausrud, KL** (Kausrud, Kyrre Linne); Svarverud, R (Svarverud, Rune); **Stenseth, NC** (Stenseth, Nils C.); Zhang, ZB (Zhang, Zhibin)	PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA **Volume:** 108 **Issue:** 35 **Pages:** 14521-14526 **DOI:** 10.1073/pnas.1100189108 **Published:** AUG 30 2011
	9	Dynamics of the plague-wildlife-human system in Central Asia are controlled by two epidemiological thresholds	Samia, NI (Samia, Noelle I.); **Kausrud, KL** (Kausrud, Kyrre Linne); Heesterbeek, H (Heesterbeek, Hans); Ageyev, V (Ageyev, Vladimir); Begon, M (Begon, Mike); Chan, KS (Chan, Kung-Sik); **Stenseth, NC** (Stenseth, Nils C.)	PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA **Volume:** 108 **Issue:** 35 **Pages:** 14527-14532 **DOI:** 10.1073/pnas.1015946108 **Published:** AUG 30 2011
	10	Quantifying the Ocean, Freshwater and Human Effects on Year-to-Year Variability of One-Sea-Winter Atlantic Salmon Angled in Multiple Norwegian Rivers	**Otero, J** (Otero, Jaime); Jensen, AJ (Jensen, Arne J.); L'Abee-Lund, JH (L'Abee-Lund, Jan Henning); **Stenseth, NC** (Stenseth, Nils Chr.); **Storvik, GO** (Storvik, Geir O.); **Vollestad, LA** (Vollestad, Leif Asbjorn)	PLOS ONE **Volume:** 6 **Issue:** 8 Article Number: e24005 **DOI:** 10.1371/journal.pone.0024005 **Published:** AUG 29 2011
	11	Effects of sheep grazing and temporal variability on population dynamics of the clonal herb Geranium sylvaticum in an alpine habitat	Evju, M (Evju, Marianne); Halvorsen, R (Halvorsen, Rune); Rydgren, K (Rydgren, Knut); Austrheim, G (Austrheim, Gunnar); **Mysterud, A** (Mysterud, Atle)	PLANT ECOLOGY **Volume:** 212 **Issue:** 8 **Pages:** 1299-1312 **DOI:** 10.1007/s11258-011-9906-2 **Published:** AUG 2011
	12	The role of El Nino-Southern Oscillation in the dynamics of a savanna large herbivore population	Marshal, JP (Marshal, Jason P.); Owen-Smith, N (Owen-Smith, Norman); Whyte, IJ (Whyte, Ian J.); **Stenseth, NC** (Stenseth, Nils Chr)	OIKOS **Volume:** 120 **Issue:** 8 **Pages:** 1175-1182 **DOI:** 10.1111/j.1600-0706.2010.19155.x **Published:** AUG 2011

	13	Temperature and food-level effects on reproductive investment and egg mass in vendace, Coregonus albula	**Gregersen, F** (Gregersen, F.); **Vollestad, LA** (Vollestad, L. A.); **Ostbye, K** (Ostbye, K.); Aass, P (Aass, P.); Hegge, O (Hegge, O.)	FISHERIES MANAGEMENT AND ECOLOGY **Volume:** 18 **Issue:** 4 **Pages:** 263-269 **DOI:** 10.1111/j.1365-2400.2010.00779.x **Published:** AUG 2011
	14	Saving the largest makes a difference: exploring effects of harvest regulations by model simulations for noble crayfish, Astacus astacus	**Sadykova, D** (Sadykova, D.); Skurdal, J (Skurdal, J.); **Hessen, DO** (Hessen, Dag O.); **Schweder, T** (Schweder, T.)	FISHERIES MANAGEMENT AND ECOLOGY **Volume:** 18 **Issue:** 4 **Pages:** 307-313 **DOI:** 10.1111/j.1365-2400.2011.00784.x **Published:** AUG 2011
	15	Predicting organic carbon in lakes from climate drivers and catchment properties	**Larsen, S** (Larsen, Soren); **Andersen, T** (Andersen, Tom); **Hessen, DO** (Hessen, Dag O.)	GLOBAL BIOGEOCHEMICAL CYCLES **Volume:** 25 Article Number: GB3007 **DOI:** 10.1029/2010GB003908 **Published:** JUL 21 2011
	16	Red Queen: from populations to taxa and communities	**Liow, LH** (Liow, Lee Hsiang); Van Valen, L (Van Valen, Leigh); **Stenseth, NC** (Stenseth, Nils Chr)	TRENDS IN ECOLOGY & EVOLUTION **Volume:** 26 **Issue:** 7 **Pages:** 349-358 **DOI:** 10.1016/j.tree.2011.03.016 **Published:** JUL 2011
	17	Tempo and mode of species diversification in Dolichopoda cave crickets (Orthoptera, Rhaphidophoridae)	Allegrucci, G (Allegrucci, Giuliana); **Trucchi, E** (Trucchi, Emiliano); Sbordoni, V (Sbordoni, Valerio)	MOLECULAR PHYLOGENETICS AND EVOLUTION **Volume:** 60 **Issue:** 1 **Pages:** 108-121 **DOI:** 10.1016/j.ympev.2011.04.002 **Published:** JUL 2011
	18	What determines variation in home range size across spatiotemporal scales in a large browsing herbivore?	**van Beest, FM** (van Beest, Floris M.); **Rivrud, IM** (Rivrud, Inger M.); **Loe, LE** (Loe, Leif E.); Milner, JM (Milner, Jos M.); **Mysterud, A** (Mysterud, Atle)	JOURNAL OF ANIMAL ECOLOGY **Volume:** 80 **Issue:** 4 **Pages:** 771-785 **DOI:** 10.1111/j.1365-2656.2011.01829.x **Published:** JUL 2011
	19	Consequences of changing sea-ice cover for primary and secondary producers in the European Arctic shelf seas: Timing, quantity, and quality	Leu, E (Leu, E.); Soreide, JE (Soreide, J. E.); **Hessen, DO** (Hessen, D. O.); Falk-Petersen, S (Falk-Petersen, S.); Berge, J (Berge, J.)	PROGRESS IN OCEANOGRAPHY **Volume:** 90 **Issue:** 1-4 Special **Issue:** SI **Pages:** 18-32 **DOI:** 10.1016/j.pocean.2011.02.004 **Published:** JUL-SEP 2011
	20	Nonlinear effect of climate on plague during the third pandemic in China	**Xu, L** (Xu, Lei); Liu, QY (Liu, Qiyong); **Stige, LC** (Stige, Leif Chr); Ben Ari, T (Ben Ari, Tamara); Fang, XY (Fang, Xiye); Chan, KS (Chan, Kung-Sik); Wang, SC (Wang, Shuchun); **Stenseth, NC** (Stenseth, Nils Chr); Zhang, ZB (Zhang, Zhibin)	PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA **Volume:** 108 **Issue:** 25 **Pages:** 10214-10219 **DOI:** 10.1073/pnas.1019486108 **Published:** JUN 21 2011
	21	Organic matter flow in the food web at a temperate heath under multifactorial climate change	Andresen, LC (Andresen, Louise C.); **Konestabo, HS** (Konestabo, Heidi S.); Maraldo, K (Maraldo, Kristine); Holmstrup, M (Holmstrup, Martin); Ambus, P (Ambus, Per); Beier, C (Beier, Claus); Michelsen, A (Michelsen, Anders)	RAPID COMMUNICATIONS IN MASS SPECTROMETRY **Volume:** 25 **Issue:** 11 **Pages:** 1485-1496 **DOI:** 10.1002/rcm.4907 **Published:** JUN 15 2011
	22	Transport of Babesia venatorum-infected Ixodes ricinus to Norway by northward migrating passerine birds	**Hasle, G** (Hasle, Gunnar); **Leinaas, HP** (Leinaas, Hans P.); Roed, KH (Roed, Knut H.); Oines, O (Oines, Oivind)	ACTA VETERINARIA SCANDINAVICA **Volume:** 53 Article Number: 41 **DOI:** 10.1186/1751-0147-53-41 **Published:** JUN 23 2011
	23	Effects of Individual Pre-Fledging Traits and Environmental Conditions on Return Patterns in Juvenile King Penguins	**Saraux, C** (Saraux, Claire); Viblanc, VA (Viblanc, Vincent A.); Hanuise, N (Hanuise, Nicolas); Le Maho, Y (Le Maho, Yvon); **Le Bohec, C** (Le Bohec, Celine)	PLOS ONE **Volume:** 6 **Issue:** 6 Article Number: e20407 **DOI:** 10.1371/journal.pone.0020407 **Published:** JUN 8 2011
	24	Trees Wanted-Dead or Alive! Host Selection and Population Dynamics in Tree-Killing Bark Beetles	**Kausrud, KL** (Kausrud, Kyrre L.); Gregoire, JC (Gregoire, Jean-Claude); Skarpaas, O (Skarpaas, Olav); Erbilgin, N (Erbilgin, Nadir); Gilbert, M (Gilbert, Marius); Okland, B (Okland, Bjorn); **Stenseth, NC** (Stenseth, Nils Chr.)	PLOS ONE **Volume:** 6 **Issue:** 5 Article Number: e18274 **DOI:** 10.1371/journal.pone.0018274 **Published:** MAY 25 2011
	25	The pCO(2) in boreal lakes: Organic carbon as a universal predictor?	**Larsen, S** (Larsen, Soren); **Andersen, T** (Andersen, Tom); **Hessen, DO** (Hessen, Dag O.)	GLOBAL BIOGEOCHEMICAL CYCLES **Volume:** 25 Article Number: GB2012 **DOI:** 10.1029/2010GB003864 **Published:** MAY 24 2011
	26	Multi-source analysis reveals latitudinal and altitudinal shifts in range of Ixodes ricinus at its northern distribution limit	Jore, S (Jore, Solveig); **Viljugrein, H** (Viljugrein, Hildegunn); Hofshagen, M (Hofshagen, Merete); Brun-Hansen, H (Brun-Hansen, Hege); Kristoffersen, AB (Kristoffersen, Anja B.); Nygard, K (Nygard, Karin); Brun, E (Brun, Edgar); Ottesen, P (Ottesen, Preben); Saevik, BK (Saevik, Bente K.); Ytrehus, B (Ytrehus, Bjomar)	PARASITES & VECTORS **Volume:** 4 Article Number: 84 **DOI:** 10.1186/1756-3305-4-84 **Published:** MAY 19 2011
	27	An ethical issue in biodiversity science: The monitoring of penguins with flipper bands	Le Maho, Y (Le Maho, Yvon); **Saraux, C** (Saraux, Claire); **Durant, JM** (Durant, Joel M.); Viblanc, VA (Viblanc, Vincent A.); Gauthier-Clerc, M (Gauthier-Clerc, Michel); Yoccoz, NG (Yoccoz, Nigel G.); **Stenseth, NC** (Stenseth, Nils C.); **Le Bohec, C** (Le Bohec, Celine)	COMPTES RENDUS BIOLOGIES **Volume:** 334 **Issue:** 5-6 Special **Issue:** SI **Pages:** 378-384 **DOI:** 10.1016/j.crvi.2011.04.004 **Published:** MAY 2011
	28	Mushroom's spore size and time of fruiting are strongly related: is moisture important?	**Kauserud, H** (Kauserud, Havard); Heegaard, E (Heegaard, Einar); Halvorsen, R (Halvorsen, Rune); Boddy, L (Boddy, Lynne); **Hoiland, K** (Hoiland, Klaus); **Stenseth, NC** (Stenseth, Nils Chr.)	BIOLOGY LETTERS **Volume:** 7 **Issue:** 2 **Pages:** 273-276 **DOI:** 10.1098/rsbl.2010.0820 **Published:** APR 23 2011
	29	History matters: ecometrics and integrative climate change biology	Polly, PD (Polly, P. David); Eronen, JT (Eronen, Jussi T.); Fred, M (Fred, Marianne); Dietl, GP (Dietl, Gregory P.); Mosbrugger, V (Mosbrugger, Volker); Scheidegger, C (Scheidegger, Christoph); Frank, DC (Frank, David C.); Damuth, J (Damuth, John); **Stenseth, NC** (Stenseth, Nils C.); Fortelius, M (Fortelius, Mikael)	PROCEEDINGS OF THE ROYAL SOCIETY B-BIOLOGICAL SCIENCES **Volume:** 278 **Issue:** 1709 **Pages:** 1131-1140 **DOI:** 10.1098/rspb.2010.2233 **Published:** APR 22 2011

