

BIG4: Biosystematics, informatics and genomics of the big 4 insect groups- training tomorrow's researchers and entrepreneurs

Kick-Off Meeting
14-18 September 2015
Copenhagen, Denmark



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UNIVERSITY OF COPENHAGEN



Natural History Museum of Denmark, its insect (mainly beetles) collection and curation

Alexey Solodovnikov & Sree Selvantharan

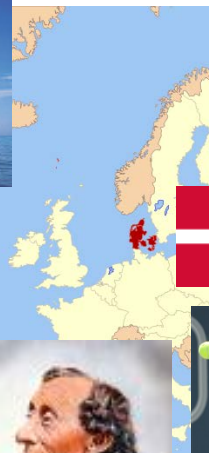


Collections-friendly Denmark

Kingdom of Denmark
(Denmark + Greenland + Faroe Islands).
Global outlook

Small country: 43,094 m²; 5,519,441 people;
Danish language, good English command (9%-
foreign citizens), science, technology and
education are valued

Free market capitalist economy + welfare
state = “The happiest country in the world”.
Happiest collections?



CARLSBERGFONDET

THE VELUX FOUNDATIONS

VILLUM FONDEN × VELUX FONDEN

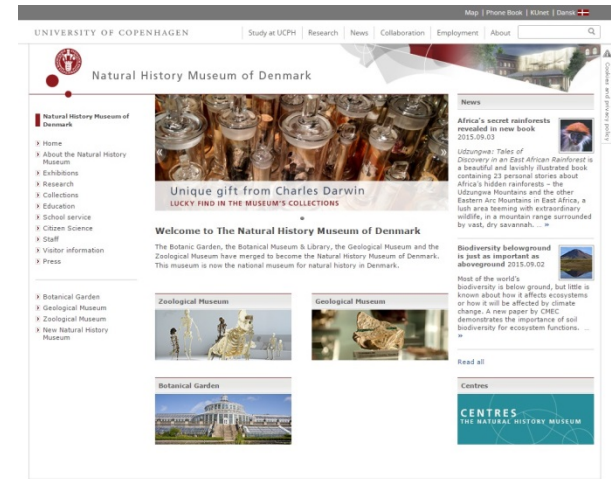


SNM, part of the University of Copenhagen: good or bad for collections?

University of Copenhagen (best in Scandinavia)
Faculty of Science



The new museum (2020)



ZMUC as part of SNM: good or bad for entomological collection?



ZMUC:
>100 employees;
Biosystematics
Department,
Collections Department



Universitetsparken 15, 2100 CPH



Snapshot of history of ZMUC:

<http://www.zmuc.dk/headweb/old-museum.htm>



The Naturalia and Housekeeping Cabinet, Charlottenborg, 1759 - 1772

Count A.G.Moltke's collection, Amalienborg, until 1810

The Danish Natural History Society collection, 1833 - 1847

Eschricht's Anatomical-Physiol. Museum, purchased 1841

Christian VIII's collection, Amalienborg, until 1848

UNIVERSITY COLLECTIONS

Thomas Bartholin's Chamber of Natural Objects in Domus Anatomica, 1657 - ca. 1676

Brünnich's New Natural Theater, Kommunitets Building, 1770

Count J.G.Moltke purchases the collection 1810

New premises in the Kommunitets Building, 1838

The museums united 1862

ZOOLOGICAL MUSEUM

The Krystalgade building opened 1870

The building in Universitetsparken opened 1963

The exhibitions opened 1970

Frederik III's Kunstkammer, ca. 1650 - 1821

The Royal Natural History Museum, Østergade, 1805

Transfer to Count Holstein's Mansion, Stormgade, 1821

THE ROYAL KUNSTKAMMER AND THE ROYAL NATURAL HISTORY MUSEUM

Museum Wormianum, ca.1620 - 1655

The Gottorp Kunstkammer to Copenhagen 1713

The Natural History Society collection, Prinsens Palæ, 1789 - 1805

The Royal Museum at Rosenborg ca.1800 - 1821

The Danish Natural History Society collection, 1833 - 1847

History of Danish zoology (Wolff 1979)

History of Danish entomology (Henriksen 1921-37)



