

Mørkhøj Bygade 19
2860 Søborg
Denmark

24 April 2012

Final report

- 1) The purpose of the visit was to look at thermal performance, and flight and locomotor activity in three European populations of *Musca domestica*. The project was carried out in Barcelona, Zürich and Aarhus. The study had the following aims:
 - To establish the thermal performance curve for a Danish, Swiss and a Spanish population of *Musca domestica* to determine if populations show evidence of thermal adaptation along a latitudinal gradient.
 - To establish locomotor activity and flight activity of a Danish, Swiss and Spanish population at different temperatures to determine whether populations show evidence of behavioural adaptation to thermal stress.

- 2) In autumn 2011 a Spanish, Swiss and a Danish population of *M. domestica* were collected. The identification of the flies has been done based on morphological traits and we plan to carry out sequence analysis on the COI gene to ensure that there is no cryptic species in the culture and establish the phylogenetic relationship between populations. Furthermore,

the Spanish population has been tested for Wolbachia and we also plan to do this on the Swiss and Danish population. Furthermore, the thermal performance of both sexes has been established for all three populations. Locomotor activity has been established for males from all populations at 24.0°C, 40.0°C and 43.0°C. Flight activity has been established at 40.0°C and will also be established at 24.0°C for both sexes and all three populations. Lastly flight distance will be corrected for by wing size.

3) Results:

Thermal performance: Thermal performance curves have been established for both males and females (Fig. 1) for all populations. It is clear that the Spanish flies show a higher survival for both males and females at 44°C and 45°C. However, the performance curve for male flies from Denmark will have to be replicated due to problems with addition of food during testing, causing higher than expected mortality.

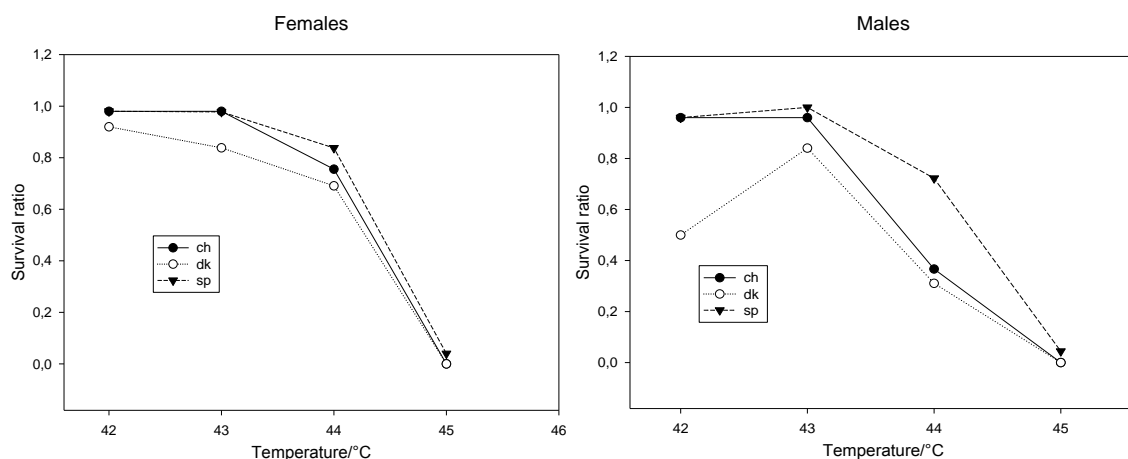


Fig. 1: Survival proportion of males and females after 120 min exposure (means) at different temperatures. Survival was measured after 24 hours of recovery. Ch=Swiss, dk=Danish, sp=Spanish.

Locomotor activity: Locomotor activity for males was tested at three temperatures, 24.0°C, 40.0°C and 43.0°C. During daytime at 24.0°C the Swiss population showed the highest activity, followed by the Spanish and Danish (Fig. 2). The clear population differences at 24.0°C are clear cut and await further analysis. However, during nighttime there were no differences between populations. At 40.0 °C the flies survived longer than expected and the differences between populations is not as clear as at 24.0°C. However, the Spanish flies stayed alive for a longer time, but did not show higher activity. This pattern is even more pronounced at 43°C (Fig. 4), where the Spanish flies not only survive for a longer time, but also show higher activity.

Flight distance: Without correction for wing size, the Spanish female flies fly the longest distance at 41°C, followed by the Swiss and Danish female flies. The latter two populations show the same flight distance. For male flies, the Swiss flies, fly slightly longer than the Spanish flies. The Danish flies show the shortest flight distance. The results obtained at 24.0°C await further analysis and correction for wing size.