	30	Six decades of pike and perch population dynamics in Windermere	**Langangen, O** (Langangen, Oystein); **Edeline, E** (Edeline, Eric); **Ohlberger, J** (Ohlberger, Jan); Winfield, IJ (Winfield, Ian J.); Fletcher, JM (Fletcher, Janice M.); Ben James, J (Ben James, J.); **Stenseth, NC** (Stenseth, Nils Chr.); **Vollestad, LA** (Vollestad, L. Asbjorn)	FISHERIES RESEARCH **Volume:** 109 **Issue:** 1 **Pages:** 131-139 **DOI:** 10.1016/j.fishres.2011.01.029 **Published:** APR 2011
	31	Growth limitation of mountain birch caused by sheep browsing at the altitudinal treeline	Speed, JDM (Speed, James D. M.); Austrheim, G (Austrheim, Gunnar); Hester, AJ (Hester, Alison J.); **Mysterud, A** (Mysterud, Atle)	FOREST ECOLOGY AND MANAGEMENT **Volume:** 261 **Issue:** 7 **Pages:** 1344-1352 **DOI:** 10.1016/j.foreco.2011.01.017 **Published:** APR 1 2011
	32	Phenology and life history of the blowfly Calliphora vicina in stockfish production areas	Aak, A (Aak, Anders); Birkemoe, T (Birkemoe, Tone); **Leinaas, HP** (Leinaas, Hans P.)	ENTOMOLOGIA EXPERIMENTALIS ET APPLICATA **Volume:** 139 **Issue:** 1 **Pages:** 35-46 **DOI:** 10.1111/j.1570-7458.2011.01105.x **Published:** APR 2011
	33	Competitive exclusion along climate gradients: energy efficiency influences the distribution of two salmonid fishes	Finstad, AG (Finstad, Anders G.); Forseth, T (Forseth, Torbjorn); Jonsson, B (Jonsson, Bror); Bellier, E (Bellier, Edwige); Hesthagen, T (Hesthagen, Trygve); Jensen, AJ (Jensen, Arne J.); **Hessen, DO** (Hessen, Dag O.); Foldvik, A (Foldvik, Anders)	GLOBAL CHANGE BIOLOGY **Volume:** 17 **Issue:** 4 **Pages:** 1703-1711 **DOI:** 10.1111/j.1365-2486.2010.02335.x **Published:** APR 2011
	34	Joint effect of phosphorus limitation and temperature on alkaline phosphatase activity and somatic growth in Daphnia magna	**Wojewodzic, MW** (Wojewodzic, Marcin W.); Kyle, M (Kyle, Marcia); Elser, JJ (Elser, James J.); **Hessen, DO** (Hessen, Dag O.); **Andersen, T** (Andersen, Tom)	OECOLOGIA **Volume:** 165 **Issue:** 4 **Pages:** 837-846 **DOI:** 10.1007/s00442-010-1863-2 **Published:** APR 2011
	35	Strong gene flow and lack of stable population structure in the face of rapid adaptation to local temperature in a spring-spawning salmonid, the European grayling (Thymallus thymallus)	**Junge, C** (Junge, C.); **Vollestad, LA** (Vollestad, L. A.); Barson, NJ (Barson, N. J.); **Haugen, TO** (Haugen, T. O.); **Otero, J** (Otero, J.); **Saetre, GP** (Saetre, G-P); Leder, EH (Leder, E. H.); Primmer, CR (Primmer, C. R.)	HEREDITY **Volume:** 106 **Issue:** 3 Special **Issue:** SI **Pages:** 460-471 **DOI:** 10.1038/hdy.2010.160 **Published:** MAR 2011
	36	Overfishing of top predators eroded the resilience of the Black Sea system regardless of the climate and anthropogenic conditions	**Llope, M** (Llope, Marcos); Daskalov, GM (Daskalov, Georgi M.); Rouyer, TA (Rouyer, Tristan A.); Mihneva, V (Mihneva, Vesselina); Chan, KS (Chan, Kung-Sik); Grishin, AN (Grishin, Alexander N.); **Stenseth, NC** (Stenseth, Nils Chr)	GLOBAL CHANGE BIOLOGY **Volume:** 17 **Issue:** 3 **Pages:** 1251-1265 **DOI:** 10.1111/j.1365-2486.2010.02331.x **Published:** MAR 2011
	37	Spawning stock and recruitment in North Sea cod shaped by food and climate	Olsen, EM (Olsen, Esben Moland); **Ottersen, G** (Ottersen, Geir); **Llope, M** (Llope, Marcos); Chan, KS (Chan, Kung-Sik); Beaugrand, G (Beaugrand, Gregory); **Stenseth, NC** (Stenseth, Nils Chr)	PROCEEDINGS OF THE ROYAL SOCIETY B-BIOLOGICAL SCIENCES **Volume:** 278 **Issue:** 1705 **Pages:** 504-510 **DOI:** 10.1098/rspb.2010.1465 **Published:** FEB 22 2011
	38	Influence of oceanic factors on Anguilla anguilla (L.) over the twentieth century in coastal habitats of the Skagerrak, southern Norway	Durif, CMF (Durif, Caroline M. F.); Gjosaeter, J (Gjosaeter, Jakob); **Vollestad, LA** (Vollestad, L. Asbjorn)	PROCEEDINGS OF THE ROYAL SOCIETY B-BIOLOGICAL SCIENCES **Volume:** 278 **Issue:** 1704 **Pages:** 464-473 **DOI:** 10.1098/rspb.2010.1547 **Published:** FEB 7 2011
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	40	Late-Quaternary biogeographic scenarios for the brown bear (Ursus arctos), a wild mammal model species	Davison, J (Davison, John); Ho, SYW (Ho, Simon Y. W.); Bray, SC (Bray, Sarah C.); Korsten, M (Korsten, Marju); Tammeleht, E (Tammeleht, Egle); Hindrikson, M (Hindrikson, Maris); **Ostbye, K** (Ostbye, Kjartan); **Ostbye, E** (Ostbye, Eivind); Lauritzen, SE (Lauritzen, Stein-Erik); Austin, J (Austin, Jeremy); Cooper, A (Cooper, Alan); Saarma, U (Saarma, Urmas)	QUATERNARY SCIENCE REVIEWS **Volume:** 30 **Issue:** 3-4 **Pages:** 418-430 **DOI:** 10.1016/j.quascirev.2010.11.023 **Published:** FEB 2011
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	46	Increased risk of phosphorus limitation at higher temperatures for Daphnia magna	**Persson, J** (Persson, Jonas); **Wojewodzic, MW** (Wojewodzic, Marcin Wodzimierz); **Hessen, DO** (Hessen, Dag Olav); **Andersen, T** (Andersen, Tom)	OECOLOGIA **Volume:** 165 **Issue:** 1 **Pages:** 123-129 **DOI:** 10.1007/s00442-010-1756-4 **Published:** JAN 2011
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2010				
	54	Periodic climate cooling enhanced natural disasters and wars in China during AD 10-1900	Zhang, ZB (Zhang, Zhibin); **Tian, HD** (Tian, Huidong); Cazelles, B (Cazelles, Bernard); **Kausrud, KL** (Kausrud, Kyrre L.); Brauning, A (Braeuning, Achim); Guo, F (Guo, Fang); **Stenseth, NC** (Stenseth, Nils Chr)	PROCEEDINGS OF THE ROYAL SOCIETY B-BIOLOGICAL SCIENCES **Volume:** 277 **Issue:** 1701 **Pages:** 3745-3753 **DOI:** 10.1098/rspb.2010.0890 **Published:** DEC 22 2010
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	129	Photoperiod may constrain the effect of global warming in arctic marine systems	**Kaartvedt, S** (Kaartvedt, Stein)	JOURNAL OF PLANKTON RESEARCH **Volume:** 30 **Issue:** 11 **Pages:** 1203-1206 **DOI:** 10.1093/plankt/fbn075 **Published:** NOV 2008
	130	Non-additive effects of density-dependent and density-independent factors on brown trout vital rates	**Vollestad, LA** (Vollestad, Leif Asbjorn); Olsen, EM (Olsen, Esben Moland)	OIKOS **Volume:** 117 **Issue:** 11 **Pages:** 1752-1760 **DOI:** 10.1111/j.1600-0706.2008.16872.x **Published:** NOV 2008
	131	Effects of climate change on marine ecosystems PREFACE	**Stenseth, NC** (Stenseth, Nils Chr.)	CLIMATE RESEARCH **Volume:** 37 **Issue:** 2-3 **Pages:** 121-122 **DOI:** 10.3354/cr00770 **Published:** OCT 21 2008
	132	Re-oligotrophication by phosphorus reduction and effects on seston quality in lakes	**Van Donk, E** (Van Donk, Ellen); **Hessen, DO** (Hessen, Dag O.); Verschoor, AM (Verschoor, Antome M.); Gulati, RD (Gulati, Ramesh D.)	LIMNOLOGICA **Volume:** 38 **Issue:** 3-4 **Pages:** 189-202 **DOI:** 10.1016/j.limno.2008.05.005 **Published:** OCT 2008
	133	Light and spectral properties as determinants of C:N:P-ratios in phytoplankton	**Hessen, DO** (Hessen, Dag O.); **Leu, E** (Leu, Eva); **Faerovig, PJ** (Faerovig, Per J.); Petersen, SF (Petersen, Stig Falk)	DEEP-SEA RESEARCH PART II-TOPICAL STUDIES IN OCEANOGRAPHY **Volume:** 55 **Issue:** 20-21 **Pages:** 2169-2175 **DOI:** 10.1016/j.dsr2.2008.05.013 **Published:** OCT 2008
	134	Chihuahuan Desert kangaroo rats: Nonlinear effects of population dynamics, competition, and rainfall	Lima, M (Lima, Mauricio); Ernest, SKM (Ernest, S. K. Morgan); Brown, JH (Brown, James H.); Belgrano, A (Belgrano, Andrea); **Stenseth, NC** (Stenseth, Nils Chr.)	ECOLOGY **Volume:** 89 **Issue:** 9 **Pages:** 2594-2603 **DOI:** 10.1890/07-1246.1 **Published:** SEP 2008
	135	Regional trends for bud burst and flowering of woody plants in Norway as related to climate change	Nordli, O (Nordli, O.); **Wielgolaski, FE** (Wielgolaski, F. E.); Bakken, AK (Bakken, A. K.); Hjeltnes, SH (Hjeltnes, S. H.); Mage, F (Mage, F.); Sivle, A (Sivle, A.); Skre, O (Skre, O.)	INTERNATIONAL JOURNAL OF BIOMETEOROLOGY **Volume:** 52 **Issue:** 7 **Pages:** 625-639 **DOI:** 10.1007/s00484-008-0156-5 **Published:** SEP 2008
	136	MODIS-NDVI-based mapping of the length of the growing season in northern Fennoscandia	Karlsen, SR (Karlsen, Stein Rune); Tolvanen, A (Tolvanen, Anne); Kubin, E (Kubin, Eero); Poikolainen, J (Poikolainen, Jarmo); Hogda, KA (Hogda, Kjell Arild); Johansen, B (Johansen, Bernt); Danks, FS (Danks, Fiona S.); Aspholm, P (Aspholm, Paul); **Wielgolaski, FE** (Wielgolaski, Frans Emil); Makarova, O (Makarova, Olga)	INTERNATIONAL JOURNAL OF APPLIED EARTH OBSERVATION AND GEOINFORMATION **Volume:** 10 **Issue:** 3 **Pages:** 253-266 **DOI:** 10.1016/j.jag.2007.10.005 **Published:** SEP 2008
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	148	Northeast arctic cod population persistence in the Lofoten-Barents Sea system under fishing	**Durant, JM** (Durant, Joel M.); **Hjermann, DO** (Hjermann, Dag O.); **Sabarros, PS** (Sabarros, Philippe S.); **Stenseth, NC** (Stenseth, Nils Chr.)	ECOLOGICAL APPLICATIONS **Volume:** 18 **Issue:** 3 **Pages:** 662-669 **DOI:** 10.1890/07-0960.1 **Published:** APR 2008
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	155	Bird migration and climate: the general picture and beyond	Jonzen, N (Jonzen, Niclas); **Ergon, T** (Ergon, Torbjorn); Linden, A (Linden, Andreas); **Stenseth, NC** (Stenseth, Nils Chr.)	CLIMATE RESEARCH **Volume:** 35 **Issue:** 1-2 **Pages:** 177-180 **DOI:** 10.3354/cr00724 **Published:** DEC 31 2007
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	158	The rise and fall of species: implications for macroevolutionary and macroecological studies	**Liow, LH** (Liow, Lee Hsiang); **Stenseth, NC** (Stenseth, Nils Chr.)	PROCEEDINGS OF THE ROYAL SOCIETY B-BIOLOGICAL SCIENCES **Volume:** 274 **Issue:** 1626 **Pages:** 2745-2752 **DOI:** 10.1098/rspb.2007.1006 **Published:** NOV 7 2007
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	160	Phenotypic plasticity mediates climate change responses among invasive and indigenous arthropods	Chown, SL (Chown, Steven L.); Slabber, S (Slabber, Sarette); McGeoch, MA (McGeoch, Melodie A.); Janion, C (Janion, Charlene); **Leinaas, HP** (Leinaas, Hans Petter)	PROCEEDINGS OF THE ROYAL SOCIETY B-BIOLOGICAL SCIENCES **Volume:** 274 **Issue:** 1625 **Pages:** 2531-2537 **DOI:** 10.1098/rspb.2007.0772 **Published:** OCT 22 2007
	161	Thousand-year-long Chinese time series reveals climatic forcing of decadal locust dynamics	**Stige, LC** (Stige, Leif Christian); Chan, KS (Chan, Kung-Sik); Zhang, ZB (Zhang, Zhibin); Frank, D (Frank, David); **Stenseth, NC** (Stenseth, Nils C.)	PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA **Volume:** 104 **Issue:** 41 **Pages:** 16188-16193 **DOI:** 10.1073/pnas.0706813104 **Published:** OCT 9 2007
	162	The North Atlantic Oscillation and ecology: links between historical time-series, and lessons regarding future climate warming	Straile, D (Straile, Dietmar); **Stenseth, NC** (Stenseth, Nils Chr.)	CLIMATE RESEARCH **Volume:** 34 **Issue:** 3 **Pages:** 259-262 **DOI:** 10.3354/cr00702 **Published:** SEP 18 2007
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	164	Empirical assessment of a threshold model for sylvatic plague	Davis, S (Davis, S.); Leirs, H (Leirs, H.); **Viljugrein, H** (Viljugrein, H.); **Stenseth, NC** (Stenseth, N. Chr.); De Bruyn, L (De Bruyn, L.); Klassovskiy, N (Klassovskiy, N.); Ageyev, V (Ageyev, V.); Begon, M (Begon, M.)	JOURNAL OF THE ROYAL SOCIETY INTERFACE **Volume:** 4 **Issue:** 15 **Pages:** 649-657 **DOI:** 10.1098/rsif.2006.0208 **Published:** AUG 22 2007
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	166	Molecular evidence for hybrid origins of the invasive polyploids Carthamus creticus and C-turkestanicus (Cardueae, Asteraceae)	Vilatersana, R (Vilatersana, Roser); **Brysting, AK** (Brysting, Anne K.); Brochmann, C (Brochmann, Christian)	MOLECULAR PHYLOGENETICS AND EVOLUTION **Volume:** 44 **Issue:** 2 **Pages:** 610-621 **DOI:** 10.1016/j.ympev.2007.05.008 **Published:** AUG 2007
	167	Canadian hare-lynx dynamics and climate variation: need for further interdisciplinary work on the interface between ecology and climate	**Stenseth, NC** (Stenseth, Nils Chr.)	CLIMATE RESEARCH **Volume:** 34 **Issue:** 2 **Pages:** 91-92 **DOI:** 10.3354/cr034091 **Published:** JUL 19 2007
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	169	Activity pattern of arctic reindeer in a predator-free environment: no need to keep a daily rhythm	**Loe, LE** (Loe, Leif Egil); **Bonenfant, C** (Bonenfant, Christophe); **Mysterud, A** (Mysterud, Atle); Severinsen, T (Severinsen, Torbjorn); **Oritsland, NA** (Oritsland, Nils Are); Langvatn, R (Langvatn, Rolf); Stien, A (Stien, Audun); Irvine, RJ (Irvine, R. Justin); **Stenseth, NC** (Stenseth, Nils Chr.)	OECOLOGIA **Volume:** 152 **Issue:** 4 **Pages:** 617-624 **DOI:** 10.1007/s00442-007-0681-7 **Published:** JUL 2007
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	172	Responses of springtail and mite populations to prolonged periods of soil freeze-thaw cycles in a sub-arctic ecosystem	**Konestabo, HS** (Konestabo, Heidi Sjursen); Michelsen, A (Michelsen, Anders); Holmstrup, M (Holmstrup, Martin)	APPLIED SOIL ECOLOGY **Volume:** 36 **Issue:** 2-3 **Pages:** 136-146 **DOI:** 10.1016/j.apsoil.2007.01.003 **Published:** JUN 2007
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	174	Phenological and geographical patterns of walleye pollock (Theragra chalcogramma) spawning in the western Gulf of Alaska	**Ciannelli, L** (Ciannelli, Lorenzo); Bailey, KM (Bailey, Kevin M.); Chan, KS (Chan, Kung-Sik); **Stenseth, NC** (Stenseth, Nils Chr.)	CANADIAN JOURNAL OF FISHERIES AND AQUATIC SCIENCES **Volume:** 64 **Issue:** 4 **Pages:** 713-722 **DOI:** 10.1139/F07-049 **Published:** APR 2007
	175	Food web dynamics affect Northeast Arctic cod recruitment	**Hjermann, DO** (Hjermann, Dag O.); Bogstad, B (Bogstad, Bjarte); **Eikeset, AM** (Eikeset, Anne Maria); **Ottersen, G** (Ottersen, Geir); Gjosaeter, H (Gjosaeter, Harald); **Stenseth, NC** (Stenseth, Nils Chr.)	PROCEEDINGS OF THE ROYAL SOCIETY B-BIOLOGICAL SCIENCES **Volume:** 274 **Issue:** 1610 **Pages:** 661-669 **DOI:** 10.1098/rspb.2006.0069 **Published:** MAR 7 2007

