Morphometric Analysis as a Tool for Detecting Differences among Tsetse Populations: a case study of tsetse samples from four sites in Zambia

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Introduction

- **Morphometrics: an interwoven set of largely statistical procedures for analysing variability in size and shape of organs and organisms (Elewa, 2010).**

- **The technique makes visible key aspects of physiology, pathology and phenotypic or genetic evolution – in individuals/groups**

- **Morphometric variation is under the influence of physiological status, adaptive changes and genetic differences. (Dujardin and Slice, 2007)**

- **Zambia: circumstances occur where existence of subpopulations may be suspected – and Morphometrics could be a useful tool to establish the true status in such cases.**

Objective

- **Apply wing Morphometric Analysis to check for differences among five groups of tsetse flies collected from four geo locations in Zambia**

METHOD

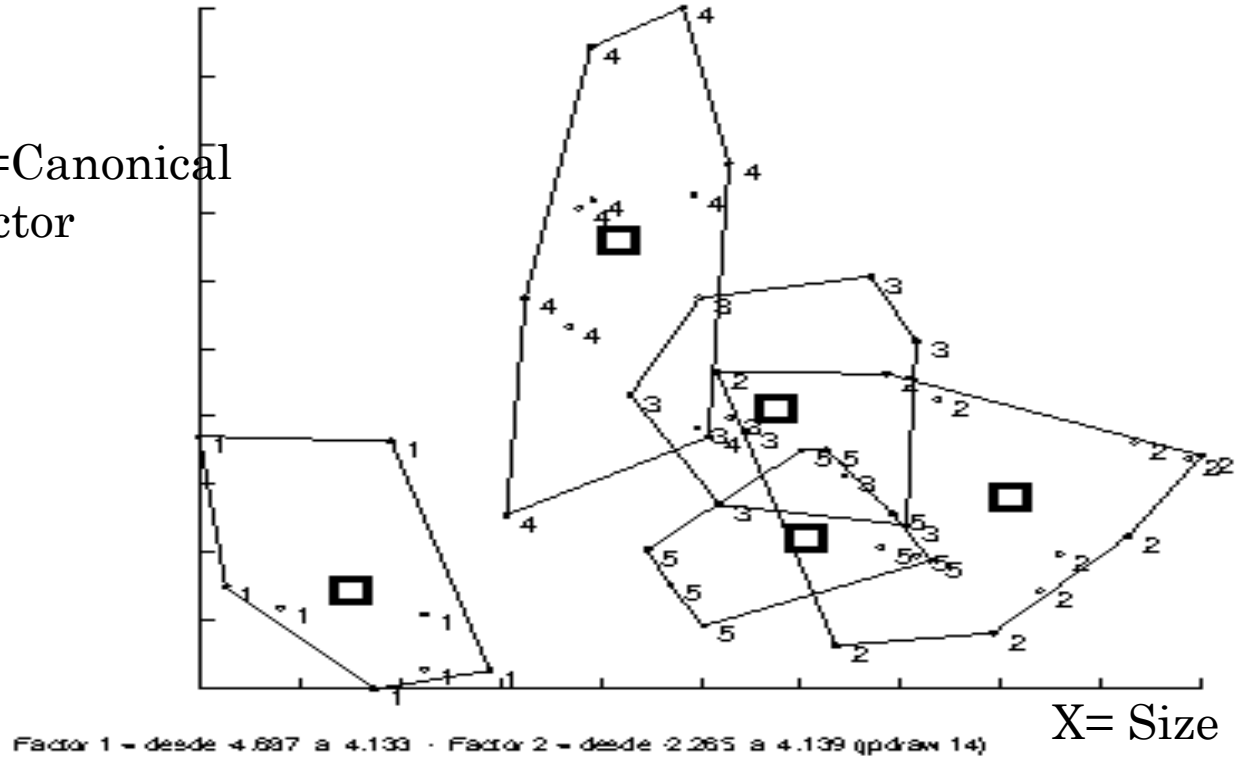
- **Five samples: samples 1 to 5, with 8 – 11 flies/sample**
- **Samples collected from 4 sites - not necessarily from separate tsetse belts (Map 1) – Collected through routine surveys/surveillance)**
- **Analyst was kept ignorant of the source of the flies, simply given wing pairs in 5 groups identified as groups 1 to 5:**
  - **Group 1: n_1= 8 pairs of wings**
  - **Group 2: n_2= 11 "**
  - **Group 3 : n_3= 10 "**
  - **Group 4: n_4= 10 "**
  - **Group 5: n_5= 9 "**
- **Morphometric Analysis undertaken per sample (group) of wing pairs**