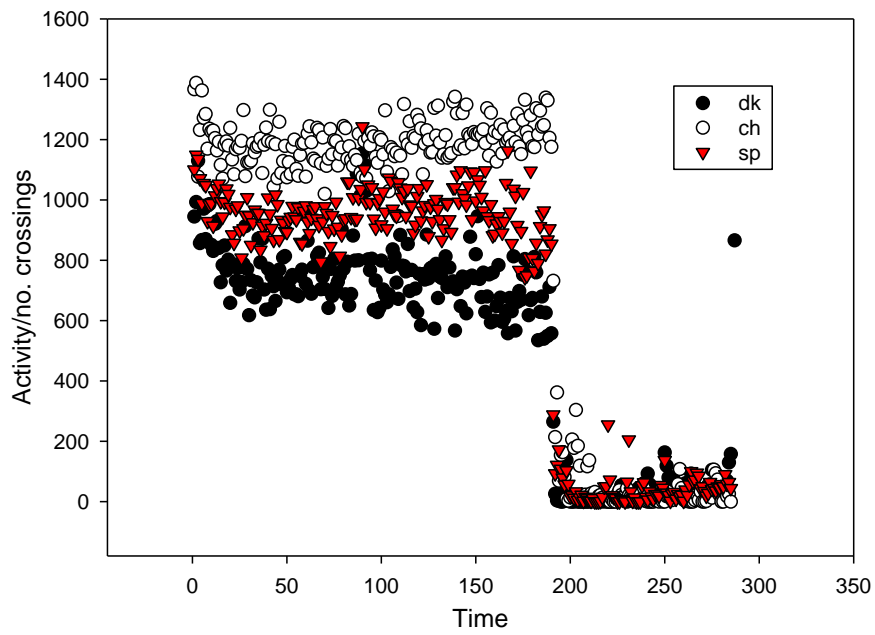


Fig. 2: Locomotor activity of males measured during a full L:D cycle at 24.0°C. The activity is the total sum of all replicates (n=10) over a 5 minute interval. Ch=Swiss, dk=Danish, sp=Spanish.

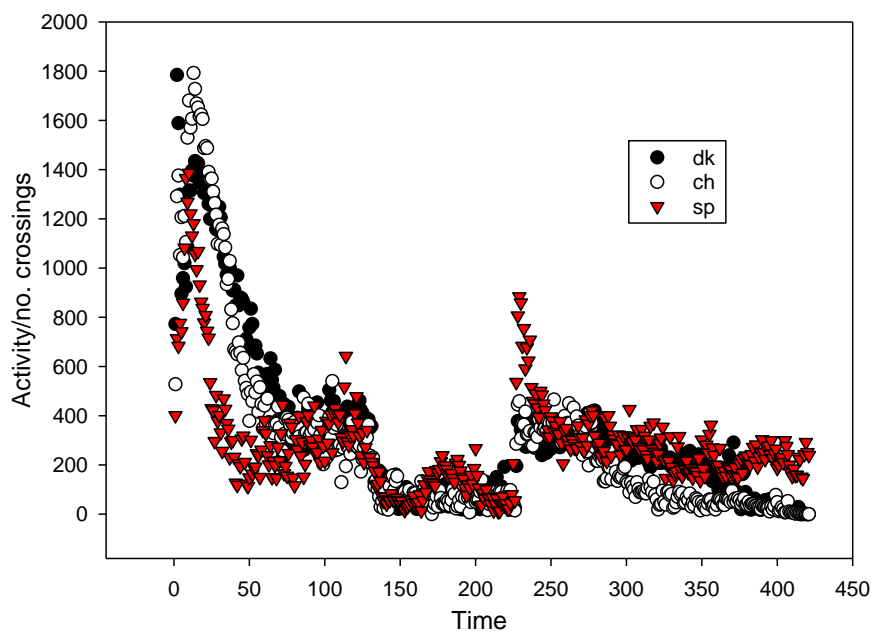


Fig. 3: Locomotor activity of males measured at 40.0°C. Activity was measured 12.00 at day 1 until 23.00 at day 2. The activity is the total sum of all replicates (n=10) over a 5 minute interval. Dk=Danish, Ch=Swiss, sp=Spanish.