	176	A generalized threshold mixed model for analyzing nonnormal nonlinear time series, with application to plague in Kazakhstan	Samia, NI (Samia, Noelle I.); Chan, KS (Chan, Kung-Sik); **Stenseth, NC** (Stenseth, Nils Chr.)	BIOMETRIKA **Volume:** 94 **Issue:** 1 **Pages:** 101-118 **DOI:** 10.1093/biomet/asm006 **Published:** MAR 2007
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	181	Acclimation effects on thermal tolerances of springtails from sub-Antarctic Marion Island: Indigenous and invasive species	Slabber, S (Slabber, Sarette); Worland, MR (Worland, M. Roger); **Leinaas, HP** (Leinaas, Hans Petter); Chown, SL (Chown, Steven L.)	JOURNAL OF INSECT PHYSIOLOGY **Volume:** 53 **Issue:** 2 **Pages:** 113-125 **DOI:** 10.1016/j.jinsphys.2006.10.010 **Published:** FEB 2007
	182	Population ecology and conservation of endangered megafauna: the case of European bison in Bialowieza Primeval Forest, Poland	**Mysterud, A** (Mysterud, A.); Barton, KA (Barton, K. A.); Jedrzejewska, B (Jedrzejewska, B.); Krasinski, ZA (Krasinski, Z. A.); Niedzialkowska, M (Niedzialkowska, M.); Kamler, JF (Kamler, J. F.); Yoccoz, NG (Yoccoz, N. G.); **Stenseth, NC** (Stenseth, N. C.)	ANIMAL CONSERVATION **Volume:** 10 **Issue:** 1 **Pages:** 77-87 **DOI:** 10.1111/j.1469-1795.2006.00075.x **Published:** FEB 2007
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	183	Ocean climate prior to breeding affects the duration of the nestling period in the Atlantic puffin	**Durant, JM** (Durant, Joel M.); Anker-Nilssen, T (Anker-Nilssen, Tycho); **Stenseth, NC** (Stenseth, Nils Chr)	BIOLOGY LETTERS **Volume:** 2 **Issue:** 4 **Pages:** 628-631 **DOI:** 10.1098/rsbl.2006.0520 **Published:** DEC 22 2006
	184	The ideal free pike: 50 years of fitness-maximizing dispersal in Windermere	**Haugen, TO** (Haugen, Thrond O.); Winfield, IJ (Winfield, Ian J.); **Vollestad, LA** (Vollestad, L. Asbjorn); Fletcher, JM (Fletcher, Janice M.); James, JB (James, J. Ben); **Stenseth, NC** (Stenseth, Nils Chr.)	PROCEEDINGS OF THE ROYAL SOCIETY B-BIOLOGICAL SCIENCES **Volume:** 273 **Issue:** 1604 **Pages:** 2917-2924 **DOI:** 10.1098/rspb.2006.3659 **Published:** DEC 7 2006
	185	Genetic structuring in fluctuating populations	Kaitala, V (Kaitala, Veijo); Ranta, E (Ranta, Esa); **Stenseth, NC** (Stenseth, Nils Chr.)	ECOLOGICAL INFORMATICS **Volume:** 1 **Issue:** 4 **Pages:** 343-348 **DOI:** 10.1016/j.ecoinf.2006.06.001 **Published:** DEC 2006
	186	Fatty acid dynamics during the spring bloom in a High Arctic fjord: importance of abiotic factors versus community changes	**Leu, E** (Leu, Eva); Falk-Petersen, S (Falk-Petersen, Stig); Kwasniewski, S (Kwasniewski, Slawomir); Wulff, A (Wulff, Angela); Edvardsen, K (Edvardsen, Kare); **Hessen, DO** (Hessen, Dag O.)	CANADIAN JOURNAL OF FISHERIES AND AQUATIC SCIENCES **Volume:** 63 **Issue:** 12 **Pages:** 2760-2779 **DOI:** 10.1139/F06-159 **Published:** DEC 2006
	187	UV effects on stoichiometry and PUFAs of Selenastrum capricomutum and their consequences for the grazer Daphnia magna	**Leu, E** (Leu, Eva); **Faerovig, PJ** (Faerovig, Per J.); **Hessen, DO** (Hessen, Dag O.)	FRESHWATER BIOLOGY **Volume:** 51 **Issue:** 12 **Pages:** 2296-2308 **DOI:** 10.1111/j.1365-2427.2006.01651.x **Published:** DEC 2006
	188	Growing seasons of Nordic mountain birch in northernmost Europe as indicated by long-term field studies and analyses of satellite images	Shutova, E (Shutova, E.); **Wielgolaski, FE** (Wielgolaski, F. E.); Karlsen, SR (Karlsen, S. R.); Makarova, O (Makarova, O.); Berlina, N (Berlina, N.); Filimonova, T (Filimonova, T.); Haraldsson, E (Haraldsson, E.); Aspholm, PE (Aspholm, P. E.); Flo, L (Flo, L.); Hogda, KA (Hogda, K. A.)	INTERNATIONAL JOURNAL OF BIOMETEOROLOGY **Volume:** 51 **Issue:** 2 **Pages:** 155-166 **DOI:** 10.1007/s00484-006-0042-y **Published:** NOV 2006
	189	Effects of regime shifts on the population dynamics of the grey-sided vole in Hokkaido, Japan	Saitoh, T (Saitoh, Takashi); Cazelles, B (Cazelles, Bernard); **Vik, JO** (Vik, Jon Olav); **Viljugrein, H** (Viljugrein, Hildegunn); **Stenseth, NC** (Stenseth, Nils Chr)	CLIMATE RESEARCH **Volume:** 32 **Issue:** 2 **Pages:** 109-118 **DOI:** 10.3354/cr032109 **Published:** OCT 13 2006
	190	Constraints to projecting the effects of climate change on mammals	Berteaux, D (Berteaux, D.); Humphries, MM (Humphries, M. M.); Krebs, CJ (Krebs, C. J.); Lima, M (Lima, M.); McAdam, AG (McAdam, A. G.); Pettorelli, N (Pettorelli, N.); Reale, D (Reale, D.); Saitoh, T (Saitoh, T.); Tkadlec, E (Tkadlec, E.); Weladji, RB (Weladji, R. B.); **Stenseth, NC** (Stenseth, N. Chr.)	CLIMATE RESEARCH **Volume:** 32 **Issue:** 2 **Pages:** 151-158 **DOI:** 10.3354/cr032151 **Published:** OCT 13 2006
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	192	Species diversity of the Okavango Delta, Botswana	Ramberg, L (Ramberg, Lars); Hancock, P (Hancock, Peter); **Lindholm, M** (Lindholm, Markus); Meyer, T (Meyer, Thoralf); Ringrose, S (Ringrose, Susan); Sliva, J (Sliva, Jan); Van As, J (Van As, Jo); VanderPost, C (VanderPost, Cornelis)	AQUATIC SCIENCES **Volume:** 68 **Issue:** 3 **Pages:** 310-337 **DOI:** 10.1007/s00027-006-0857-y **Published:** OCT 2006
	193	Disentangling local from macroenvironmental effects: quantifying the effect of human encroachments based on historical river catches of anadromous salmonids	L'Abee-Lund, JH (L'Abee-Lund, Jan Henning); **Haugen, TO** (Haugen, Thrond O.); **Vollestad, LA** (Vollestad, Leif Asbjorn)	CANADIAN JOURNAL OF FISHERIES AND AQUATIC SCIENCES **Volume:** 63 **Issue:** 10 **Pages:** 2318-2329 **DOI:** 10.1139/F06-123 **Published:** OCT 2006

	194	Climate variability, fish, and fisheries	Lehodey, P (Lehodey, P.); Alheit, J (Alheit, J.); Barange, M (Barange, M.); Baumgartner, T (Baumgartner, T.); Beaugrand, G (Beaugrand, G.); Drinkwater, K (Drinkwater, K.); Fromentin, JM (Fromentin, J. -M.); Hare, SR (Hare, S. R.); **Ottersen, G** (Ottersen, G.); Perry, RI (Perry, R. I.); Roy, C (Roy, C.); Van der Lingen, CD (Van Der Lingen, C. D.); Werner, F (Werner, F.)	JOURNAL OF CLIMATE **Volume:** 19 **Issue:** 20 **Pages:** 5009-5030 **DOI:** 10.1175/JCLI3898.1 **Published:** OCT 15 2006
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	196	Hydrography of the southern Bay of Biscay shelf-break region: Integrating the multiscale physical variability over the period 1993-2003	**Llope, M** (Llope, Marcos); Anadon, R (Anadon, Ricardo); Viesca, L (Viesca, Leticia); Quevedo, M (Quevedo, Mario); Gonzalez-Quiros, R (Gonzalez-Quiros, Rafael); **Stenseth, NC** (Stenseth, Nils C.)	JOURNAL OF GEOPHYSICAL RESEARCH-OCEANS **Volume:** 111 **Issue:** C9 Article Number: C09021 **DOI:** 10.1029/2005JC002963 **Published:** SEP 15 2006
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	199	Climate and hunting success in male barn owls	**Durant, JM** (Durant, J. M.)	JOURNAL OF ORNITHOLOGY **Volume:** 147 **Issue:** 5 **Pages:** 159-160 Supplement: 1 **Published:** AUG 2006
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	201	Changes in spawning stock structure strengthen the link between climate and recruitment in a heavily fished cod (Gadus morhua) stock	**Ottersen, G** (Ottersen, G); **Hjermann, DO** (Hjermann, DO); **Stenseth, NC** (Stenseth, NC)	FISHERIES OCEANOGRAPHY **Volume:** 15 **Issue:** 3 **Pages:** 230-243 **DOI:** 10.1111/j.1365-2419.2006.00404.x **Published:** MAY 2006
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	203	Testing five hypotheses of sexual segregation in an arctic ungulate	**Loe, LE** (Loe, LE); Irvine, RJ (Irvine, RJ); **Bonenfant, C** (Bonenfant, C); Stien, A (Stien, A); Langvatn, R (Langvatn, R); Albon, SD (Albon, SD); **Mysterud, A** (Mysterud, A); **Stenseth, NC** (Stenseth, NC)	JOURNAL OF ANIMAL ECOLOGY **Volume:** 75 **Issue:** 2 **Pages:** 485-496 **DOI:** 10.1111/j.1365-2656.2006.01069.x **Published:** MAR 2006
	204	Behaviour and growth of juvenile brown trout exposed to fluctuating flow	Flodmark, LEW (Flodmark, LEW); Forseth, T (Forseth, T); L'Abee-Lund, JH (L'Abee-Lund, JH); **Vollestad, LA** (Vollestad, LA)	ECOLOGY OF FRESHWATER FISH **Volume:** 15 **Issue:** 1 **Pages:** 57-65 **DOI:** 10.1111/j.1600-0633.2006.00127.x **Published:** MAR 2006
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	207	Increased effect of harsh climate in red deer with a poor set of teeth	**Loe, LE** (Loe, LE); **Bonenfant, C** (Bonenfant, C); Langvatn, R (Langvatn, R); **Mysterud, A** (Mysterud, A); **Veiberg, V** (Veiberg, V); **Stenseth, NC** (Stenseth, NC)	OECOLOGIA **Volume:** 147 **Issue:** 1 **Pages:** 24-30 **DOI:** 10.1007/s00442-005-0172-7 **Published:** FEB 2006
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	209	Small rodent winter survival: snow conditions limit access to food resources	Korslund, L (Korslund, L); **Steen, H** (Steen, H)	JOURNAL OF ANIMAL ECOLOGY **Volume:** 75 **Issue:** 1 **Pages:** 156-166 **DOI:** 10.1111/j.1365-2656.2005.01031.x **Published:** JAN 2006

	210	Cod and climate: effect of the North Atlantic Oscillation on recruitment in the North Atlantic	**Stige, LC** (Stige, Leif Chr.); **Ottersen, G** (Ottersen, Geir); Brander, K (Brander, Keith); Chan, KS (Chan, Kung-Sik); **Stenseth, NC** (Stenseth, Nils Chr.)	MARINE ECOLOGY-PROGRESS SERIES **Volume:** 325 **Pages:** 227-241 **DOI:** 10.3354/meps325227 **Published:** 2006
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	214	Importance of climatological downscaling and plant phenology for red deer in heterogeneous landscapes	Pettorelli, N (Pettorelli, N); **Mysterud, A** (Mysterud, A); Yoccoz, NG (Yoccoz, NG); Langvatn, R (Langvatn, R); **Stenseth, NC** (Stenseth, NC)	PROCEEDINGS OF THE ROYAL SOCIETY B-BIOLOGICAL SCIENCES **Volume:** 272 **Issue:** 1579 **Pages:** 2357-2364 **DOI:** 10.1098/rspb.2005.3218 **Published:** NOV 22 2005
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	216	Weather packages: finding the right scale and composition of climate in ecology	**Stenseth, NC** (Stenseth, NC); **Mysterud, A** (Mysterud, A)	JOURNAL OF ANIMAL ECOLOGY **Volume:** 74 **Issue:** 6 **Pages:** 1195-1198 **DOI:** 10.1111/j.1365-2656.2005.01005.x **Published:** NOV 2005
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	221	Continuous and discrete extreme climatic events affecting the dynamics of a high-arctic reindeer population	Chan, KS (Chan, KS); **Mysterud, A** (Mysterud, A); Oritsland, NA (Oritsland, NA); Severinsen, T (Severinsen, T); **Stenseth, NC** (Stenseth, NC)	OECOLOGIA **Volume:** 145 **Issue:** 4 **Pages:** 556-563 **DOI:** 10.1007/s00442-005-0157-6 **Published:** OCT 2005
	222	Using the satellite-derived NDVI to assess ecological responses to environmental change	Pettorelli, N (Pettorelli, N); **Vik, JO** (Vik, JO); **Mysterud, A** (Mysterud, A); Gaillard, JM (Gaillard, JM); Tucker, CJ (Tucker, CJ); **Stenseth, NC** (Stenseth, NC)	TRENDS IN ECOLOGY & EVOLUTION **Volume:** 20 **Issue:** 9 **Pages:** 503-510 **DOI:** 10.1016/j.tree.2005.05.011 **Published:** SEP 2005
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	225	Optimizing dispersal study design by Monte Carlo simulation	Skarpaas, O (Skarpaas, O); Shea, K (Shea, K); Bullock, JM (Bullock, JM)	JOURNAL OF APPLIED ECOLOGY **Volume:** 42 **Issue:** 4 **Pages:** 731-739 **DOI:** 10.1111/j.1365-2664.2005.01056.x **Published:** AUG 2005
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	231	The relative role of winter and spring conditions: linking climate and landscape-scale plant phenology to alpine reindeer body mass	Pettorelli, N (Pettorelli, N); Weladji, RB (Weladji, RB); Holand, O (Holand, O); **Mysterud, A** (Mysterud, A); Breie, H (Breie, H); **Stenseth, NC** (Stenseth, NC)	BIOLOGY LETTERS **Volume:** 1 **Issue:** 1 **Pages:** 24-26 **DOI:** 10.1098/rsbl.2004.0262 **Published:** MAR 2005
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	235	Effects of freeze-thaw cycles on microarthropods and nutrient availability in a sub-Arctic soil	**Sjursen, HS** (Sjursen, HS); Michelsen, A (Michelsen, A); Holmstrup, M (Holmstrup, M)	APPLIED SOIL ECOLOGY **Volume:** 28 **Issue:** 1 **Pages:** 79-93 **DOI:** 10.1016/j.apsoil.2004.06.003 **Published:** JAN 2005
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	236	Nonadditive effects of the environment on the survival of a large marine fish population	**Ciannelli, L** (Ciannelli, L); Chan, KS (Chan, KS); Bailey, KM (Bailey, KM); **Stenseth, NC** (Stenseth, NC)	ECOLOGY **Volume:** 85 **Issue:** 12 **Pages:** 3418-3427 **DOI:** 10.1890/03-0755 **Published:** DEC 2004
	237	Relationships in red deer Cervus elaphus mandibles	Langvatn, R (Langvatn, R); **Mysterud, A** (Mysterud, A); **Stenseth, NC** (Stenseth, NC)	ACTA THERIOLOGICA **Volume:** 49 **Issue:** 4 **Pages:** 527-542 **DOI:** 10.1007/BF03192596 **Published:** DEC 2004
	238	Do sub-Arctic winter moth populations in coastal birch forest exhibit spatially synchronous dynamics?	Ims, RA (Ims, RA); Yoccoz, NG (Yoccoz, NG); **Hagen, SB** (Hagen, SB)	JOURNAL OF ANIMAL ECOLOGY **Volume:** 73 **Issue:** 6 **Pages:** 1129-1136 **DOI:** 10.1111/j.0021-8790.2004.00882.x **Published:** NOV 2004
	239	Hemispheric asymmetries in biodiversity - A serious matter for ecology	Chown, SL (Chown, SL); Sinclair, BJ (Sinclair, BJ); **Leinaas, HP** (Leinaas, HP); Gaston, KJ (Gaston, KJ)	PLOS BIOLOGY **Volume:** 2 **Issue:** 11 **Pages:** 1701-1707 Article Number: e406 **DOI:** 10.1371/journal.pbio.0020406 **Published:** NOV 2004
	240	Modelling non-additive and nonlinear signals from climatic noise in ecological time series: Soay sheep as an example	**Stenseth, NC** (Stenseth, NC); Chan, KS (Chan, KS); Tavecchia, G (Tavecchia, G); Coulson, T (Coulson, T); **Mysterud, A** (Mysterud, A); Clutton-Brock, T (Clutton-Brock, T); Grenfell, B (Grenfell, B)	PROCEEDINGS OF THE ROYAL SOCIETY B-BIOLOGICAL SCIENCES **Volume:** 271 **Issue:** 1552 **Pages:** 1985-1993 **DOI:** 10.1098/rspb.2004.2794 **Published:** OCT 7 2004
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	2	Decline and recovery of Atlantic cod (Gadus morhua) stocks throughout the North Atlantic	Lilly GR; Wieland K; Rothschild B; Sundby S; Drinkwater KF; Brander K; **Ottersen G;** Budgell P; Carscadden J; Stenson G; Chouinard G; Swain DP; Daan N; Enberg K; Hammill M; Rosing-Asvid A; Svedäng H; Vázquez A	Kruse GH, Drinkwater K, Ianelli JN, Link JS, Stram DL, Wespestad V, Woodby D (eds) Resiliency of Gadid Stocks to Fishing and Climate Change, 24th Lowell Wakefield Fisheries Symposium, Vol 24. Alaska Seagrant Program, Anchorage, Alaska, USA. pp 39-66
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	3	River and Like Ice	Prowse, T.D.; Bonsal, B.R.; Duguay, C.R.; **Hessen, D.O.;** Vuglinsky, V.S.	UNEP-report Global Outlook for Ice and Snow. United Nations Environment Program 2007. ISBN 978-92. pp. 202-214
2006				
	4	Effects of UV radiation in arctic and alpine freshwater ecosystems	**Hessen, D.O.**	Ørbæk, J.B. et al. Arctic Alpine Ecosystems and People in a Changing Environment. Springer Verlag, Heildelberg. pp. 211-226
2005				
	5	Climate forcing, food web structure, and community dynamics in pelagic marine ecosystems	Ciannelli L; **Hjermann DØ;** Lehodey P; **Ottersen G;** Duffy-Anderson JT; **Stenseth NC**	Belgrano A, Scharler UM, Dunne J, Ulanowicz RE, eds. Aquatic food webs an ecosystem approach. Oxford: Oxford University Press. 2005. pp. 143-169
2004				
	6	Marine birds and climate fluctuation in North Atlantic	**Durant, JM; Stenseth, NC;** Anker-Nilssen, T; Harris MP; Thompson P; Wanless S	**Stenseth, N.C.**, **Ottersen, G.**, Hurrell, J.W. & Belgrano, A. (eds). Marine Ecosystems and Climate Variation: The North Atlantic, Oxford University Press, Oxford. Chapter: 7 Published: 2004 ISBN: 0 19 850748 8. pp: 95-105