Sample/Data processing

- **Per group: Only left wings digitized –11 landmarks of type I nature from each wing in the COO module of CLIC (http://www.mpl.ird.fr/morphometrics)**
- **The data collected was formatted using TET module of CLIC**
- **Formatted data was analysed in the MOG module of CLIC using Discriminant Analysis (DA) or Canonical Variates Analysis (CVA)**
- **Analysis (DA & CVA) was done on samples based on GROUPS (i.e. the groups 1 to 5)**

RESULTS

Y=Canonical factor



X= Size

Fig 1.Graphic presentation of results for each of the GROUPS 1, 2, 3,4 & 5

Results

- There was indication of a clear difference between GROUP 1 and the other four groups

- Among groups 2 to 5, the results showed a marked difference between group 2 and 4, and also between groups 4 and 5.

- Groups 2, 3 and 5 appear to be considerably similar.

DISCUSSION

1. **A look at the sources of the samples of tsetse flies in each group**

DISCUSSION

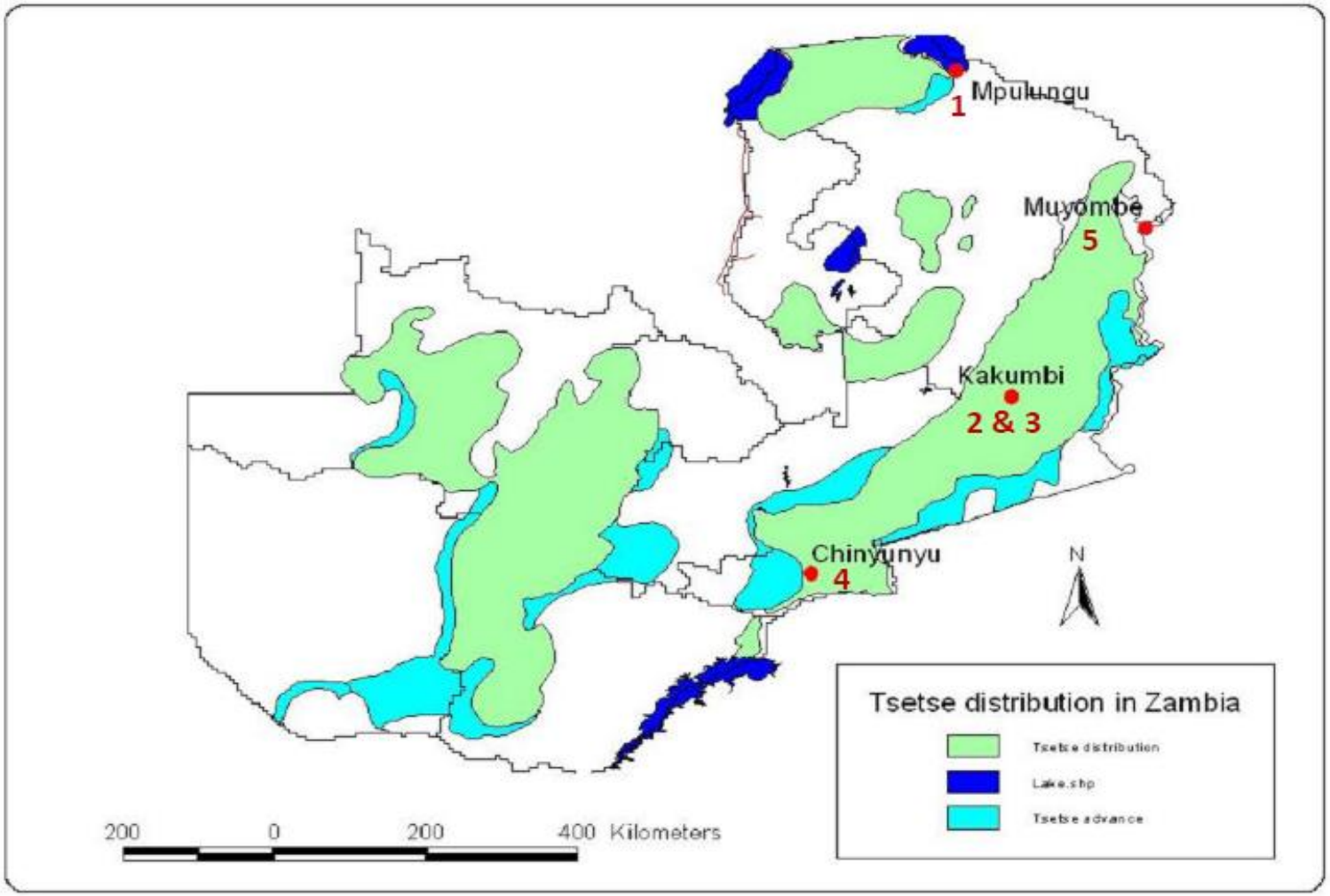


FIG 2: Sources of tsetse samples

DISCUSSION

2. A detailed look at the groups based on knowledge of the species in the groups (fig 2) – i.e. group 1 VS groups 2 to 5 together

- DA was done according to species
- Species: *G.f. martinii & Gm. Morsitans*

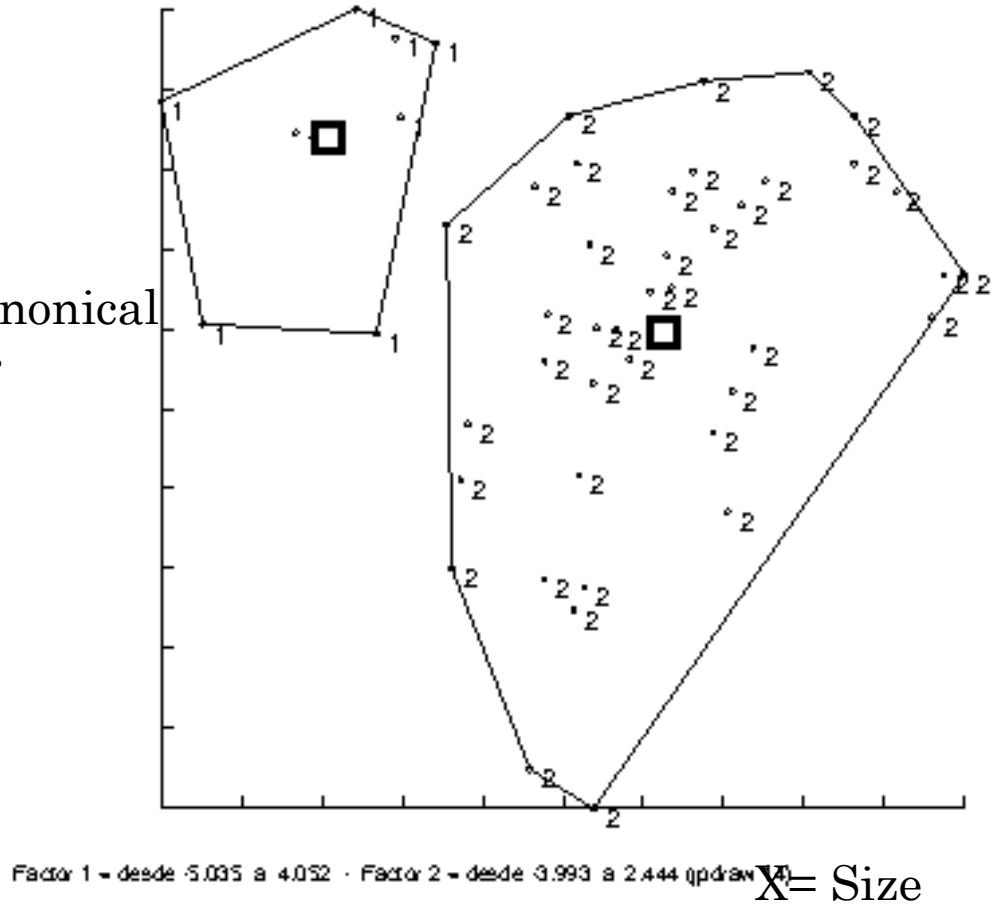


Fig 3.Graphic presentation of sample according to speciesthat is 1= *G.f.m* from Mpulungu, *2*= *G.m.m* from Kakumbi, , *G.m.m* from Chinyunyu,, *G.m.m* from Muyombe

Conclusion

- **Wing morphometric analysis did detect differences among the 5 groups of tsetse samples – based on morphological differences in the wings of the sample flies**

- **A look at the results and sources of the samples indicates agreement with the facts with regard to species and separation (in space) among the groups.**

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