Entomologists at the Biosystematics



Nikolaj Scharff, Arachnida



**Lars Vilhelmsen,
Hymenoptera**



Thomas Pape, Diptera



Henrik Enghoff- Myriapoda



**Niels Peder Kristensen – Lepidoptera,
and phylogeny of insect orders**



Ole Karsholt



Jan Pedersen



David Cheung



Anders Illum



Mikkel Høegh Post



Ole Martin

Curators:

Research
Curation

UC Teaching:

Arthropod
systematics,

Zoological
Systematics,

Fieldcourse:
Terrestrial arthropods

Assistant Curators:

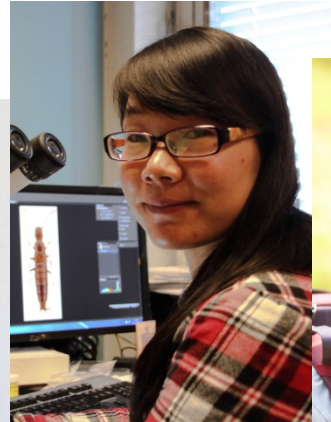
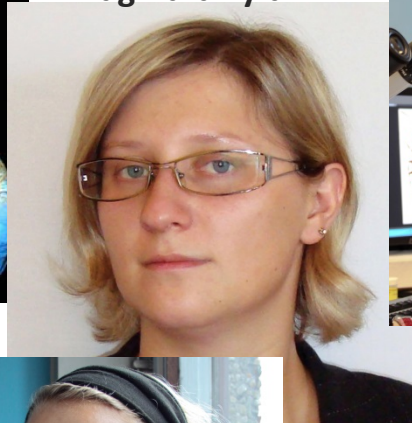


Entomology BSc, MSc, PhD, post doc students



Sofia Reboleira

Dagmara Żyła



Xiao-Yan Li



Adam Brunke



Cecilie
Svenningsen



Eliana Buonaventura



Line Kræmer



Andrea Schomann



Gustavo
Miranda



Mathias Justesen



Aslak Hansen



Guest researchers & our dear volunteers



Verner Michelsen



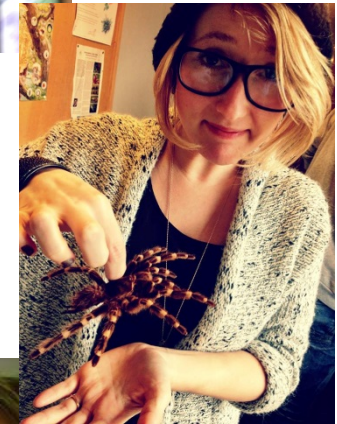
Vesper Verdich



Clæs Theilgaard



Oluf Georg



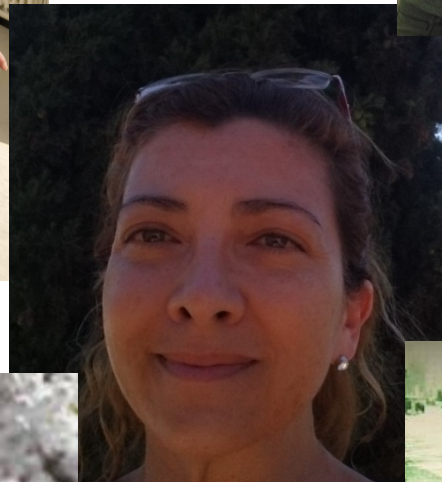
Mariaelisabeth Laursen



Peter Nielsen



Ken Puliafico



Mariana Chani



Tina Fjeldsted



Ku-based Entomology courses, as a link to larger pool of students




Feltbiologi II
Terrestrisk Zoologi 2015

Kompendium til sommerkursus på Kristiansminde

Statens Naturhistoriske Museum
Zoologisk Museum
Københavns Universitet

Bacheloruddannelsen i Biologi, 1. år, blok 5



Dry (pinned) beetle collection: world

At least 3,000,000 specimens
 (10 cabinet sections: >6000 full drawers):
 ca.60% in unit trays; Junk & Schenkling cat.

Geographic strengths:
 Palearctic, Ethiopian Region (East Africa),
 Oriental Region

Particular taxonomic strengths:
 Carabidae, Hydrophilidae, Staphylinidae

Unsorted pinned accessions: >100 drawers:
 Palearctic, Tanzania; Laos; New Zealand,
 Australia, etc.