	7	Uncertainty and predictability: the niches of migrants and nomads	Jonzén, N.; **Knudsen, E.;** Holt, R.D.; Sæther, B.E.	Milner-Gulland, E.J., Fryxell, J.M. & Sinclair, A.R.E., eds., Animal Migration: A Synthesis. Oxford University Press, Oxford. pp. 91–109
	8	The responses of fish populations to ocean climate fluctuations	**Ottersen G;** Alheit J; Drinkwater K; Friedland K; Hagen E; **Stenseth NC**	**Stenseth NC**, **Ottersen G**, Hurrell J, Belgrano A (eds) Marine ecosystems and climate variation: the North Atlantic. Oxford University Press, Oxford. pp 73-94
	9	Climatic fluctuations and marine systems: a general introduction to the ecological effects	**Ottersen, G; Stenseth, NC;** Hurrell, JW	Stenseth NC, **Ottersen G**, Hurrell J, Belgrano A (eds) Marine ecosystems and climate variation: the North Atlantic. Oxford University Press, Oxford. pp 3-14
	10	A freshwater perspective on climate variability and its effect on marine ecosystems	**Hessen, D. O.**	**Stenseth** and **Ottersen** (Eds.) Climate and the North Sea. Oxford Univ. Press. pp. 159-164
	11	Material fluxes from the Russian Rivers Ob and Yenisey: Interactions with climate and effect of the Arctic Seas	Carroll, J.L.; Savinov, V; Christensen, G.; Blakely, P.; Pettersen, L.; Sørensen, K.; Kjelstad, B.; Köhler, H.; Spitzy, A.; **Hessen, D.O.**	AWI Reports on Polar and Marine Research 479: pp. 103-122.
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	12	An Overview of the North Atlantic Oscillation	Hurrell JW; Kushnir Y; **Ottersen G;** Visbeck M.	In: Hurrell JW, Kushnir Y, **Ottersen G**, Visbeck M, editors. The North Atlantic Oscillation: Climatic Significance and Environmental Impact. Washington D.C.: American Geophysical Union. pp. 279+vii.
	13	The Response of Marine Ecosystems to Climate Variability Associated with the North Atlantic Oscillation.	Drinkwater K; Belgrano A; Borja A; Conversi A; Edwards M; Greene C; **Ottersen G;** Pershing A; Walker H.	Hurrell J, Kushnir Y, **Ottersen G**, Visbeck M, editors. The North Atlantic Oscillation: Climatic Significance and Environmental Impact: American Geophysical Union. pp. 211-234
	14	The Response of Terrestrial Ecosystems to Climate Variability Associated with the North Atlantic Oscillation.	**Mysterud A; Stenseth NC;** Yoccoz NG; **Ottersen G;** Langvatn R.	Hurrell J, Kushnir Y, **Ottersen G**, Visbeck M, editors. The North Atlantic Oscillation: Climatic Significance and Environmental Impact: American Geophysical Union. pp. 235-62
	15	UV-radiation and pelagic metazoans	**Hessen, D.O.**	Helbling, E.W. and Zagarese, H. (Eds.) UV-effects in Aquatic Organisms and Ecosystems. Comprehensive Series in Photochemical and Photobiological Sciences. pp. 399-430
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	16	UV-radiation and Arctic freshwater zooplankton	**Hessen, D.O.**	**D. O. Hessen** (ed): UV radiation and Arctic Ecosystems, Ecological Series 153, Springer-Verlag. pp. 157-184
	17	UV-radiation and the pelagic food web of Arctic freshwaters	**Hessen, D.O.;** Dahl-Hansen; G.A.; van Donk, E	**D. O. Hessen** (ed): UV radiation and Arctic Ecosystems, Ecological Series 153, Springer-Verlag. pp. 185-202
	18	Spectral properties and UV-attenuation in Arctic freshwater systems	Ørbæk, J.B.; Svenøe, T; **Hessen, D.O.**	**D. O. Hessen** (ed): UV radiation and Arctic Ecosystems, Ecological Series 153, Springer-Verlag. pp. 57-72

ATTACHMENT II - A SELECTION OF THE 10 MOST IMPORTANT ARTICLES PUBLISHED DURING THE PERIOD 2001-2010

The list is sorted by year (reverse order). Number of citations according to ISI, November 2011.

1) **Kausrud, KL**; **Mysterud, A**; Steen, H; **Vik, JO**; **Østbye, E**; Cazelles, B; Framstad, E; **Eikeset, AM**; b; Solhoy, T; **Stenseth, NC**. (2008). Linking climate change to lemming cycles. *Nature* 456 (7218): 93-97
TOTAL TIMES CITED: 45
Abstract: The population cycles of rodents at northern latitudes have puzzled people for centuries(1,2), and their impact is manifest throughout the alpine ecosystem(2,3). Climate change is known to be able to drive animal population dynamics between stable and cyclic phases(4,5), and has been suggested to cause the recent changes in cyclic dynamics of rodents and their predators(3,6-9). But although predator - rodent interactions are commonly argued to be the cause of the Fennoscandian rodent cycles(1,10-13), the role of the environment in the modulation of such dynamics is often poorly understood in natural systems(8,9,14). Hence, quantitative links between climate-driven processes and rodent dynamics have so far been lacking. Here we show that winter weather and snow conditions, together with density dependence in the net population growth rate, account for the observed population dynamics of the rodent community dominated by lemmings (Lemmus lemmus) in an alpine Norwegian core habitat between 1970 and 1997, and predict the observed absence of rodent peak years after 1994. These local rodent dynamics are coherent with alpine bird dynamics both locally and over all of southern Norway, consistent with the influence of large- scale fluctuations in winter conditions. The relationship between commonly available meteorological data and snow conditions indicates that changes in temperature and humidity, and thus conditions in the subnivean space, seem to markedly affect the dynamics of alpine rodents and their linked groups. The pattern of less regular rodent peaks, and corresponding changes in the overall dynamics of the alpine ecosystem, thus seems likely to prevail over a growing area under projected climate change.

2) **Durant, JM**; **Hjermann, DØ**; **Ottersen, G**; **Stenseth, NC**. (2007). Climate and the match or mismatch between predator requirements and resource availability. *Climate Research* 33 (3): 271-283
TOTAL TIMES CITED: 83
Abstract: Climate influences a population through a variety of processes, including reproduction, growth, migration patterns and phenology. Climate may operate either directly through metabolic and reproductive processes or indirectly through prey, predators, and competitors. One mechanism that may be particularly important, and which is the focus of this review, is the role of climate in affecting the reproductive success of a predator through its effect on the relative timing of food requirement and food availability during early life stages. This principle-the match or mismatch of predators' requirement with resource availability-originated in the marine literature, where it initially referred to how growth and survival of fish larvae (predator) depends on this production being synchronous with that of their main food items, i.e. early stage zooplankton (prey). Here we review how the match/mismatch hypothesis (MMH) is used to describe climate effects on ecological patterns and processes in both marine and terrestrial systems. In addition to studying match/mismatch sensu stricto, we expand on it to include effects of overall production level and the spatial aspect. Possible impacts of climate change on match/mismatch are examined in the context of one of the most apparent effects of global warming: an advancement of spring phenology. As a consequence of different species reacting dissimilarly, even minor changes in climate may invoke non-linear responses unbalancing established patterns of synchrony. All components of a food chain cannot be expected to shift their phenology at the same rate, and thus are unlikely to remain synchronous.

3) Jonzén, N; Linden, A; **Ergon, T**; **Knudsen, E**; **Vik, JO**; Rubolini, D; Piacentini, D; **Brinch, C**; Spina, F; Karlsson, L; Stervander, M; Andersson, A; Waldenstrom, J; Lehikoinen, A; Edvardsen, E; Solvang, R; **Stenseth, NC**. (2006). Rapid advance of spring arrival dates in long-distance migratory birds. *Science* 312 (5782): 1959-1961
TOTAL TIMES CITED: 126

Abstract: Several bird species have advanced the timing of their spring migration in response to recent climate change. European short-distance migrants, wintering in temperate areas, have been assumed to be more affected by change in the European climate than long-distance migrants wintering in the tropics. However, we show that tong-distance migrants have advanced their spring arrival in Scandinavia more than short-distance migrants. By analyzing a long-term data set from southern Italy, we show that long-distance migrants also pass through the Mediterranean region earlier. We argue that this may reflect a climate-driven evolutionary change in the timing of spring migration.

4) **Stenseth, NC**; Samia, NI; Viljugrein, H; **Kausrud, KL**; Begon, M; Davis, S; Leirs, H; Dubyanskiy, VM; Esper, J; Ageyev, VS; Klassovskiy, NL; Pole, SB; Chan, KS (2006). Plague dynamics are driven by climate variation. *Proceedings of the National Academy of Sciences of the United States of America (PNAS)*, 103, 13110-13115
TOTAL TIMES CITED: 49
Abstract: The bacterium Yersinia pestis causes bubonic plague. In Central Asia, where human plague is still reported regularly, the bacterium is common in natural populations of great gerbils. By using field data from 1949-1995 and previously undescribed statistical techniques, we show that Y. pestis prevalence in gerbils increases with warmer springs and wetter summers: A 1 degree Celcius increase in spring is predicted to lead to a > 50% increase in prevalence. Climatic conditions favoring plague apparently existed in this region at the onset of the Black Death as well as when the most recent plague pandemic arose in the same region, and they are expected to continue or become more favorable as a result of climate change. Threats of outbreaks may thus be increasing where humans live in close contact with rodents and fleas (or other wildlife) harboring endemic plague.

5) **Pettorelli, N**; **Vik, JO**; **Mysterud, A**; Gaillard, JM; Tucker, CJ; **Stenseth, NC** (2005). Using the satellite-derived NDVI to assess ecological responses to environmental change. *TRENDS in Ecology & Evolution*, 20 (9): 503-510
TOTAL TIMES CITED: 246
Abstract: Assessing how environmental changes affect the distribution and dynamics of vegetation and animal populations is becoming increasingly important for terrestrial ecologists to enable better predictions of the effects of global warming, biodiversity reduction or habitat degradation. The ability to predict ecological responses has often been hampered by our rather limited understanding of trophic interactions. Indeed, it has proven difficult to discern direct and indirect effects of environmental change on animal populations owing to limited information about vegetation at large temporal and spatial scales. The rapidly increasing use of the Normalized Difference Vegetation Index (NDVI) in ecological studies has recently changed this situation. Here, we review the use of the NDVI in recent ecological studies and outline its possible key role in future research of environmental change in an ecosystem context.

6) **Stenseth, NC**; **Mysterud A**. (2005). Weather packages: finding the right scale and composition of climate in ecology. *Journal of Animal Ecology* 74 (6): 1195-1198.
TOTAL TIMES CITED: 66
Abstract:
1. Animals are affected by local weather variables such as temperature, rainfall and snow. However, large-scale climate indices such as the North Atlantic Oscillation (NAO) often outperform local weather variables when it comes to explain climate-related variation in life history traits or animal numbers.
2. In a recent paper, Hallet et al. (2004, Nature, 430, 71-75) document convincingly why this may happen. In this perspective, we identify from the literature three mechanisms why this is so: (1) the time window; (2) the spatial window; and (3) the weather composition component of climate.
3. Such an understanding may be used to derive even better 'weather packages' than the NAO.

7) **Stenseth, NC**; **Ottersen, G**; Hurrell, JW; **Mysterud, A**; Lima, M; Chan, KS; Yoccoz, NG; Adlandsvik, B. (2003). Studying climate effects on ecology through the use of climate indices: the North Atlantic Oscillation, El Nino Southern Oscillation and beyond. *Proceedings of the Royal Society of London Series B-Biological Sciences*, 270 (1529): 2087-2096.
TOTAL TIMES CITED: 219

Abstract: Whereas the El Nino Southern Oscillation (ENSO) affects weather and climate variability worldwide, the North Atlantic Oscillation (NAO) represents the dominant climate pattern in the North Atlantic region. Both climate systems have been demonstrated to considerably influence ecological processes. Several other large-scale climate patterns also exist. Although less well known outside the field of climatology, these patterns are also likely to be of ecological interest. We provide an overview of these climate patterns within the context of the ecological effects of climate variability. The application of climate indices by definition reduces complex space and time variability into simple measures, 'packages of weather'. The disadvantages of using global climate indices are all related to the fact that another level of problems are added to the ecology-climate interface, namely the link between global climate indices and local climate. We identify issues related to: (i) spatial variation; (ii) seasonality; (iii) non-stationarity; (iv) nonlinearity; and (v) lack of correlation in the relationship between global and local climate. The main advantages of using global climate indices are: (i) biological effects may be related more strongly to global indices than to any single local climate variable; (ii) it helps to avoid problems of model selection; (iii) it opens the possibility for ecologists to make predictions; and (iv) they are typically readily available on Internet.

8) **Stenseth, NC**; **Mysterud, A**; **Ottersen, G**; Hurrell, JW; Chan, KS; Lima, M. (2002). Ecological effects of climate fluctuations. *Science* 297 (5585):1292-1296.
TOTAL TIMES CITED: 601
Abstract: Climate influences a variety of ecological processes. These effects operate through local weather parameters such as temperature, wind, rain, snow, and ocean currents, as well as interactions among these. In the temperate zone, local variations in weather are often coupled over large geographic areas through the transient behavior of atmospheric planetary-scale waves. These variations drive temporally and spatially averaged exchanges of heat, momentum, and water vapor that ultimately determine growth, recruitment, and migration patterns. Recently, there have been several studies of the impact of large-scale climatic forcing on ecological systems. We review how two of the best-known climate phenomena the North Atlantic Oscillation and the El Nino Southern Oscillation affect ecological patterns and processes in both marine and terrestrial systems.

9) **Ottersen, G**; Planque, B; Belgrano, A; Post, E; Reid, PC; **Stenseth, NC** (2001). Ecological effects of the North Atlantic Oscillation. *Oecologia* 128 (1): 1-14.
TOTAL TIMES CITED: 325
Abstract: Climatic oscillations as reflected in atmospheric modes such as the North Atlantic Oscillation (NAO) may be seen as a proxy for regulating forces in aquatic and terrestrial ecosystems, Our review highlights the variety of climate processes related to the NAO and the diversity in the type of ecological responses that different biological groups can display. Available evidence suggests that the NAO influences ecological dynamics in both marine and terrestrial systems, and its effects may be seen in variation at the individual, population and community levels. The ecological responses to the NAO encompass changes in timing of reproduction, population dynamics, abundance, spatial distribution and interspecific relationships such as competition and predator-prey relationships. This indicates that local responses to large-scale changes may be more subtle than previously suggested. We propose that the NAO effects may be classified as three types: direct, indirect and integrated. Such a classification will help the design and interpretation of analyses attempting to relate ecological changes to the NAO and, possibly, to climate in general.

10) **Mysterud, A**; **Stenseth, NC**; **Yoccoz, NG**; Langvatn, R; Steinheim, G (2001). Nonlinear effects of large-scale climatic variability on wild and domestic herbivores. *Nature* 410 (6832): 1096-1099.
TOTAL TIMES CITED: 122
Abstract: Large-scale climatic fluctuations, such as the North Atlantic Oscillation (NAO)(1,2), have been shown to affect many ecological processes(3-6). Such effects have been typically assumed to be linear. Only one study has reported a nonlinear relation(7); however, that nonlinear relation was monotonic (that is, no reversal). Here we show that there is a strong nonlinear and non-monotonic (that is, reversed) effect of the NAO on body weight during the subsequent autumn for 23,838 individual wild red deer (Cervus elaphus) and 139,485 individual domestic sheep (Ovis aries) sampled over several decades on the west coast of Norway. These relationships are, at least in part, explained

by comparable nonlinear and nonmonotonic relations between the NAO and local climatic variables (temperature, precipitation and snow depth). The similar patterns observed for red deer and sheep, the latter of which live indoors during winter and so experience a stable energy supply in winter, suggest that the (winter) climatic variability (for which the index is a proxy) must influence the summer foraging conditions directly or indirectly.

