

Deadline for application November 26, 2010

Masters project in bioinformatics 30 Credits, spring 2011

Forensic entomology – insects as evidence

Species determination by means of molecular genetics

Research goal

With a bioinformatics approach we would like to use published fly (Diptera) whole genome sequences to search of species-specific differences that can be used for DNA analysis. To verify differences a phylogenetic test between selected sequences will be included. For validation of inter- and intra species specific differences must we also want to include a test of a s.c. what is called sample saturation (Ewans 1972).

Background

Forensic entomology refers to the knowledge of insects and their relevance in forensic casework. Establishing a time frame is crucial in all investigations concerning for example unattended deaths and criminal neglect. Forensic entomology (the analysis of insects and other arthropods in criminal investigations) offers estimates of the post mortem interval (the time that has elapsed since death occurred) up to several weeks after death has occurred. During the warm season insects will arrive to a cadaver within minutes of deposition and if the cadaver is left they will colonize the body in succession waves until there is nothing left to feed upon. The presence of different insect species on a corpse can give us an estimate about the time of death, and sometimes also if the body has been moved since death occurred and potentially knowledge of other ante- and perimortem circumstances. Traditionally morphological characters have been used to determine entomological material to species level, but for difficult species or heavily decomposed larval remains, genetic determination may be used to aid the forensic entomologist.

We have started a project for molecular genetic determination of seven species (*Calliphora vomitoria*, *Calliphora vicina*, *Calliphora loewi*, *Calliphora subalpina*, *Cynomya mortuorum*, *Lucilia sericata* and *Lucilia illustris*). We started with published sequences from the Cytochrome oxidase 1 (CO1) and the 28S ribosomal RNA (rRNA) genes. However, several of our species had not been sequenced for these genes. We succeeded to distinguish between them and also to determine or distinguish between 8 anonymous samples. Still, species determination for several of them could not be done due to lack of reference sequences.

Project

The project is suitable as a final thesis for a master's student with special interest in bioinformatics, molecular genetics (DNA) and biology. The project is designed to mostly consist of *in silico* laborations. At the end of the project some *in vitro* laborations might be included. The project corresponds to 30 Credits (Spring term 2011). The work will be done at the Department of Forensic Genetics and Forensic Toxicology, National Board of Forensic Medicine in Linköping. Supervisors Associate professor in forensic genetics, Gunilla Holmlund and Ph.D. entomologist Anders Lindström at the Section for Environment and Biosecurity, Department for Chemistry, Environment and Feed Hygiene, National Veterinary Institute, Uppsala. At the end of the project some *in vitro* DNA analyses might be included.

Requirements

Some knowledge in the Swedish language is appreciated since it is the main language at the genetics department in Linköping. For application send a short presentation of yourself, your CV, a copy of the LADOK (courses you have attended) any other information of importance, and the names and contact information of two reference persons to the address below.

Reference

Ewens WJ (1972) The sampling theory of selectively neutral alleles. *Theor Popul Biol* 3:87-112

Contact person

Gunilla Holmlund Ph. D. Doc.
Associate professor in Forensic Genetics
National Board of Forensic Medicine
Department of Forensic Genetics and Forensic Toxicology
Artillerigatan 12
SE-587 58 LINKÖPING
Sweden

IKE Department of Clinical and Experimental Medicine
Faculty of Health Sciences
Linköping University

Phone: int + 46 13 25 21 44
Mobile: int + 70 756 17 32
Fax: int + 13 13 60 05

gunilla.holmlund@rmv.se