Danish collection, faunistics



Synoptic collection



>600 drawers

Mogens Holmen
 Ole Vagtholm-Jensen
 Ole Martin
Ole Mehl
Viggo Mahler
 Jan Boe Runge
 Henning Liljehult
 Gunnar Pritzl
 Palle Jørum
 Henning Pedersen
 Mogens Hansen
 Hans Gønget
 Kristian Arevad
 Sigvald Kristensen
 Philip Francis Thomsen
 Hans Peter Ravn
 Jan Pedersen

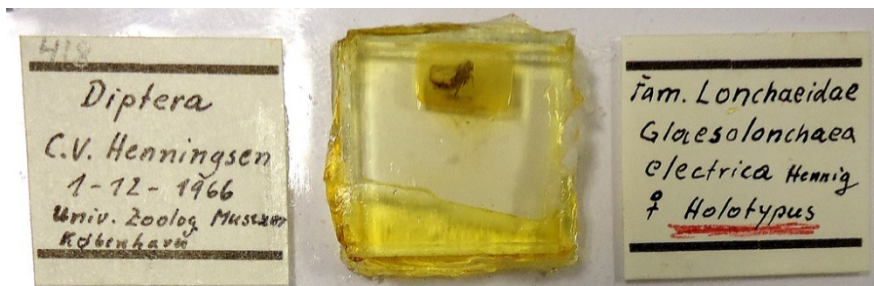
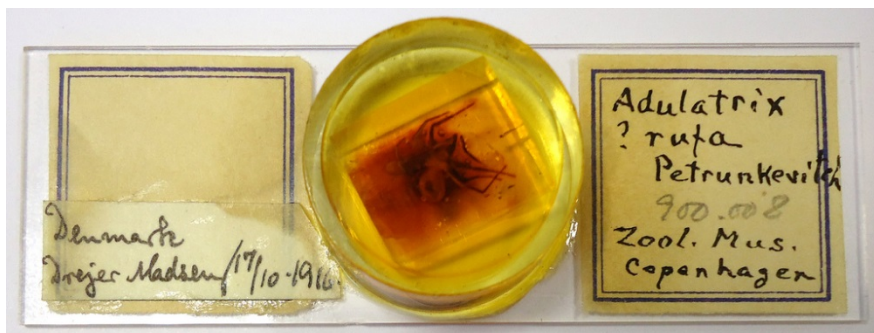
Wet (alcohol) collection



Unmounted stuff from most recent expeditions (e.g., Laos, E Australia, 2008); Large backlogs from Tanzania, other countries; large series of beetles from Denmark, Greenland, Iceland, Faroe Islands. Important beetle larvae collection, especially good for Denmark;

DNA quality material: in -20C kitchen freezer... so far.

Fossils



Organization by the World catalogue



History: constant growth of beetle collection, but no long-term ZMUC employed coleopterist in past decades

Johann Christian
Fabricius (1745-1808)



Jørgen Christian
Schiødte
(1815-1884)