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Univ Sydney, Sch Biol Sci, Sydney, NSW 2006, Australia	Australia	1
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Ctr Rech Tour Valat, F-13200 Arles, France	France	3
IRD GEODES, F-93142 Bondy, France	France	3
Univ Strasbourg, Inst Pluridisciplinaire Hubert Curien, Dept Ecol Physiol & Ethol, F-67087 Strasbourg 02, France	France	3
Ctr Rech Halieut Mediterraneen & Trop, IFREMER, UMR EME 212, F-34203 Sete, France	France	4
Ecole Normale Super, F-75230 Paris 05, France	France	4
Ecole Normale Super, CNRS, UMR 7625, F-75230 Paris, France	France	5
Alfred Wegener Inst Polar & Marine Res, D-27570 Bremerhaven, Germany	Germany	1
Helmholtz Ctr Environm Res, Dept Lake Res, D-39114 Magdeburg, Germany	Germany	1
Leibniz Inst Meereswissensch, IFM GEOMAR, Marine Ecol Expt Ecol FB3, D-24105 Kiel, Germany	Germany	1
Natl Museum, D-60325 Frankfurt, Germany	Germany	1
Senckenberg Forschungsinst, D-60325 Frankfurt, Germany	Germany	1
Senckenberg Nat Hist Museum & Res Inst, Frankfurt, Germany	Germany	1
Tech Univ Dresden, Inst Hydrobiol, D-01062 Dresden, Germany	Germany	1
Tech Univ Dresden, Neunzehnhain Ecol Stn, D-09514 Lengefeld, Germany	Germany	1
Tech Univ Dresden, Okol Stn Neunzehnhain, D-09514 Lengefeld, Germany	Germany	1
Tech Univ Munich, Chair Ecoclimatol, Ctr Life & Food Sci Weihenstephan, D-85354 Freising Weihenstephan, Germany	Germany	1
UFZ Helmholtz Ctr Environm Res, Dept Ecol Modelling, D-04318 Leipzig, Germany	Germany	1
Univ Hamburg, Inst Hydrobiol & Fisheries Sci, D-22767 Hamburg, Germany	Germany	1
Univ Heidelberg, Heidelberg Inst Plant Sci Biodivers & Plant Syste, D-69120 Heidelberg, Germany	Germany	1

Univ Konstanz, Limnol Inst, Constance, Germany	Germany	1
Univ Potsdam, Dept Biol & Biochem, D-14469 Potsdam, Germany	Germany	1
Univ Potsdam, Dept Ecol & Ecosyst Modelling, Inst Biochem & Biol, D-14469 Potsdam, Germany	Germany	1
Leibniz Inst Freshwater Ecol & Inland Fisheries, Berlin, Germany	Germany	2
Univ Bayreuth, Dept Anim Ecol 2, D-95440 Bayreuth, Germany	Germany	2
Johannes Gutenberg Univ Mainz, Dept Geog, D-55099 Mainz, Germany	Germany	3
Univ Erlangen Nurnberg, Inst Biol, D-91058 Erlangen, Germany	Germany	3
Greenland Inst Nat Resources, GCRC, Nuuk 3900, Greenland	Greenland	1
Bar Ilan Univ & Kinneret, Mina & Everard Goodman Fac Life Sci, IL-14950 Migdal, Israel	Israel	1
Israel Oceanog & Limnol Res, Limnol Lab, IL-14950 Migdal, Israel	Israel	1
Technion Israel Inst Technol, Fac Civil & Environm Engn, IL-32000 Haifa, Israel	Israel	1
Ist Super Protez Ric Ambientale, I-40064 Ozzano Dell Emilia, Italy	Italy	1
Univ Milan, Dipartimento Biol, I-20133 Milan, Italy	Italy	1
Univ Roma Tor Vergata, Dept Biol, I-00173 Rome, Italy	Italy	1
Fisheries Res Agcy, Natl Res Inst Fisheries Sci, Kanagawa 2368648, Japan	Japam	1
Hokkaido Univ, Div Marine Bioresource & Environm Sci, Fac Fisheries Sci, Hakodate, Hokkaido 0418611, Japan	Japam	2
Taldykorgan Plague Control Stn, Taldykorgan 040000, Kazakhstan	Kazachstan	1
Kazakh Sci Ctr Quarantine & Zoonot Dis, Alma Ata 050054, Kazakhstan	Kazachstan	2
Sabah Pk, Kota Kinabalu 88806, Sabah, Malaysia	Malaysia	1
Univ Kebangsaan Malaysia, Sch Environm & Nat Resources Sci, Bangi 43600, Selangor, Malaysia	Malaysia	1
Ctr Limnol, Netherlands Inst Ecol, Dept Aquat Food Webs, Nieuwersluis, Netherlands	Netherlands	1
Deltares, Dept Water Qual & Freshwater Ecosyst, NL-3508 AL Utrecht, Netherlands	Netherlands	1
Deltares, NL-2600 MH Delft, Netherlands	Netherlands	1
Natl Inst Publ Hlth & Environm RIVM, CCE, NL-3720 BA Bilthoven, Netherlands	Netherlands	1
Netherlands Environm Assessment Agcy PBL, NL-3720 AH Bilthoven, Netherlands	Netherlands	1
Netherlands Inst Ecol NIOO KNAW, Dept Aquat Ecol, NL-3631 AC Nieuwersluis, Netherlands	Netherlands	1
Netherlands Inst Ecol NIOO KNAW, NL-6666 ZG Heteren, Netherlands	Netherlands	1
UNESCO IHE Inst Water Educ, NL-2601 DA Delft, Netherlands	Netherlands	1
Univ Groningen, Theoret Biol Grp, Ctr Ecol & Evolutionary Studies, NL-9751 NN Haren, Netherlands	Netherlands	1
Univ Utrecht, Dept Farm Anim Hlth, NL-3584 Utrecht, Netherlands	Netherlands	1
Univ Utrecht, Fac Vet Med, NL-3584 CL Utrecht, Netherlands	Netherlands	1
Univ Utrecht, Lab Palaeobotany & Palynol, Inst Environm Biol, NL-3584 CD Utrecht, Netherlands	Netherlands	1
Univ Wageningen & Res Ctr, Dept Aquat Ecol & Water Qual, NL-6700 AA Wageningen, Netherlands	Netherlands	1

Witteveen & Bos, NL-7400 AV Deventer, Netherlands	Netherlands	1
NIOO CL, Dept Aquat Food Webs, NL-3631 AC Nieuwersluis, Netherlands	Netherlands	2
Univ Canterbury, Sch Biol Sci, Christchurch 1, New Zealand	New Zealand	1
Univ Canterbury, Sch Forestry, Christchurch 8140, New Zealand	New Zealand	1
Univ Waikato, Ctr Biodivers & Ecol Res, Hamilton, New Zealand	New Zealand	1
Philippine Natl Museum, Bot Div, Manila, Philippines	Philippines	1
Adam Mickiewicz Univ Poznan, Dept Behav Ecol, PL-61614 Poznan, Poland	Poland	1
Polish Acad Sci, Inst Systemat & Evolut Anim, PL-31016 Krakow, Poland	Poland	1
Polish Acad Sci, Mammal Res Inst, PL-17230 Bialowieza, Poland	Poland	1
Poznan Univ Life Sci, Inst Zool, PL-60625 Poznan, Poland	Poland	2
Inst Biophys SB RAS, Krasnoyarsk 660036, Russia	Russia	1
Knipovich Polar Res Inst Marine Fisheries & Ocean, Murmansk 183763, Russia	Russia	1
Murmansk Marine Biol Inst, Murmansk, Russia	Russia	1
Nansen Int Environm & Remote Sensing Ctr, St Petersburg 199034, Russia	Russia	1
Pasvik State Nat Reserve, Rajakoski, Russia	Russia	1
Siberian Fed Univ, Inst Computat Modelling SB RAS, Krasnoyarsk 660036, Russia	Russia	1
St Petersburg State Univ, Dept Bot, St Petersburg 199034, Russia	Russia	1
St Petersburg State Univ, Dept Ichthyol & Hydrobiol, St Petersburg 199178, Russia	Russia	2
CEH, Penicuik EH26 0QB, Midlothian, Scotland	Scotland	1
Fisheries Res Serv, Freshwater Lab, Pitlochry PH16 5LB, Perthshire, Scotland	Scotland	1
Norwegian Comp Ctr, Tarland AB34 4YS, Aboyne, Scotland	Scotland	1
Univ Aberdeen, Aberdeen Ctr Environm Sustainabil, Aberdeen AB24 3UU, Scotland	Scotland	1
Univ St Andrews, Sch Geog & Geosci, St Andrews, Fife, Scotland	Scotland	1
Macaulay Inst, Aberdeen AB15 8QH, Scotland	Scotland	3
CapeNature, ZA-7701 Rondebosch, South Africa	South Africa	1
Dept Environm Affairs & Tourism, ZA-8012 Cape Town, South Africa	South Africa	1
Oceans & Coasts, Dept Environm Affairs, ZA-8012 Cape Town, South Africa	South Africa	1
S African Natl Pk, ZA-1350 Skukuza, South Africa	South Africa	1
Univ Cape Town, Percy Fitzpatrick Inst African Ornithol, Ctr Excellence, Natl Res Fdn,Dept Sci & Technol, ZA-7701 Rondebosch, South Africa	South Africa	1
Univ Stellenbosch, Dept Bot & Zool, Ctr Invas Biol, ZA-7602 Matieland, South Africa	South Africa	1
Univ Stellenbosch, Dept Conservat Ecol & Entomol, ZA-7602 Matieland, South Africa	South Africa	1
Univ Witwatersrand, Ctr African Ecol, Sch Anim Plant & Environm Sci, ZA-2050 Wits, South Africa	South Africa	1
Univ Cape Town, Marine Res Inst, ZA-7701 Rondebosch, South Africa	South Africa	2

Univ Cape Town, Dept Zool, Anim Demog Unit, ZA-7701 Rondebosch, South Africa	South Africa	3
Pukyong Natl Univ, Dept Marine Biol, Pusan 608737, South Korea	South Korea	2
Basque Fdn Hlth Innovat & Res BIOEF, Sondika 48015, Bizkaia, Spain	Spain	1
CSIC UIB, Inst Mediterrani Estudis Avancats, Esporles 07190, Mallorca, Spain	Spain	1
Ctr Quintos Mora, Toledo 45003, Spain	Spain	1
ETS Ingenieros Montes, Madrid 28040, Spain	Spain	1
IFISC CSIC UIB, Inst Fis Interdisciplinar & Sistemas Complejos, E-07122 Palma de Mallorca, Spain	Spain	1
IMEDEA CSIC UIB, Inst Mediterraneo Estudios Avanzados, Esporles 07190, Islas Baleares, Spain	Spain	1
Integrat Ecol Grp, Estac Biol Doriana, Seville 41092, Spain	Spain	1
Univ Autonoma Madrid, Lab Arqueozool, Madrid, Spain	Spain	1
Univ Basque Country, Fac Pharm, Ecol Lab, Dept Plant Biol & Ecol, Gasteiz 01006, Spain	Spain	1
Univ Basque Country, Fac Sci & Technol, Ecol Lab, Dept Plant Biol & Ecol, Bilbao 48080, Spain	Spain	1
Univ Complutense Madrid, Dept Zool & Phys Anthropol, Fac Biol, E-28040 Madrid, Spain	Spain	1
Univ Girona, Dept Ciencies Ambientals, Girona 17071, Spain	Spain	1
Ctr Oceanog Balears, Inst Espanol Oceanog, Palma De Mallorca 07015, Spain	Spain	2
Inst Marine Res, Swedish Board Fisheries, SE-45321 Lysekil, Sweden	Sweden	1
Lund Univ, Dept Biol, SE-22362 Lund, Sweden	Sweden	1
Lund Univ, Dept Chem Engn, S-22100 Lund, Sweden	Sweden	1
Natl Vet Inst, Dept Virol Immunobiol & Parasitol, S-75007 Uppsala, Sweden	Sweden	1
Swedish Univ Agr Sci SLU, S-75007 Uppsala, Sweden	Sweden	1
Swedish Univ Agr Sci, Dept Aquat Sci & Assessment, S-75007 Uppsala, Sweden	Sweden	1
Swedish Univ Agr Sci, Dept Wildlife Fish & Environm Studies, S-90183 Umea, Sweden	Sweden	1
Umea Univ, Dept Ecol & Environm Sci, S-90187 Umea, Sweden	Sweden	1
Uppsala Univ, Dept Anim Ecol, Evolutionary Biol Ctr, Uppsala, Sweden	Sweden	1
Uppsala Univ, Swedish Univ Agr Sci, Dept Aquat Sci & Assessment, Uppsala, Sweden	Sweden	1
Swedish Univ Agr Sci, Dept Ecol, S-75007 Uppsala, Sweden	Sweden	2
Lund Univ, Dept Theoret Ecol, Lund, Sweden	Sweden	3
Uppsala Univ, Dept Ecol & Evolut, S-75236 Uppsala, Sweden	Sweden	3
Oeschger Ctr Climate Change Res, Bern, Switzerland	Switzerland	1
Swiss Fed Inst Aquat Sci & Technol Eawag, Dubendorf, Switzerland	Switzerland	1
Univ Bern, Inst Phys, Bern, Switzerland	Switzerland	1
Univ Zurich, Zool Museum, CH-8057 Zurich, Switzerland	Switzerland	1
Swiss Fed Res Inst WSL, Dendro Sci Unit, CH-8903 Birmensdorf, Switzerland	Switzerland	2

Univ Bern, Oeschger Ctr Climate Change Res, CH-3012 Bern, Switzerland	Switzerland	2
Swiss Fed Res Inst WSL, Birmensdorf, Switzerland	Switzerland	3
Tanzania Fisheries Res Inst TAFIRI, Mwanza Ctr, Mwanza, Tanzania	Tanzania	1
So Sci Res Inst Marine Fisheries & Oceanog YugNIR, UA-98300 Kerch, Crimea, Ukraine	Ukraine	1
Bard Coll, Biol Program, Annandale On Hudson, NY USA	USA	1
Brown Univ, Dept Ecol & Evolutionary Biol, Providence, RI 02912 USA	USA	1
Colorado State Univ, Nat Resource Ecol Lab, Ft Collins, CO 80523 USA	USA	1
Colorado State Univ, US Geol Survey, Ft Collins, CO 80523 USA	USA	1
Duke Univ, Dept Biol, Durham, NC 27708 USA	USA	1
Mt Studies Inst, Silverton, CO 81433 USA	USA	1
New Mexico Dept Hlth, Epidemiol & Response Div, Santa Fe, NM 87502 USA	USA	1
Northwestern Univ, Dept Stat, Evanston, IL 60208 USA	USA	1
Old Dominion Univ, Ctr Coastal & Phys Oceanog, Norfolk, VA 23529 USA	USA	1
Oregon State Univ, Coll Ocean & Atmospher Sci, Corvallis, OR 97331 USA	USA	1
Paleontol Res Inst, Ithaca, NY 14850 USA	USA	1
Portland State Univ, Dept Civil & Environm Engn, Portland, OR 97207 USA	USA	1
Smithsonian Migratory Bird Ctr, Natl Zool Pk, Washington, DC 20008 USA	USA	1
SUNY Coll Oswego, Dept Earth Sci, Oswego, NY 13126 USA	USA	1
SUNY Stony Brook, Dept Ecol & Evolut, Stony Brook, NY 11794 USA	USA	1
Syracuse Univ, Dept Civil & Environm Engn, Syracuse, NY 13244 USA	USA	1
Univ Calif Davis, Tahoe Environm Res Ctr, John Muir Inst Environm, Davis, CA USA	USA	1
Univ Calif San Diego, Scripps Inst Oceanog, Climate Atmospher Sci & Phys Oceanog CASPO Div, San Diego, CA 92093 USA	USA	1
Univ Calif Santa Barbara, NCEAS, Santa Barbara, CA 93101 USA	USA	1
Univ Calif Santa Cruz, Dept Ecol & Evolutionary Biol, Santa Cruz, CA 95064 USA	USA	1
Univ Chicago, Dept Ecol & Evolut, Chicago, IL 60637 USA	USA	1
Univ Hawaii Manoa, Dept Zool, Honolulu, HI 96822 USA	USA	1
Univ Maryland, Dept Biol, College Pk, MD 20742 USA	USA	1
Univ Massachusetts Dartmouth, Dept Biol, N Dartmouth, MA USA	USA	1
Univ Miami, Florida Integrated Sci Ctr, USGS, Coral Gables, FL 33124 USA	USA	1
Univ New Mexico, Dept Biol, Albuquerque, NM 87131 USA	USA	1
Univ SW Louisiana, Dept Biol, Lafayette, LA 70504 USA	USA	1
Univ Virginia, Boyce, VA 22620 USA	USA	1
Univ Virginia, Dept Environm Sci, Charlottesville, VA 22904 USA	USA	1

Univ Washington, Sch Aquat & Fishery Sci, Seattle, WA 98195 USA	USA	1
US Forest Serv, No Res Stn, USDA, Morgantown, WV 26505 USA	USA	1
Utah State Univ, Dept Biol, Logan, UT 84322 USA	USA	1
Washington Univ, Dept Anat & Neurobiol, St Louis, MO 63110 USA	USA	1
Western Michigan Univ, Dept Biol Sci, Kalamazoo, MI 49008 USA	USA	1
Ctr Control & Prevent, Bacterial Dis Branch, Div Vector Borne Dis, Ft Collins, CO USA	USA	2
Ctr Dis Control & Prevent, Bacterial Zoonoses Branch, Div Vector Borne Infect Dis, Natl Ctr Infect Dis, Ft Collins, CO USA	USA	2
Indiana Univ, Dept Geol Sci, Bloomington, IN 47405 USA	USA	2
NOAA Fisheries, Pacific Isl Fisheries Sci Ctr, Ecosyst & Oceanog Div, Honolulu, HI 96822 USA	USA	2
Univ Alaska, Inst Arctic Biol, Fairbanks, AK 99775 USA	USA	2
Univ Calif San Diego, Scripps Inst Oceanog, Div Climate Res, La Jolla, CA 92093 USA	USA	2
Univ Calif Santa Barbara, Dept Ecol Evolut & Marine Biol, Santa Barbara, CA 93106 USA	USA	2
Arizona State Univ, Sch Life Sci, Tempe, AZ 85287 USA	USA	3
Univ Iowa, Dept Stat & Actuarial Sci, Iowa City, IA 52242 USA	USA	8
Cardiff Business Sch, Cardiff CF10 3AX, S Glam, Wales	Wales	1
Cardiff Sch Biosci, Cardiff CF10 3AX, S Glam, Wales	Wales	1

Til: Instituttstyret ved Biologisk institutt

Sakstype: Orienteringssak

Saksnr.: O-Sak IS 13/2011

Møtedato: 08.12.2011

Notatdato: 01.12.2011

Saksbehandlere: Lise Bøkenes og Glenn-Peter Sætre

Sakstittel: Undervisningssaker

- Emnet BIO4110/9110 Økologisk modellering i GIS er endret fra å gå annen hver høst til hver høst
- Det er opprettet et PhD-emne BIO9905CEES1 Effect Studies and Adaptation to Climate Change. Emnet er på 5 studiepoeng og vil kun gå våren 2012.
- Det er opprettet et emne på master/PhD-nivå BIO4160/9160 Ny litteratur innen mikrobiell økologi og metagenomikk. Emnet er på 5 studiepoeng og vil gå hver vår.
- Det er opprettet et emne på master/PhD-nivå BIO4170/9170 Ny litteratur innen evolusjonær genomikk. Emnet er på 5 studiepoeng og vil gå hver høst.
- Det er opprettet et emne på master/Phd-nivå BIO4600/9600 Vitenskapelig forfatterskap. Emnet er på 5 studiepoeng og vil gå hver vår
- En arbeidsgruppe har sett på hvordan man dagens programråd fungerer i forhold til institutter og fakultet. De har kommet frem til et forslag til endringer i dagens struktur. Dette forslaget er er vedtatt i fakultetsstyret.

