Automated mass-digitisation line for individual insect specimens

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Digitarium / Riitta Tegelberg
Finnish digitisation service centre specialised in high-performance (mass -, large scale -) digitisation of natural history collections

In University of Eastern Finland, Joensuu campus

Co-operation with the Finnish Museum of Natural History (= Luomus, in University of Helsinki) and the National Digital Library of Finland

www.digitarium.fi
Tasks

- Development of methods and processes
- Research (e.g. tools for automatic processing of data)
- Training of specialists, knowledge dissemination
- Digitisation services for museums
Insect collections in Finland

- At Luomus: around 9 million specimens, mostly butterflies, beetles and two-winged Diptera
- + other museums and private collections: total of 20 million specimens

Of the specimens, less than 5 % have been imaged and 15 % databased
Imaging of insects: challenges

- variable sizes
- reflective exoskeleton
- number and position of labels
- fragile structures
- small morphological details
- 3D...
Imaging process at Digitarium: insects

- Before arriving to Luomus, insect collections will be digitised at Digitarium
- Only specimens, images, and metadata are welcomed to Luomus
- -> imaging of individual specimens
Is it possible to digitise insect specimens using conveyor belts?

...this is what we have...

Maybe a smaller version..?
A couple of months later:

Automated digitisation line for insects, Buggy, was born

- Individual insects are transferred through conveyor belt system on pallets
- Specimens and labels remain pinned
- Cameras produce top (insect) and side images (insect and labels)

- [https://www.youtube.com/watch?v=Z2tW1NkxEdU&feature=youtu.be](https://www.youtube.com/watch?v=Z2tW1NkxEdU&feature=youtu.be)
Buggy: present performance

- Specimen size 0.5 – 35 mm
- New specimen imaged every 14 s (max)
- Max 250 specimens per hour
- In practice, process = 4 min
- 2 operators: ±500 specimens / day / line
- Resolution of images: from the top 25 Mpix, from the side 14 Mpix
On-going Coleoptera test drive, outcomes

- Digitisation of a specimen produces 2 TIFFs, 3 JPEGs, properties file, metadata file = 10 MB
- Presently 12 000 / 13 000 specimens digitised (in 1.5 months)
- Metadata: collector’s name, taxon, (date) (data entry by Digitarium)
- Collector’s accession books have been digitised and databased (accession number, locality, date; data entry by Luomus):
Obstacles during the development

- *ID labels have to be really small (handling difficult)* – duplex printing: same information on both sides
- *Not available* – palletts that carry the specimens are self-made out of plastic by using a 3D-printer
- *Mirror writing* – to make text (dates) from mirrors human readable, software produces third image
Future for Buggy

- Buggy will be part of the everyday digitisation process

- New property: focus stacking by using automated StackShot™ camera rail
  Test with parasitoid wasp collection (*Parasitica*)

- Testing with differently pinned / glued specimens

- Need for in-demand label printing

- Pre- and post-processing development (*need for speed*)
digitise!

Thank you