N.T. Lund, O.R. Sehested, B.W. Westermann, C.R.W. Wiedemann

G. Bøving, K. Henriksen, E. Zimsen, S.G. Larsson



V. Hansen
(1889-1974)



M. Hansen
(1956-2000)

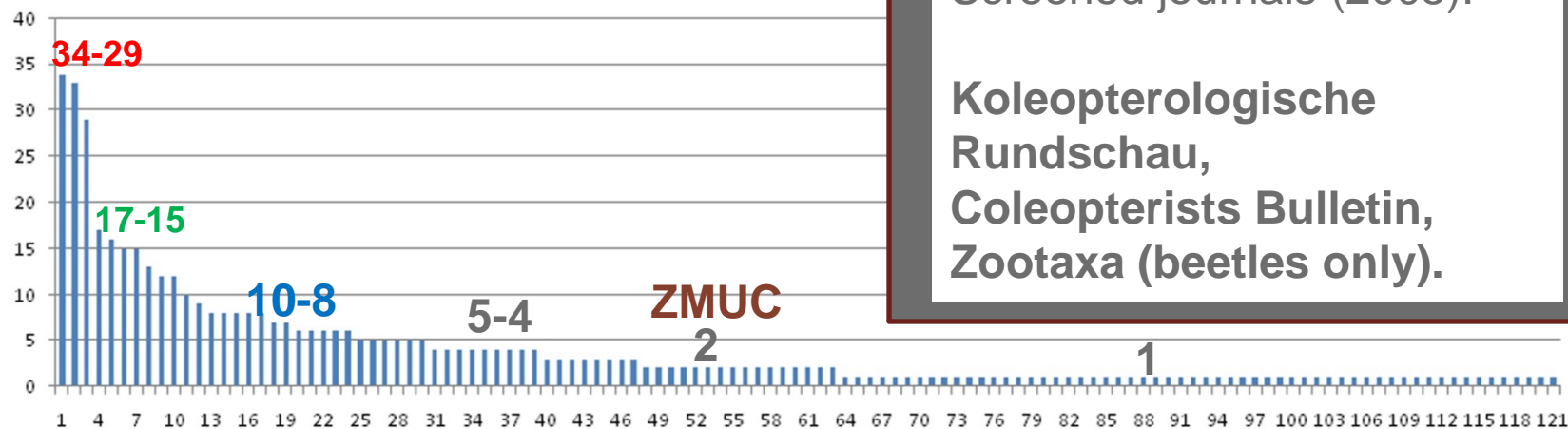


Ole Martin



'Sleeping beauty': Relative impact of the Beetle Collection of ZMUC early 21st century

N of papers, where respective collection acknowledged as source of material



Screened journals (2005):

Koleopterologische Rundschau,
Coleopterists Bulletin,
Zootaxa (beetles only).

Mentioned collections (121 in total)

34-29

NHM, London
Smithsonian
NHM, Vienna

10-8

Essig Ent. Mus.
INBio, Costa Rica
Nat. Mus. Prague
Florida State Col.
Inst. Zool. China

17-15

MNHN, Paris
FMNH, Chicago
Canadian Mus. of Nat.
Mus.Comp. Zool. USA

5-4

Nat. Hist. Mus., Stuttgart
Nat. Univ. Mexico
Zool. Mus., Lund
Univ. of Kansas, USA
Austral. Nat. Ins. Col.
Nat. Hist. Mus. Geneve

2

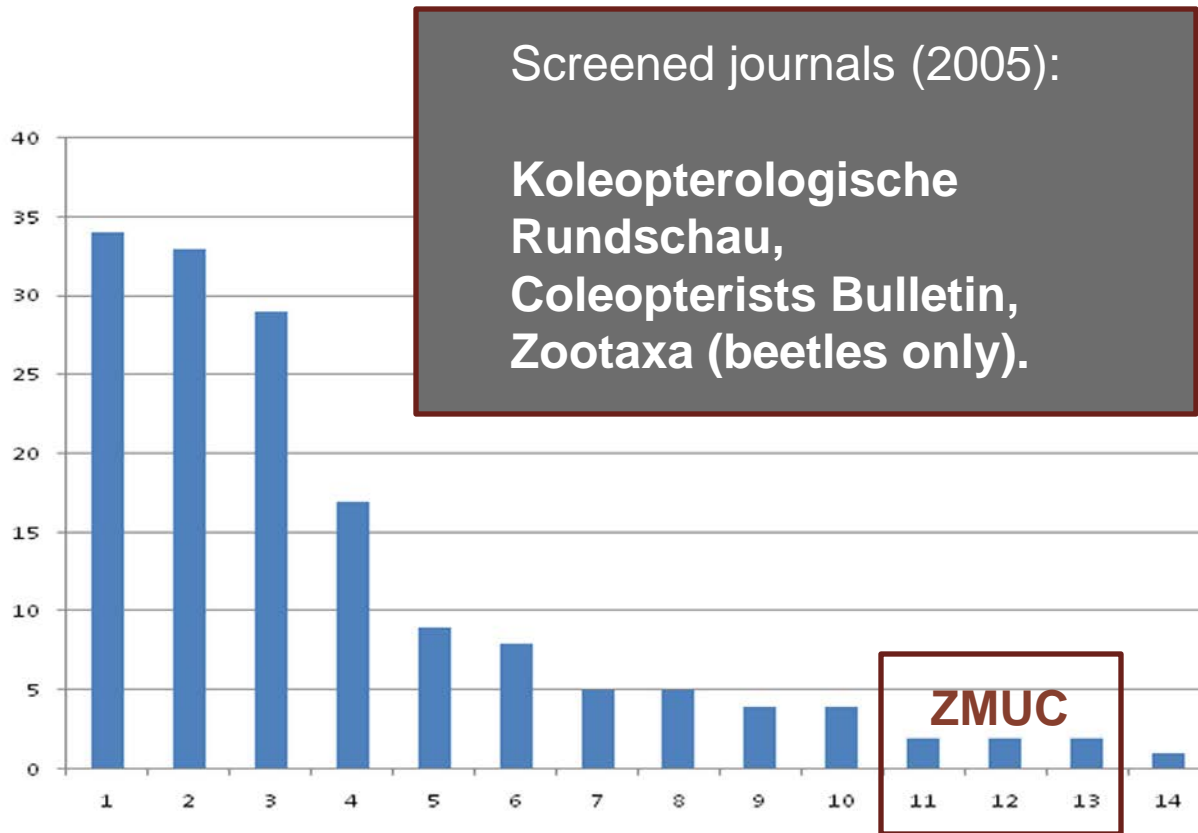
Nat. Mus., Chile
Naturalis, Leiden
Nat. Hist. Mus., Stockh.
Mus. Centr. Afr., Terv.
ZMUC
Inst. Syst. Evol. Poland