Vedlegg: Emneside BIO9905CEES1
Emneside BIO4160
Emneside BIO4170
Emneside BIO4600
Notat: Studieprogrammenes forankring og sammensetning

BIO9905CEES1 - Effect Studies and Adaptation to Climate Change

Course content - Learning outcomes - Admission - Prerequisites - Teaching - Exam information - Contact us

Facts about this course:

Credits:	5
Level:	Ph.D. level course
Teaching semester:	Spring 2012
Examination semester:	Spring 2012
Language of instruction:	English
Administrated by:	Department of Biology

Course content

Individuals and institutions across the Nordic region are becoming increasingly aware of how heavily ecological and physical systems are linked to social, economic and political systems. Understanding these connections is now becoming even more critical as global threats, such as climate change, threaten to fundamentally alter the balance between these systems. Thus, there is a need to educate young researchers to combine ecological, physical and social perspectives. This course will serve this function by combining expertise from a range of disciplines for a comprehensive look at climate impacts on biological and social systems across the Nordic region. This course is organized by a cross-disciplinary partnership between three new Nordic Centres of Excellence (NorMER, NORD-STAR and TUNDRA) to educate graduate students on a wide range of climate issues facing the world today, with a particular focus on the Nordic region.

Learning outcomes

This course has 2 primary components: (1) the education of young researchers on the ecological and social impacts and adaptation of climate change in the Nordic region through lectures and activities organized by and with top researchers on climate and climate impacts, (2) Training young researchers to combine physical, biological, and social science perspectives to better understand the methods and tools for addressing climate change impacts and adaptation. Specific themes include: (1) physical and chemical climate change processes, (2) climate change impacts on Nordic marine ecosystems, (3) climate change impacts on terrestrial ecosystems, (4) climate change policy and action.

Admission

This course is primarily intended for PhD students admitted to a program at a Norwegian University or University College. For registration please contact the student administration office in the Department of Biology .

PhD students from other faculties at UiO and other universities (than Oslo) must in addition apply as a Visiting PhD Student

Space priority is given to students involved in one of the three Nordic Centres of Excellence NorMER, Tundra, and Nord-STAR.

Prerequisites

No obligatory prerequisites beyond the minimum requirements for entrance to higher education in Norway.

Teaching

This is an intensive course over five days (May 7th-11th). The first four days involve lectures organized by theme (before lunch), and afternoon group workshops during which students develop interdisciplinary lectures. Day 5 lectures are given by the students. Within two weeks the students will submit a paper, on a topic to be determined at the course.

Exam information

Students are graded on their participation in the group workshops, their lecture presentations and the submitted paper.

Assessment and grading

Students are awarded either a passing or failing grade. The pass/fail scale is applied as an independent scale with only two possible results.

Contact us

Department of Biology

Visiting address:
Kristine Bonnevie's building, Blindernveien 31

Visiting hours:

Postal address:
P.O.Box 1066, Blindern
NO-0316 Oslo

Phone: +47 22 85 72 74
Fax: +47 22 85 47 26
E-mail: studieinfo@bio.uio.no
Web: http://www.mn.uio.no/bio/english/

BIO4160 - Ny litteratur innen mikrobiell økologi og metagenomikk

English version

Fakta om emnet:	
Studiepoeng:	5
Type:	Avansert emne på masternivå
Undervises:	Hvert vårsemester
Eksamen:	Hvert vårsemester
Undervisningsspråk:	Engelsk hvis utvekslingsstudenter ber om det, ellers norsk
Tilbys ved:	Biologisk institutt

Semestersider (undervisningstider, eksamensdato, pensum m.m.):

- Vår 2012

Kort om emnet

Kurset vil fokusere på viktige emner innen mikrobiell økologi og metagenomikk. Kurset vil inkludere både bakterier og mikroeukaryote organismer. Implementeringen av nye DNA-analysemetoder innen metagenomikk/metatranskriptomikk vil bli vektlagt, herunder DNA-analyse av miljøprøver fra naturen ('environmental sequencing'). Videre vil det bli fokusert på bioinformatiske analyser av DNA-data fra miljøprøver. Kurset vil bestå av litteraturkollokvier som vil finne sted annenhver uke gjennom semesteret, hvor studentene presenterer og diskuterer nylig publiserte og viktige arbeider innen feltet.Studentene vil ha en muntlig presentasjon samt en skriftlig innlevering.

Hva lærer du?

Studentene vil få kunnskap om ny forskning innen feltene mikrobiell økologi og metagenomikk. Nye metoder innen genomikk (f.eks. metagenomikk og metatranskriptomikk) vil bli vektlagt

Opptak og adgangsregulering

PhD-studenter må melde seg opp til BIO9160 - Ny litteratur innen mikrobiell økologi og metagenomikk

Studenter må hvert semester søke plass på undervisningen og melde seg til eksamen i StudentWeb.

Dersom du ikke allerede har studieplass ved UiO, kan du søke opptak til våre studieprogrammer eller søke om å bli enkeltemnestudent.

Forkunnskaper

Anbefalte forkunnskaper

BIO1200 - Biologisk mangfold og BIO2140 - Molekylærbiologi og biologiske metoder

Overlapping

5 studiepoeng mot BIO9160 - Ny litteratur innen mikrobiell økologi og metagenomikk.

Undervisning

Kollokvier. Studentene skal selv gi en presentasjon i løpet av semesteret og levere en prosjektoppgave. Begge må være bestått før studenten kan gå opp til eksamen.

Vurdering og eksamen

Muntlig eksamen teller 100%. Presentasjon og prosjektoppgave må være godkjent.

Sensur

Emnet bruker gradert bokstavkarakterskala fra A til F, der A er beste karakter og F er stryk, jf. § 6.1 om karaktersystemet i Forskrift om studier og eksamener ved UiO.

Begrunnelse og klage

En student kan be om begrunnelse for eksamenskarakterene, og kan også klage over karakterfastsettingen og/eller over formelle feil ved eksamen. Les mer om begrunnelse og klage.

Adgang til utsatt eller ny eksamen/vurdering

Dette emnet tilbyr ny eksamen i begynnelsen av påfølgende semester til kandidater som stryker eller trekker seg under ordinær eksamen.
For nærmere opplysninger, se reglement for utsatt og ny eksamen ved MN-fakultetet
Studenter som pga gyldig frafall (sykdom o.l.) ikke har kunnet gjennomføre ordinær eksamen, kan søke om å få avlegge utsatt eksamen. Utsatt eksamen arrangeres enten senere i samme semester eller tidlig i semesteret etter ordinær eksamen. Dokumentasjon på gyldig fravær må legges ved søknad om utsatt eksamen, jf §5.5 i Forskrift om studier og eksamener ved UiO

Tilrettelagt eksamen/vurdering

En student som har en funksjonshemning og/eller kroniske eller akutte helseproblemer som fører til vesentlige ulemper i eksamenssituasjonen i forhold til andre studenter, kan søke om tilrettelegging ved eksamen. Mødre som ammer kan søke om tilleggstid på eksamen.

Evaluering av emnet

Tilbakemelding fra studentene våre er avgjørende for at vi skal kunne tilby best mulige emner og studieprogrammer. Som student ved UiO vil du derfor bli bedt om å delta i ulike typer evaluering av studiehverdagen din. Vi gjennomfører fortløpende evaluering av dette emnet, og med jevne mellomrom ber vi studentene delta i en mer omfattende og detaljert evaluering, en såkalt "periodisk evaluering" av emnet.

Kontakt oss

Biologisk institutt

Besøksadresse:

Kristine Bonnevies hus, Blindernveien 31

Ekspedisjonstid:

Postadresse:

Postboks 1066, Blindern

0316 Oslo

Telefon: 22 85 72 74

Faks: 22 85 47 26

E-post: studieinfo@bio.uio.no

Web: http://www.mn.uio.no/bio/

BIO4170 - Ny litteratur innen mikrobiell evolusjonær genomikk

English version

Fakta om emnet:

Studiepoeng:	5
Type:	Avansert emne på masternivå
Undervises:	Hvert høstsemester
Eksamen:	Hvert høstsemester
Undervisningsspråk:	Engelsk hvis utvekslingsstudenter ber om det, ellers norsk
Tilbys ved:	Biologisk institutt

Kort om emnet

Kurset vil fokusere på viktige emner innen mikrobiell evolusjonsbiologi, spesielt genom-evolusjon. Kurset vil inkludere både bakterier og mikroeukaryote organismer. Implementeringen av nye DNA-analysemetoder innen genomanalyser vil bli vektlagt, herunder bioinformatiske analyser an genomdata. Kurset vil bestå av litteraturkollokvier som vil finne sted annenhver uke gjennom semesteret, hvor studentene presenterer og diskuterer nylig publiserte og viktige arbeider innen feltet.Studentene vil ha en muntlig presentasjon samt en skriftlig innlevering.

Hva lærer du?

Studentene vil få kunnskap om ny forskning innen feltene miktobiell evolusjonsbiologi og genomevolusjon. Nye metoder innen genomanalyser vil bli vektlagt

Opptak og adgangsregulering

PhD-studenter må melde seg opp til BIO9170 - Ny litteratur innen mikrobiell evolusjonær genomikk

Studenter må hvert semester søke plass på undervisningen og melde seg til eksamen i StudentWeb.

Dersom du ikke allerede har studieplass ved UiO, kan du søke opptak til våre studieprogrammer eller søke om å bli enkeltemnestudent.

Forkunnskaper

Anbefalte forkunnskaper

BIO1200 - Biologisk mangfold og BIO2140 - Molekylærbiologi og biologiske metoder

Overlapping

5 studiepoeng mot BIO9170 - Ny litteratur innen mikrobiell evolusjonær genomikk.

Undervisning

Kollokvier. Studentene skal selv gi en presentasjon i løpet av semesteret og levere en prosjektoppgave. Begge må være bestått før studenten kan gå opp til eksamen.

Vurdering og eksamen

Muntlig eksamen teller 100%. Presentasjon og prosjektoppgave må være godkjent.

Sensur

Emnet bruker gradert bokstavkarakterskala fra A til F, der A er beste karakter og F er stryk, jf. § 6.1 om karaktersystemet i Forskrift om studier og eksamener ved UiO.

Begrunnelse og klage

En student kan be om begrunnelse for eksamenskarakterene, og kan også klage over karakterfastsettingen og/eller over formelle feil ved eksamen. Les mer om begrunnelse og klage.

Adgang til utsatt eller ny eksamen/vurdering

Dette emnet tilbyr ny eksamen i begynnelsen av påfølgende semester til kandidater som stryker eller trekker seg under ordinær eksamen.
For nærmere opplysninger, se reglement for utsatt og ny eksamen ved MN-fakultetet
Studenter som pga gyldig frafall (sykdom o.l.) ikke har kunnet gjennomføre ordinær eksamen, kan søke om å få avlegge utsatt eksamen. Utsatt eksamen arrangeres enten senere i samme semester eller tidlig i semesteret etter ordinær eksamen. Dokumentasjon på gyldig fravær må legges ved søknad om utsatt eksamen, jf §5.5 i Forskrift om studier og eksamener ved UiO

Tilrettelagt eksamen/vurdering

En student som har en funksjonshemning og/eller kroniske eller akutte helseproblemer som fører til vesentlige ulemper i eksamenssituasjonen i forhold til andre studenter, kan søke om tilrettelegging ved eksamen. Mødre som ammer kan søke om tilleggstid på eksamen.

Evaluering av emnet

Tilbakemelding fra studentene våre er avgjørende for at vi skal kunne tilby best mulige emner og studieprogrammer. Som student ved UiO vil du derfor bli bedt om å delta i ulike typer evaluering av studiehverdagen din. Vi gjennomfører fortløpende evaluering av dette emnet, og med jevne mellomrom ber vi studentene delta i en mer omfattende og detaljert evaluering, en såkalt "periodisk evaluering" av emnet.

Kontakt oss

Biologisk institutt

Besøksadresse:
Kristine Bonnevies hus, Blindernveien 31

Ekspedisjonstid:

Postadresse:
Postboks 1066, Blindern
0316 Oslo

Telefon: 22 85 72 74
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E-post: studieinfo@bio.uio.no
Web: http://www.mn.uio.no/bio/

BIO4600 Vitenskapelig forfatterskap

Kort om emnet - Hva lærer du? - Opptak og adgangsregulering - Forkunnskaper - Overlapping - Undervisning - Vurdering og eksamen - Evaluering av emnet - Kontakt oss

Fakta om emnet:	
Studiepoeng:	5
Type:	Avansert emne på masternivå
Undervises:	Hvert vårsemester
Eksamen:	Hvert vårsemester
Undervisningsspråk:	Engelsk
Tilbys ved:	Biologisk institutt

Kort om emnet

Å skrive er vesentlig i vitenskapelig arbeid. Forskere skriver avhandlinger, rapporter, essayer, artikler og søknader. Å formidle vitenskapelig innsikt til ikke-fagfolk er dessuten en viktig men ofte nedprioritert del av forskerens virksomhet. Mange vitenskapelige tekster er ordrike og upresise. Vi forskere antar ofte at avanserte ideer må utrykkes i et obskurt og komplisert språk. Virkelig gode forskere er imidlertid i stand til å formulere komplekse synspunkter i et klart og tydelig språk. Kurset gir en innføring i prinsippene bak god skrivekunst, med særlig fokus på vitenskapelige tekster. Undervisningen og kursmateriellet er på engelsk, men målet er å utvikle gode skrivevaner som kan benyttes uavhengig av språk. Målet er ikke å lære teknisk skriving, men heller å utvikle gode skrive- og redigeringsferdigheter og journalistiske evner.
Kurset har form av en serie workshops. Følgende tema gjennomgås; utkast og revisjoner, strukturen i forskjellige typer av tekster (vitenskapelige artikler, essayer, sammendrag) og å skrive for ikke-fagfolk. Vi drøfter generelle spørsmål om stil, setningsoppbygning, verbformer og verbtider.

Hva lærer du?

Studentene får prøvd ut forskjellige former for vitenskapelig skriving. Studenter vil også lære å redigere og forkorte lange tekster uten å miste innhold, skrive korte artikler om forskjellige områder innen vitenskapen, skrive vitenskapelige artikler for et ikke-vitenskapelig publikum og å uttrykke vitenskapelige ideer klart og konsist.

Opptak og adgangsregulering

PhD-studenter må melde seg til BIO9600
PhD-studenter vil bli prioritert

Studenter må hvert semester søke plass på undervisningen og melde seg til eksamen i StudentWeb.

Dersom du ikke allerede har studieplass ved UiO, kan du søke opptak til våre studieprogrammer eller søke om å bli enkeltemnestudent.

Forkunnskaper

Ingen obligatoriske forkunnskaper utover generell studiekompetanse.