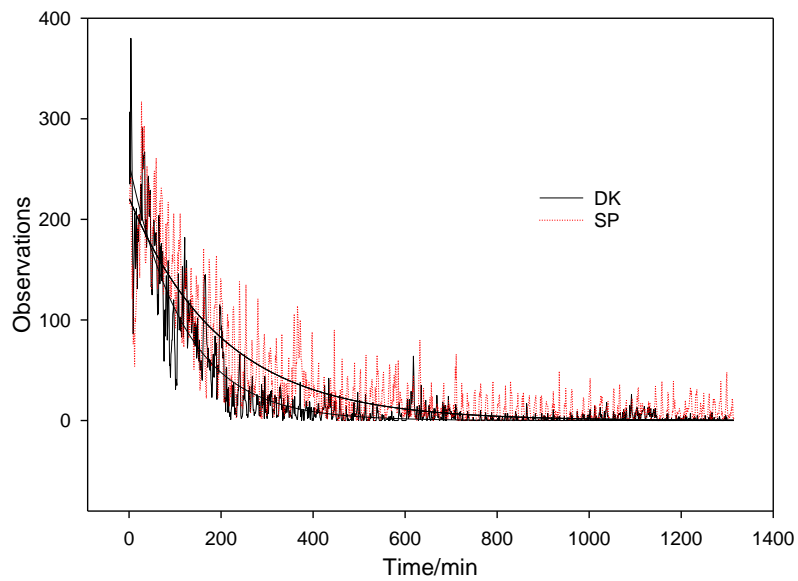


Fig. 4: Locomotor activity of males measured at 43.0°C. Activity was measured from 09.00 am until 23.00 pm. The activity is the total sum of all replicates (n=10) over a 5 minute interval.; dk=Danish, ch=Swiss, sp=Spanish.

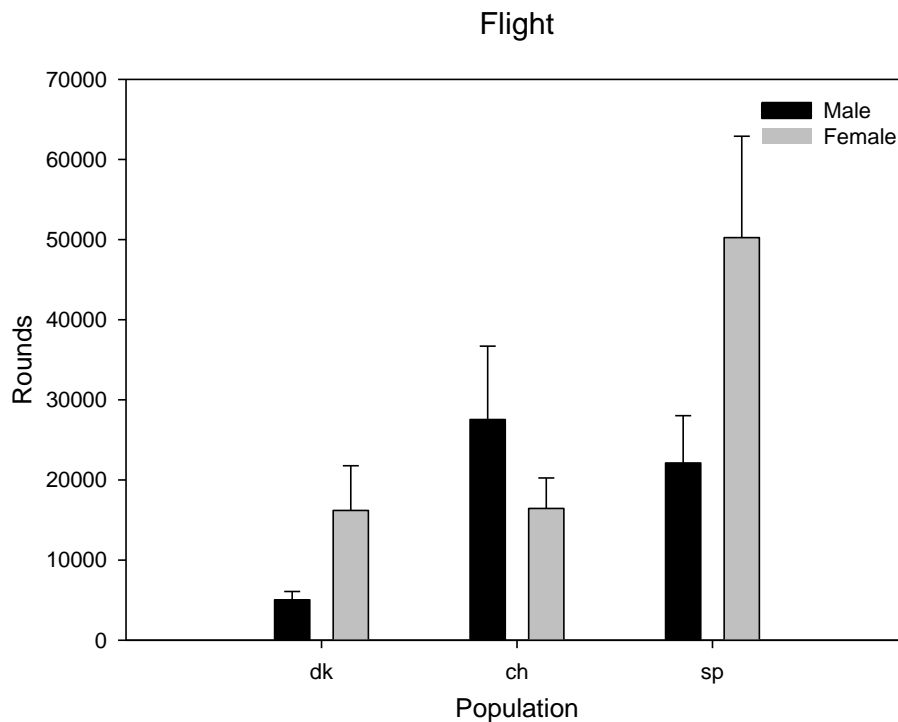


Fig. 5: Flight distance (rounds in a flight drum) of males and females from three populations measured at 40.0°C. Activity was measured from 09.00 am until 18.00 pm. The activity is the mean \pm S.E, (n=20); dk=Danish, ch=Swiss, sp=Spanish.

- 4) Future collaboration: The PI will continue to collaborate with the institutions visited in the area of *Musca domestica* and behaviour, thermal performance and dispersal. At the moment we will finished the planned experiments and do some follow-up experiments to finish the project.
- 5) The PI and the persons involved in the study, plan to publish one or two papers in international journals.