1

Mirzayans Mus. Iran
Bratislava Nat. Mus.
Ent. Mus. Ecuador
Canterbury Mus. NZ
Santa Barb. Mus. USA
West. Austral. Mus.



'Sleeping beauty': Relative impact of the Beetle Collection of ZMUC early 21st century



1. **NHM, London (34)**
2. Smithsonian (33)
3. NHM, Vienna (29)
4. MNHN, Paris (17)
5. Inst. Zool. China (9)
6. INBio, Costa Rica (8)
7. Austral. Nat. Ins. Col. (5)
8. Univ. of Kansas, USA (5)
9. Zool. Mus. Lund (4)
10. NHM, Stuttgart (4)
11. **ZMUC (2)**
12. Nat. Hist. Mus. Stockh. (2)
13. Naturalis, Leiden (2)
14. Mirzayans Mus. Iran (1)

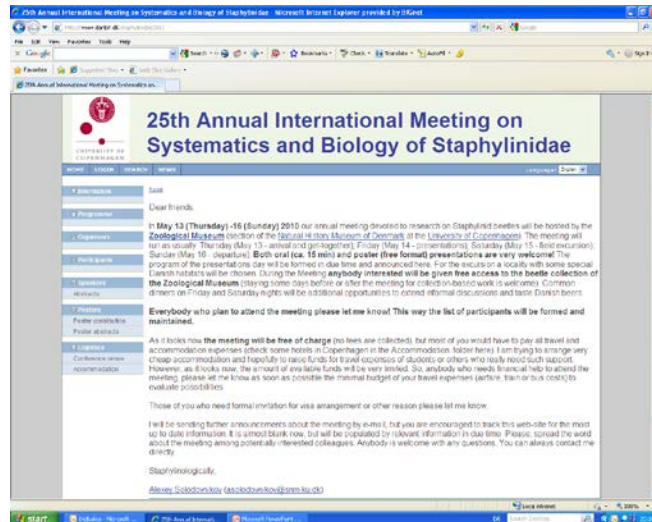


Goals and priorities

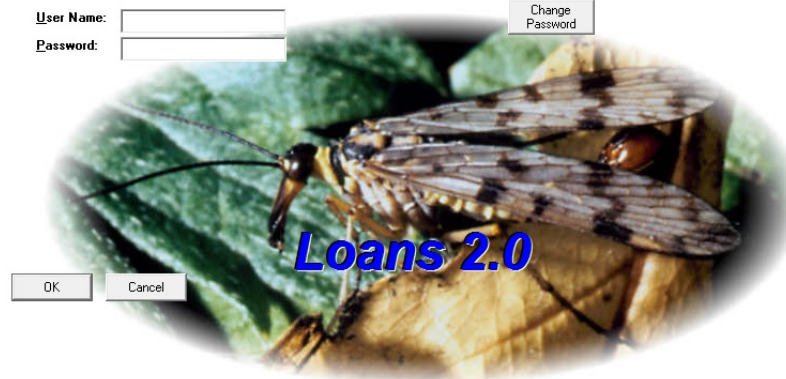
1. Robust loan/visitor traffic (shift from types to unrevised material)
2. Regular fieldwork in biodiversity poorly known areas: world representation of genera for Staphylinidae
3. DNA-tissue collection, at least for Staphylinidae project
4. Efficient workflow for sorting backlogs, pin-mounting and integrating accessions, with students
5. Entire beetle collection to unit trays, upgrade of the systematic arrangement
6. Efficient databases and on-line representation



Loan/visitor traffic



Prague



OK Cancel



Beutelsbach



Ref # 07091547490 Date 07-09-2015 Done!