Overlapping

5 studiepoeng mot BIO9600.

Undervisning

Kurset består av workshops på 2 timer annenhver uke. Den første timen består av en forelesning og diskusjon over et gitt emne. I den andre timen drøftes studentenes egne skriveoppgaver. Hver uke skal studentene rette og diskutere arbeidet til to andre studenter, slik at alle i løpet av kurset får omfattende tilbakemelding fra medstudenter på sitt arbeid. I løpet av kurset gjøres det korte øvelser, og når kurset er ferdig leveres det inn en oppgave på 2000 ord.

Vurdering og eksamen

Karakter vil bygge på vurdering av tre korte oppgaver (500 ord) i løpet av kurset og en lengre, avsluttende oppgave (1500-2000 ord).
Det kreves minst 75 % oppmøte, og forventes at alle oppgaver leveres i tide.

Sensur

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Notat september 2011

Studieprogrammenes forankring og ansvarsfordeling

MN-fakultetets utdanningsstrategi

Forslag fra arbeidsgruppen:
Studiedekan Annik Myhre (MN)
Arne Huseby (MI)
Knut Mørken (IFI, CMA)
Karen Ulshagen (Farmasi)
Dag Langmyhr (IFI)
Helle Berg Bjørsom (MNSU)
Glen-Peter Sætre (Bio)
Mona Bratlie (MN)

Hanne Sølna (MN), sekretær

Contents

Bakgrunn

Utdanningsstrategien ble vedtatt i fakultetsstyret oktober 2010 som en oppfølging av MatNat21 og analysen for utdanning. For å få iverksatt strategien ble det våren 2011 utarbeidet en handlingsplan med 13 delmål (vedlegg 1).

Det er oppnevnt arbeidsgrupper og utarbeidet mandater for å realisere de ulike delmålene. Dette notatet er knyttet til delmål 12 i handlingsplanen. Arbeidsgruppen har hatt tre møter i september 2011.

Mål og mandat

Studieprogrammene skal ha en forankring og en ansvarsfordeling som best mulig støtter opp om fakultetets utdanningsstrategi.

12.1 Roller og ansvar for henholdsvis emne- og programeiere er fordelt og beskrevet med tanke på å oppnå god samhandling, enkle vedtakslinjer og god ressursbruk.
12.2 Tverrdisiplinære studietilbud ivaretas på lik linje med disiplinære studietilbud (også med ressurser og profilering)

Mandat:

- Beskrive hvilke endringer som ble innført med kvalitetsreformen, hvorfor og hvordan de har virket
- Beskrive hva som er fakultetets, programrådets og instituttets rolle og ansvar i dag
- Vurdere hensiktsmessigheten av dagens formelle (studieutvalget) og uformelle (undervisningslederforum) undervisningsutvalg
- Belyse hvilke spesielle utfordringer tverrdisiplinære (MN) og tverrfakultære (UiO) studieprogrammer medfører
- Foreslå mulige endringer i dagens struktur for å oppnå en bedre optimalisering av struktur og bemanning.
- Gjøre rede for hvem som har kvalitetssikringsansvaret og hvordan kvalitetsarbeidet best kan ivaretas, ved eventuelle endringer, slik at dette blir praktisert enhetlig for alle studieprogram ved fakultetet.
- Foreslå en hensiktsmessig utvalgsstruktur som gir grunnlag for gode diskusjoner, beslutninger og erfaringsoverføringer.

Forslaget skal særlig bidra til et bedre samspill mellom emneeier og programeier og bedre forankrede beslutninger med hensyn på studiekvalitet og ressursbruk.

Endringer som ble innført med kvalitetsreformen

Kvalitetsreformen var den norske oppfølgingen av Bolognaprosessen. Den ledet til flere endringer innen både økonomi, styring og utdanning som påvirket strukturen ved MN og førte til endrede rammebetingelser. Målet med kvalitetsreformen var å øke kvaliteten, intensiteten og internasjonaliseringen i utdanningen og viktige elementer var:

- Ny gradsstruktur.
- Tettere oppfølging av studentene
- Økt fokus på gjennomstrømning.
- Økt fokus på kvalitetssikring (og opprettelse av NOKUT).
- Nye eksamens- og evalueringsformer.
- Innføring av internasjonale vitnemålstillegg, såkalte «diploma supplement», samt overgang til studiepoeng etter ECTS-modellen (European Credit Transfer System).
- Økt fokus på internasjonal studentutveksling.

Studieprogrammene

Med kvalitetsreformen ble det opprettet studieprogrammer på bachelor- og masternivå samt to årsstudier. Et bachelorprogram er definert av 180 studiepoeng som vanligvis inkluderer et betydelig antall obligatoriske emner. Et masterprogram defineres av 120 studiepoeng inkludert en oppgave på enten 60 eller 30 studiepoeng. Studieprogrammene ledes av en programrådsleder sammen med et programråd. Programrådet skal ha en sammensetning som speiler den faglige sammensetningen av studieprogrammet. Fakultetet ved studiedekanen er den faglige eieren av studieprogrammene og den som programrådslederen rapporterer til. Studieprogrammene blir administrativt tilordnet et vertsinstitutt blant annet med ansvar for sosiale tiltak. Instituttene er faglig eier av emnene og leverer emner til studieprogrammene som etterspør de emnene de mener er best for å gi et helhetlig læringsutbytte.

Før 2003 var lavere grad (cand. mag.) bygget opp med emne- og studieretningsgrupper som instituttet hadde det faglige ansvaret for, samt andre emner instituttet anbefalte. Det var da anbefalte studieplaner innenfor instituttet som ledet til ulike hovedfagsstudier (studieretninger) på instituttet eller hovedfagsstudier på andre MN-institutter. Det faglige eierskapet for både emner og studieretningsgrupper lå hos instituttet og i det daglige til en undervisningsleder og et undervisningsutvalg.

Finansieringsmodellen

Hovedvekten av finansieringen innen utdanning ble etter 2003 basert på avlagte studiepoeng og antall studieplasser. Studieplassene inngår i basis i finansieringsmodellen mens studiepoengene er resultatbaserte. På papiret førte det til at det ble økonomisk gunstig for et institutt å ha en ettertraktet emneportefølje med mange studenter pr. emne. Dette kan dempes av utfordringer med tilgang på ulike typer undervisningsressurser som laboratorier, utstyr, undervisningsressurser til felt etc og kostnader på disse.

Vertsinstitutt
Studieprogrammene har ikke direkte tilgang på ressurser i form av budsjett eller egen administrasjon. Dette er løst ved at programmene er knyttet til et vertsinstitutt som mottar midler. Disse midlene ble til å begynne med tildelt som bundne midler, men ble senere lagt inn i instituttets rammebevilgning og er ment å dekke administrative utgifter og faglig-sosiale tiltak i programmet. Vertsinstituttet utpeker en administrativ koordinator til hvert studieprogram.

Kvalitetssikring
Det overordnede ansvaret for studieprogrammene og emnene ligger hos fakultetet. Det praktiske kvalitetssikringsansvaret for studieprogrammet ligger hos programrådsleder og programråd, mens det for emnene er instituttene som har kvalitetsansvaret. Kvaliteten i et studieprogram er nær knyttet til emnene som inngår i programmet. Instituttene har dermed indirekte et stort ansvar for kvaliteten for et studieprogram ved å levere emner som bidrar til en god helhet og som holder god undervisningskvalitet både menneskelig og ressursmessig.

Studieprogrammene og instituttene leverer separate studiekvalitetsrapporter. Det pågår arbeid for å samordne denne rapporteringen med den regulære tertialrapporteringen. Spørsmålet er om dette er hensiktsmessig særlig siden denne rapporteringen følger kalenderåret og ikke det akademiske året som undervisningsaktivitetene er styrt av.

Ved noen institutter er undervisningsleder identisk med programrådsleder og programkoordinator en regulær studieadministrativ, noe som bidrar til en viss koordinering av rapporteringsarbeidet.

Mål med endringene
Målet med de nye studieprogrammene var i større grad enn før å få tilrettelagt for tverrfaglige studieprogrammer både innad på fakultetet og mellom fakultetene. Et grep var å plassere ansvaret for det faglige innholdet hos en programrådsleder med et programråd som speilet programmets faglige profil for slik å løsrive studieprogrammet fra instituttenes mer disiplinære profil.

En grunnidé i starten var at studieprogrammene skulle være forbrukere av emner som de bestilte fra instituttene. For å få inntekter måtte instituttene levere emner som passet inn i studieprogrammene, både de tradisjonelle (disiplinære) og de tverrfaglige. Dette forutsatte en god samordning og koordinering institutter og programmer imellom. Tanken var også at dette skulle lede til en fornyelse av emneporteføljen.

Hvordan har endringene virket
Innføringen av studieprogrammer har utvilsomt ført til et bredere studietilbud ved MN, ikke minst i form av tverrdisiplinære studieprogrammer. Dette har gitt mer kontakt på tvers av tradisjonelle faggrenser i form av økt samarbeid i programrådene og i utvikling av emneporteføljen.

Programrådene som kom i tillegg til undervisningsutvalgene, har trukket flere personer inn i planleggingen og driften av undervisningstilbudet. Dette har sannsynligvis gitt økt bevissthet omkring undervisningen blant de ansatte i hvert fall i tiden rundt og like etter reformen. Dagens situasjon er nok mer korrekt beskrevet ved at det er programrådsleder

som har ansvaret for den daglige driften av programmet og bruker programrådet som et rådgivende organ. Når fakultetet er i større revisjonsprosesser er det mange som tar ansvar. En annen side av endringene er at administrasjonen av studietilbudet også har økt.

Innføringen av kvalitetsreformen kom på en tid da Internett og www etablerte seg som viktige informasjonskanaler. Dette gjorde det enklere enn før å profilere de ulike studietilbudene. Om dette har ført til bedre rekruttering er vanskelig å si.

Studieprogrammene har gjort det mulig å etablere en kullfølelse og tidligere skape et felles faglig-sosialt miljø. Men dette kan også ha sine negative sider ved at studentene tidligere blir bundet opp til ett studieprogram slik at kostnaden ved å bytte studium blir større.

Innføringen av studieprogrammer med programråd som rapporterer direkte til fakultetet har utvilsomt ført til en svakere forankring av studieprogrammene ved instituttene. På papiret betyr dette at instituttet ikke er aktivt med i utviklingen av programmene ved eget institutt, siden dette koordineres av fakultetet. I praksis er det de fleste steder god kommunikasjon mellom programrådene og instituttene, men det er et uttalt behov flere steder for å knytte programrådene tettere inn mot instituttene.

Flere studieprogrammer er lite fleksible fordi det ofte ikke er mer enn 10 – 30 frie studiepoeng blant de 180. Dette gjør det vanskelig for studentene å bytte studieprogram underveis.

Roller og ansvar i dag

Det er i dag tre aktører som er involvert i planlegging og drift av undervisningen ved MN, nemlig instituttene, programrådene og fakultetet selv. Ved instituttene utføres mesteparten av dette arbeidet av undervisningsleder i samarbeid med studieadministrasjonen og der de har et undervisningsutvalg fungerer dette som etoverordnet organ. Programrådenes arbeid utføres i hovedsak av programrådsleder i samarbeid med en programkoordinator tilordnet programmet av vertsinstituttet. Studiedekanen i samarbeid med fakultetets studiekoordinator og studieavdeling tar seg av den løpende driften på fakultetet, med studieutvalget (STUT) og undervisningslederforum (ULF) som rådgivende organer. De ulike aktørene har følgende roller og ansvar:

Fakultetet

- Er eier og har overordnet ansvar for studieprogrammene ved studiedekanen (universitetsstyret er den overordnete eier).
- Er eier og har overordnet ansvar for emnene.
- Oppretter og nedlegger studieretninger.
- Overordnet ansvar for kvalitetssikringen/studiekvaliteten.
- Overordnet ansvar for nettsidene med presentasjoner av programmene.
- Felles rekrutteringstiltak.

Programråd

De fleste programrådene møtes sjelden slik at mesteparten av oppgavene ivaretas av programrådsleder sammen med programkoordinator. Programrådene fungerer dermed stort sett som et rådgivende organ for programledelsen.

- Ansvar for den faglige sammensetningen av programmet og faglig utvikling.
- Ansvar for overgangsordninger fra andre studier.
- Gir innspill på opptaksrammer i samråd med instituttene.
- Ansvar for mottak av nye programstudenter (men har ikke ressurser selv).
- Ansvar for rekrutteringstiltak (men har ikke ressurser selv).
- Ansvar for internasjonalisering med utveksling for egne studenter.
- Programrådene er tenkt å skulle trekke opp de større linjene mens programrådsleder har den løpende håndteringen av programmet.
- Programrådet bidrar til forankring av beslutninger til ulike deler av instituttet og til eventuelle andre institutter som er representert i programmet.
- Programrådet bidrar til at flere blir involvert i og føler et ansvar for utdanningen.
- Farmasi har slått sammen undervisningsutvalg og programråd til ett utvalg som har et helhetlig ansvar for studieprogram og emnetilbudet.

Programrådsleder

- Rapporterer til fakultetet ved studiedekan.
- Inngår ikke i noen linje på instituttet.
- Har dialog med undervisningsleder på involverte institutter om emnebidrag og kvaliteten på disse.
- Har dialog og samarbeid med vertsinstitutt om faglig-sosialt læringsmiljø.
- På farmasi, biologi, geofag og informatikk som har relativt disiplinære studieprogrammer og der det er ett masterprogram som naturlig bygger på et bachelorprogram, er samme person programrådsleder for både bachelor- og masterprogrammet. På Materialer, energi og nanoteknologi (MENA) er samme person programrådsleder på både bachelor- og masterprogram.
- På tre institutter (biologi, informatikk og farmasi) er undervisningsleder samme person som programrådsleder(e), mens på kjemi er programrådsleder for bachelorprogrammet også undervisningsleder.

Instituttet

- Løpende ansvar for oppretting, endring og nedleggelse av emner.
- Ansvar for administrativ drifting av studieprogrammene og bidra med ressurser (personer, penger og arealer).
- Ansvar for internasjonalisering ved et engelskspråklig emnetilbud og bilaterale avtaler.
- Ansvar for bidrag til sentrale rekrutterings- og profileringstiltak (Åpen dag, Ungforsk, etc).

Undervisningsfora på fakultets- og institutt nivå

Det er i dag to undervisningsfora på MN-fakultetet hvorav ett formelt (studieutvalget) og ett uformelt (undervisningslederforum) som ledes av studiedekanen. For begge foraene møter aktuelle saksbehandlere fra fakultetsadministrasjonen eller personer fra andre enheter etter behov. I tillegg er det et undervisningsutvalg på seks av instituttene som ledes av en undervisningsleder.

Studieutvalget (STUT)
Studieutvalget som er studiedekanens rådgivende utvalg består av alle programrådsledere for 14 bachelorprogrammer, 19 masterprogrammer, ett 5-årig masterprogram samt ett årsstudium. I tillegg er det fem studentrepresentanter, en teknisk/administrativ samt en åremålstilsatt. Et av målene med studieutvalget er å gi programrådsledere innflytelse over fakultetets utdanning og bidra til å etablere et nettverk mellom programrådslederne hvor også erfaringsutveksling kan foregå.

Undervisningslederforum (ULF)
Undervisningslederforum består av alle instituttenes undervisningsledere samt studiedekan og studiekoordinator. Forumet har ingen studentrepresentanter. Målet med dette forumet har vært å få en dialog med instituttene som emneeiere og ansvarlige for undervisningen. Dette er et forum for diskusjon og informasjonsutveksling mellom fakultetet og emneeierne (instituttene) om for eksempel tiltak mot fusk, omlegging til 4 timers eksamen, kloning av emner, nasjonalt kvalifikasjonsrammeverk og andre saker der det er ønskelig å finne fram til gode og praktiske prosesser og løsninger.

Undervisningsutvalg
Etter tilbakemeldinger fra Fysisk institutt, Farmasøytisk institutt, Kjemisk institutt og Institutt for informatikk eksisterer det undervisningsutvalg som ledes av en undervisningsleder (kjemisk institutt kaller det studieleder). Ansvarsområdene disse undervisningsutvalgene har er:

- Enkeltemner og samlet emneportefølje inkludert sensurordninger og eksamensordninger.
- Overordnet ansvar for at emnetilbudet er dimensjonert i forhold til tilgjengelige undervisningsressurser.
- Evaluering av emnene.
- Dialog med programrådsledere.

Samhandling med programrådslederne ved eget institutt skjer ved:
- Uformell kontakt.
- At programrådsledere blir invitert til spesielle saker i undervisningsutvalget.
- At undervisningsleder også er programrådsleder.

Sammensetningen av undervisningsutvalgene omfatter som regel vitenskapelige ansatte, studenter og stipendiater samt studiekonsulent.

Institutt for molekylær biovitenskap og Biologisk institutt har ikke etablert egne undervisningsutvalg.