To:

Arranged by Alexey Solodovnikov Cancel

of the Entomology department

Collection labels Kind Loan Notes

Return date 07-09-2016

Loaner e-mail

Write copy of loan sheet returned

COLEOPTERA

Expand

Regular fieldwork



Russian Far East



Costa Rica



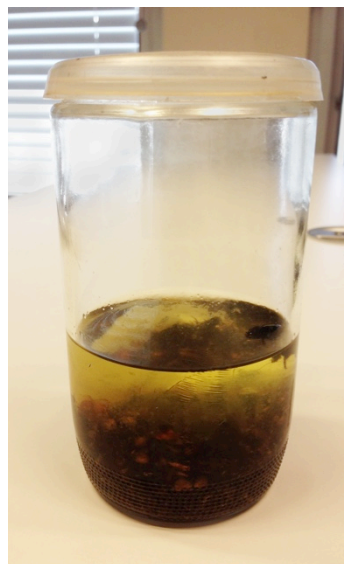
Skyros, Greece



Efficient workflow for sorting backlogs, pin-mounting and integrating accessions



Collecting



Bulk Sorting



Mounting



Databasing,
loans, ID



Publication



Sorting & Storing



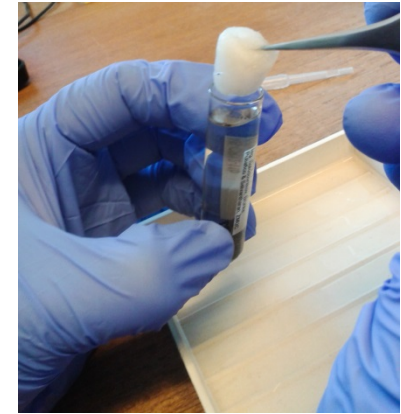
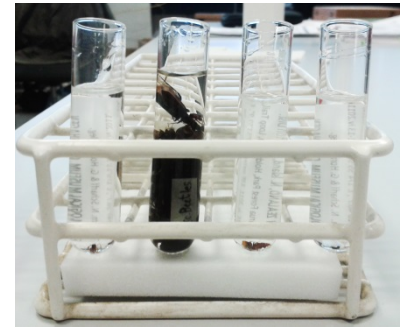
Bulk samples



to



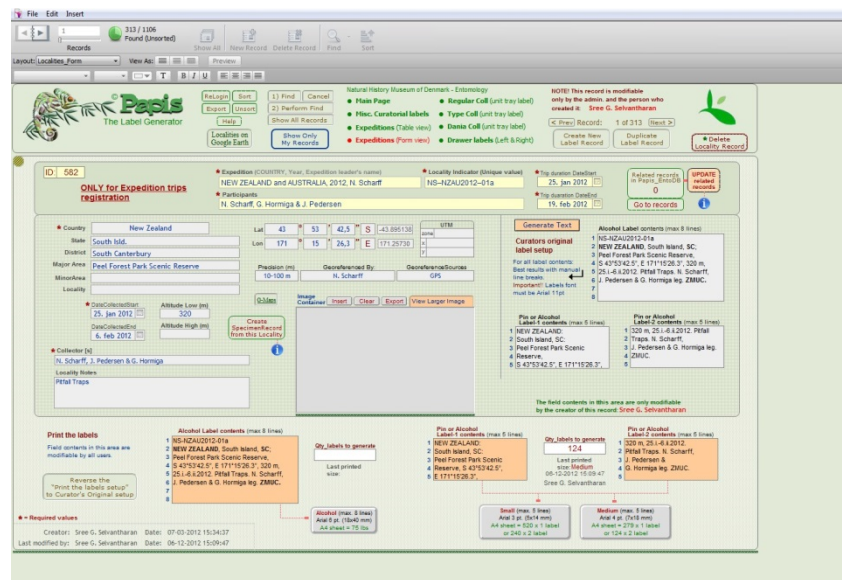
this!



Sorting Workflow



Mounting & labelling



DNA tissue collection

Frysís - Freezís DNA sample management for Papis at ZMUC

Category	Subcategory	Specimen	DNACode	Extraction date	Extraction time
Stephens	Boraginaceae	870202	AMS	10-12-2008	
Stephens	Flacourtiaceae	PIE0101a	AMS	14-07-2009	
Stephens	Flacourtiaceae	PIE0101b	AMS	08-03-2011	
Stephens	Boraginaceae	870203	AMS	17-09-2008	
Stephens	Boraginaceae	AD16	AJB	10-01-2010	
Stephens	Labiataceae	LAT0111a	AMS	14-07-2009	
Stephens	Labiataceae	LAT0111b	AMS	08-03-2011	
Stephens	Asteraceae	ADT001	AMS	08-03-2011	
Stephens	Boraginaceae	AD18	AJB	10-01-2010	
Stephens	Scrophulariaceae	SC1001	AMS	08-03-2011	
Stephens	Boraginaceae	AD17	AJB	10-01-2010	
Stephens	Boraginaceae	AD19	AMS	08-03-2011	
Stephens	Boraginaceae	AD20	AJB	10-01-2010	
Stephens	Boraginaceae	AD19	AJB	10-01-2010	

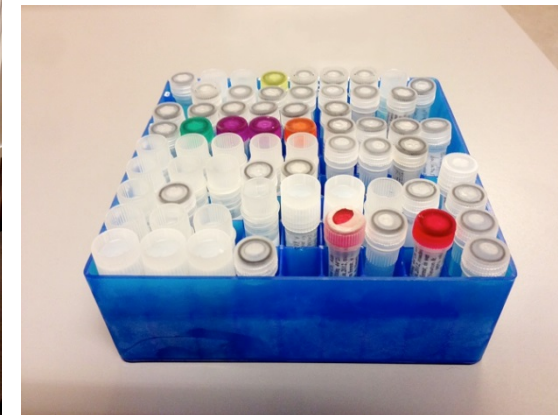
Extraction ATTENTION: NO SECURITY NET
[to overview](#)

CatalogNumber: ZMUC00045831 | DNACode: 831E1 | Storage: EBOX 96%

Extracted by: JKH | Date: 25-09-2014 | body part: [] | Notes: []

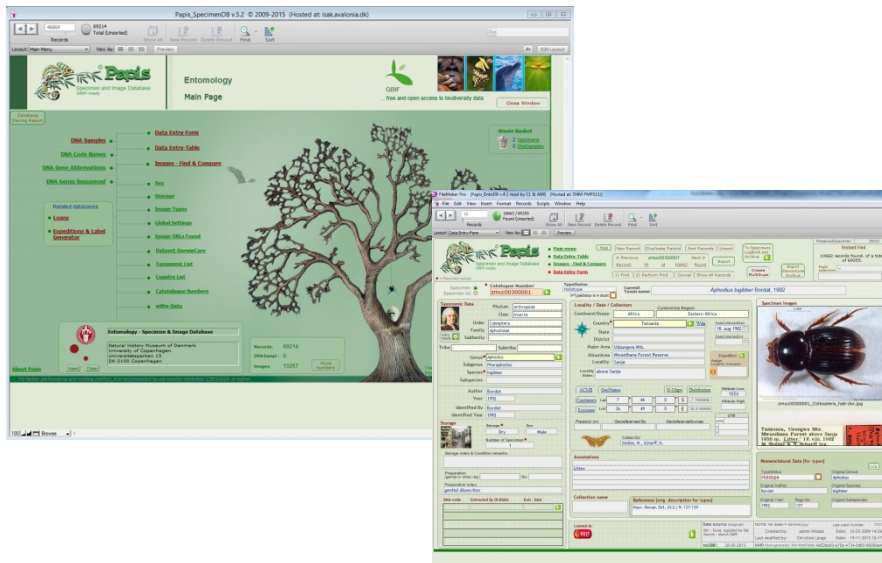
Order: Carabidae | Family: Carabidae | Subfamily: [] | Species: [] | Freezer label: CAREFUL!
 Title: [] | Subtitle: [] | zmuc00045760
 Carabus arvensis | Country: Denmark | Locality: Lave Kibstrup, Østjylland | Denmark

locus	dbank acc. no.	seq. by	seq. date	amplification protocol	sequence	GenBank



Databasing

From PAPIS to Specify



Accession integration



Ole Mehl's collection



Ex coll.
Ole Mehl

Mapping of the receptor
collection



Pinning 'Ex coll.' Labels for
donor collection &
moving to new unit trays



Integrating specimens
to the donor collection