Kjemisk institutt har nettopp vedtatt en omlegging av organiseringen av studier og undervisning blant annet med inndeling i undervisningsseksjoner som ledes av en undervisningsseksjonsleder. Det er utarbeidet mandat for ansvar og myndighet for undervisningsleder og andre med ansvar for undervisning.

To andre institutter, Matematisk institutt og Institutt for informatikk, melder at de nok har hatt et mandat for undervisningsutvalget, men at de er blitt borte med nye nettsider.

Erfaringer med utvalgene

Erfaringen er at det er en utfordring å få til diskusjoner i studieutvalget som munner ut i gode og overordnede beslutninger eller råd til studiedekan. Det er varierende oppmøte og programrådsledere som ikke kan møte sender ofte sin administrative programkoordinator. Saker som har vært diskutert er innføring av nasjonalt kvalifikasjonsrammeverk, rekrutteringstiltak/prosjekt, handlingsplan for internasjonalisering, ForVei, utdanningsstrategien etc. Med så mange deltagere og lite kontinuitet i sammensetningen, er det krevende å få møtene til å bli gode. Erfaringsdeling er nesten fraværende.

I undervisningslederforum er det bedre oppmøte og kontinuitet i deltagelsen. Fokus er ofte på oppfølging og iverksetting i og med at medlemmene har et faglig og operativt ansvar. Her synes det også at erfaringsdelingen undervisningslederne imellom er større enn i studieutvalget. Med færre møtedeltagere er det lettere å etablere et fellesskap og få diskusjoner med synspunkter fra alle instituttene og dermed en bredere forankring av beslutninger og prosesser.

Møtetidspunkt og gjennomføring er noe som påvirker hvorvidt et møte fungerer godt eller ikke. STUT har hatt sjeldnere (1 – 2 ganger pr semester) og lengre (1.5 – 2 timer) typisk fra kl 9 – 11. ULF har hatt kortere (1 time)og hyppigere (2 – 4 ganger pr semester) møter.

Det har vært saker der det har vært ønskelig å ha både programrådsleder og undervisningsleder tilstede i forbindelse med saker som berører både programmer og. I slike situasjoner har det vært innkalt til fellesmøte (STUTULF).

Arbeidsgruppen har ikke grunnlag for å vurdere hvordan erfaringene med undervisningsutvalg fungerer på instituttene som har det. Hvis forslaget om at programrådsledere skal ha representasjon i undervisningsutvalgene vedtas, må undervisningsutvalget formaliseres og det må utarbeides et mandat. Institutt som ikke har undervisningsutvalg må etablere et utvalg for utdanning som sikrer studentdeltagelse da det er viktig at studentene er med på å utvikle utdanningsstrategien både på program og emnenivå.

Utfordringer med tverrdisiplinære og tverrfakultære studieprogrammer

En viktig grunn for å innføre studieprogram med selvstendige programråd, var å legge bedre til rette for helhetlige studietilbud på tvers av de tradisjonelle instituttgrensene og til og med fakultetsgrensene. Dette har for en stor del vært en suksess, men har også sine klare utfordringer som særlig var aktuelle i en tidlig fase etter reformen:

- Selv om et program spenner over flere institutter er det ofte vanskelig å få det totale miljøet til å ta ansvar for programmet.
- Det er begrenset tilgang på ekte tverrdisiplinære emner som passer inn i programmet og bygger oppunder det helhetlige læringsutbyttet.
- For tverrfakultære programmer ligger det en betydelig utfordring i ulike regelverk og ulike tradisjoner innenfor studentoppfølging, undervisningsregnskap, etc.

Forslag til endringer i dagens struktur

Undervisningsstrukturen som ble innført i 2003 har hatt både positive og enkelte negative konsekvenser. Målet med eventuelle endringer må både være å dempe eller fjerne de

negative konsekvensene samtidig som de positive effektene bevares og forsterkes og at andre viktige mål ivaretas. Sentrale målsetninger med endringsforslagene i dette notatet er:

- Plassere programmene inn i linjen der ressursene er.
- Sikre at instituttene er aktivt med i utvikling av programmene.
- Sikre samhandling og kommunikasjon mellom programmene som har et faglig fellesskap.
- Skape utvalg og møteplasser som bidrar til erfaringsdeling og som fungerer rådgivende for fakultetet.
- Minst mulig byråkrati, men samtidig sikre enhetlig praktisering av regelverk og kvalitetssystem samt likebehandling av søkere og studenter.
- Få vitenskapelige ansatte ytterligere involvert i og ta ansvar for utdanningen.
- Ivareta tverrfagligheten innad på fakultetet.

Det er viktig å fastholde at fakultetet må ha det overordnede ansvar for utdanningstilbudet, både studieprogrammer og emner. I praksis vil dette ansvaret delegeres til programråd og instituttledelse, men fakultetets oppgave vil være å ta seg av naturlige fellesoppgaver, påse at det til enhver tid er gode tverrdisiplinære studietilbud, og sørge for gode løsninger ved konflikter og andre vanskelige situasjoner.

Programråd

Programrådene spiller en viktig rolle og bør ikke svekkes. Videre må rådene være representative for fagene som inngår og det må være rutiner for at «alle impliserte» høres når beslutninger tas. Ikke minst må studentene ha tilstrekkelig representasjon, noe som er spesielt viktig i de tverrfaglige programrådene.

I de tilfellene der programmene er disiplinære som for eksempel på Institutt for informatikk og Farmasøytisk institutt, vil en oppdeling i undervisningsutvalg og programråd kun innebære en arbeidsdeling, og en sammenslåing av de to vil kunne være naturlig og fungere bra. I så fall havner programrådet i linjen og rapporterer til instituttleder.

For de tverrfaglige programmene er det viktig å legge til rette for en god samhandling mellom de involverte instituttene. Organisatorisk bør ordningen med vertsinstitutt videreføres, men det er spesielt viktig at programrådene har representanter fra alle relevante fagmiljøer. Ved større programrevisjoner kan det også være aktuelt at fakultetet engasjerer seg mer aktivt i prosessen for å sikre optimal ressursutnyttelse og at det tverrfaglige aspektet ikke svekkes.

Dette skillet betyr at det bør åpnes for at tverrfaglige og disiplinære programrådene organiseres noe forskjellig fra de mer disiplinære programmene. En kan også tenke seg andre konstellasjoner som kan kreve en tredje organiseringsform. Det bør derfor ikke fastlegges absolutte krav til organisering, bare anbefalinger, med forslag til tydelige normalløsninger.

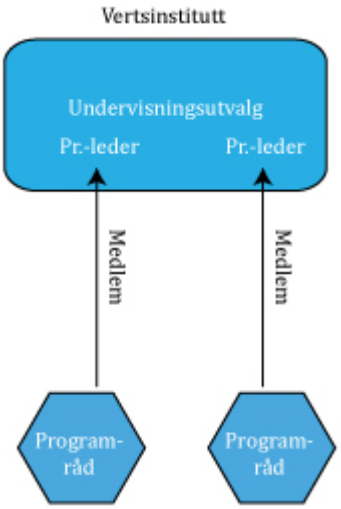
Ny struktur

Alle studieprogrammer skal ha et programråd med en sammensetning som speiler fagsammensetningen i programmet ved at de involverte instituttene har en fast

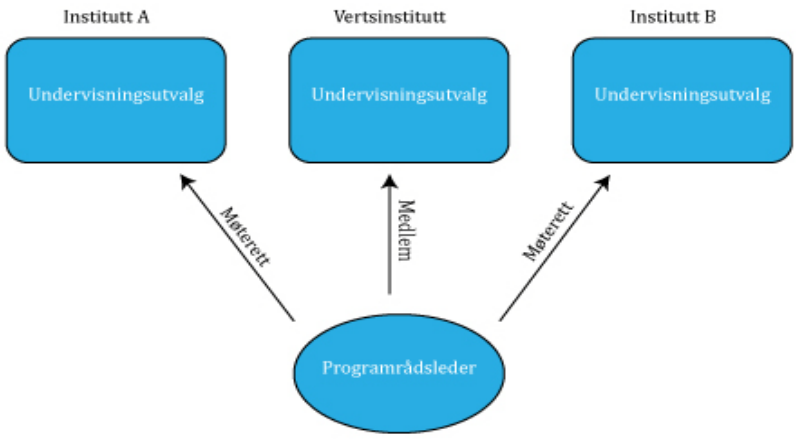
representasjon i henhold til en «fordelingsnøkkel». Disse medlemmene utnevnes av de involverte instituttene. Programrådsleder oppnevnes av vertsinstituttet for programmet.

Det daglige ansvaret for programmene legges til instituttene og da fortrinnsvis til vertsinstituttet. For å sikre at programmene får innflytelse på instituttenes undervisnings-tilbud, er det svært viktig at programrådslederne trekkes inn i arbeidet i undervisnings-utvalgene. Det er videre viktig å sørge for en tydelig rapporteringslinje fra programråds-ledere til fakultetet, men for å unngå uklare ansvarsforhold må dette heretter organiseres via linjen. I praksis betyr dette at programrådslederne rapporterer via vertsinstituttenes undervisningsledere. Disse endringene vil medføre at man får et langt mer helhetlig grep omkring utvikling av emner og programmer, samtidig som det tydeliggjør ansvarsforholdene. Spesielt er det viktig at instituttene får et helhetsansvar for utvikling og vedlikehold av emner og programmer. På bakgrunn av dette foreslår arbeidsgruppen at:

1 - Programrådsleder går inn i undervisningsutvalget ved sitt vertsinstitutt.



2 - Programrådsleder for et tverrfaglig program er både medlem av undervisningsutvalget ved sitt vertsinstitutt samt har møterett i undervisningsutvalg på institutter som er involvert i det tverrfaglige programmet.



3 – De institutt som ikke har et undervisningsutvalg etabler et utvalg for utdanning som også inkluderer studentrepresentasjon.

For disiplinære studieprogrammer kan programråd og undervisningsutvalg slås sammen. Undervisningsleder utnevnes av instituttleder.

Mandat for henholdsvis programråd og undervisningsutvalg må justeres i tråd med de endringene som blir vedtatt. Der det ikke eksisterer mandat for undervisningsutvalg må det etableres og da i henhold til de overordnete føringene fra fakultetet.

Fakultetet vil fortsatt stå som eier av studieprogrammer og emner. Dette innebærer at det er fakultetets oppgave å vurdere opprettelse og nedleggelse av studieprogrammer, studieretninger og emner ut fra fakultetets overordnede strategier. Ved eventuelle konflikter vedrørende programmer og emner på eller mellom instituttene, er det fakultetet som har ansvaret for å finne fram til løsninger.

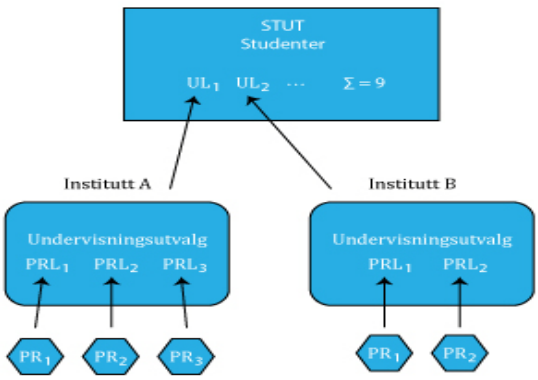
Internt på hvert institutt vil programrådsleder og undervisningsleder arbeide tett sammen, men programrådsleder vil være underordnet undervisningsleder. Programrådets hovedansvar vil være å sette samme enkeltemner til en helhet og sørge for god daglig drift av programmet. Undervisningsutvalget vil ha som sitt hovedansvar forvaltningen av emneporteføljen. Studentene skal være representert i både undervisningsutvalg og programråd i henhold til vanlige regler. Det er også mulig å ha felles undervisningsutvalg og programråd der dette er faglig begrunnet.

Kvalitetsansvar

Som eier av studieprogrammer og emner og har Fakultetet fortsatt det overordnede ansvar for kvalitetssikring og for at programmene utgjør en helhet og har en profil som er i overensstemmelse med fakultetets strategier. Instituttene vil imidlertid få delegert det operative ansvaret fra fakultetet for kvaliteten både på programmer og emner. Instituttene skal videre levere kvalitetsrapporter til fakultetet. Slik det ser ut til nå vil UiO samkjøre rapporteringen på studiekvalitet med ordinær (tertial)rapportering.

Utvalg

På bakgrunn av erfaringene med de to utvalgene STUT og ULF samt strukturen på den foreslåtte modellen, bør et nytt rådgivende organ for studiedekanen bestå av undervisningsledere og studentrepresentasjon:



Denne møtearenaen minner om dagens ULF som pr i dag har 4 programrådsledere blant sine 9 undervisningsledere men som ikke har studenter med. Her trengs det et nytt mandat som sikrer studentrepresentasjon samt en avklaring i forhold til programrådene og instituttenes utvalg for undervisning.

For å sikre innspill, erfaringsdeling og forankring kan det jevnlig (1 gang pr semester eller år) arrangeres undervisningskonferanse der alle undervisningsledere, programrådsledere samt programrådsrepresentanter inviteres i tillegg til eventuelt instituttledere. Dette er erfaringsmessig et bedre format på møter med så mange deltagere. Formålet med undervisningskonferansen er å motivere og inspirere til kontinuerlig forbedring av fakultetets utdanningstilbud og læringsmiljø.

Utifra sak vil fakultetet kunne innkalle programrådsledere enten bachelor eller master eller begge, til ad hoc møter. Dette vil tilsvare andre møtearenaer som ligger utenfor linjen:

- STUA møte mellom fakultetets studieadministrasjon og studieadministrative på instituttene.
- Møte mellom kontorsjefene og fakultetets administrative ledelse.

Kopi av innkalling til og eventuelt referat fra slike møter, bør sendes i kopi til undervisningslederne.

Oppsummering

Den viktigste endringen arbeidsgruppen foreslår er at programmene heretter plasseres inn i linjen under instituttene. Dette er en løsning som harmonerer med dagens system for ressurstildeling. Vi mener også dette er et helt nødvendig grep for å sikre at instituttene får et tydelig helhetsansvar for utvikling og vedlikehold av programmer og emner. Dagens organisering der dette ansvaret er delt mellom programråd og institutt er i det lange løp ikke bærekraftig i så henseende.

En linjestruktur har opplagt noen utfordringer i forhold til tverrfaglige programmer, men vi mener at disse vil bli håndtert tilfredsstillende ved at man kan beholde programrådene, og sikre representasjon i disse på tvers av instituttgrensene. I tillegg minner vi om at fakultetet fortsatt bør ha et særlig oppfølgingsansvar overfor disse programmene for å sikre optimal ressursutnyttelse og at det tverrfaglige aspektet ikke svekkes.

En logisk konsekvens av å legge programmene inn i linjen under instituttene er at verts-instituttene også får ansvar for å oppnevne programrådsledere. De øvrige programråds-medlemmene oppnevnes av de involverte instituttene. Dette vil samtidig forenkle dagens omstendelige prosedyre der programrådslederne oppnevnes av fakultetet etter forslag fra vertsinstituttene.

En annen nødvendig konsekvens av linjestrukturen er at rapportering også må følge den samme linjen. Det er naturlig at dette løses ved at programrådene rapporterer til vertsinstituttets undervisningsleder. Vi mener at dette vil redusere byråkratiet til et minimum, og dessuten redusere dobbeltarbeid.

Arbeidsgruppen foreslår på bakgrunn av dette:

- Det løpende ansvaret for programmene overføres til instituttene.
- Instituttene oppnevner programrådsledere for egne programmer.
- Programrådsleder blir medlem av undervisningsutvalget ved vertsinstituttet.
- Institutt som ikke har et undervisningsutvalg må etablere et utvalg for utdanning som sikrer studentrepresentasjon.
- Programrådsleder på tverrfaglige program har møterett i undervisningsutvalg/utvalg for utdanning ved de instituttene som er involvert i programmet.
- Programrådsleder rapporterer til undervisningsleder ved vertsinstituttet.
- Undervisningsutvalgene/Utvalg for utdanning formaliseres og det utarbeides mandat som sikrer programrådsledere representasjon hos vertsinstitutt og eventuelt møterett hos involverte institutter.
- Representasjonen i programrådene speiler den faglige sammensetningen av programmet.
- Ved tverrfaglige program er det de involverte instituttene som oppnevner sine representanter til programrådet.
- Studiedekanens rådgivende organ vil bestå av undervisningslederne og studenter.

Til: Instituttstyret ved Biologisk institutt

Sakstype: Orienteringsak

Saksnr.: O-sak IS 14/2011

Møtedato: 8.12.11

Notatdato: 1.12.11

Saksbehandler: Maren Onsrud

Sakstittel: Møteplan for Instituttstyret 2012

Ut fra årets erfaringer og fakultetets møteplan for 2012 foreslår vi følgende møteplan for styret ved Biologisk institutt:

15. mars
7. juni
11. oktober
6. desember