Figure 1. Dr Lutz Fehrmann providing training in environmental variables to Myanmar staff from the universities of Myeik, Mandalay, and Mawlamyine (and some students from Myeik University) during the 'Data analysis' workshop of 4-10 September, 2019.

WP2.8: Report on Training to improve skills and competences – Data Analysis
(as part enhancing the curriculum in Environmental Protection)

1 Work package 2.8 Results (narrative) (1000 characters)

In September 2019, as part of a series of workshops to improve hard, soft and transversal skills, a workshop took place in Myeik University. It was attended by staff from the 3 MUPs with some additional students. The focus was on data analysis. MUP staff were divided into 3 groups based on their fieldwork team, namely: 'environmental variables', 'bird surveys' and 'bird parasites'. Each group reviewed the research questions and hypotheses, prepared and explored the data, calculated variables, analysed the data using R, and prepared a presentation about their findings. Besides WP2.8, the Steering Committee interviewed and selected students for the internship programme (WP5.3). They also followed up on the approval and accreditation process of the curriculum (WP 2.5), discussed expectations and provided recommendations for the MUP selected staff for the exchange visits to EUPs (WP 2.9). Finally, evaluation of uptake of skills and competences by students and staff (WP 3.2) was performed.

2 Anticipated outcome

- Training to improve academic and technical skills and competences (WP 2.8.1)
- Training in quality assurance (WP2.8.1)
- Evaluating the uptake of skills and competences by staff (WP 3.2)
- Selecting students for internships (WP5.3)

3 Responsible

- Project coordinator, project manager, MUP contact persons

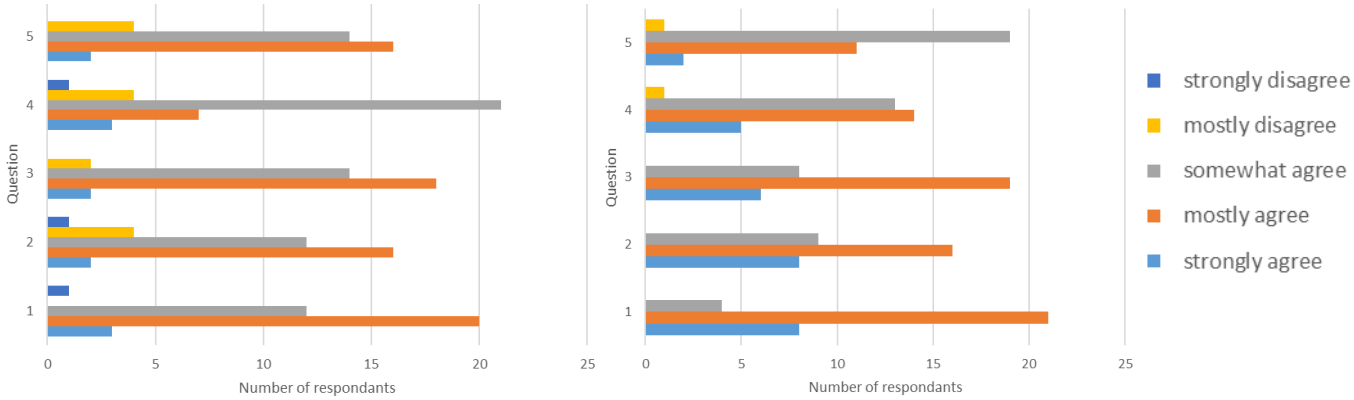
- As trainers, mainly the EUP staff involved at each activity. As trainee all MUP staff involved at each activity.
- Trainers and trainees are listed in the attendance lists and include 24 Myanmar staff and students from Myeik University, 6 from Mawlamyine University, and 7 from the University of Mandalay. European trainers included 3 from the University of Natural Resources and Environmental Science (BOKU), Austria: Dr Swen Renner, Dr Marcela Suarez-Rubio and Dr Paul Bates; 2 from the University of Extremadura (UEx), Spain: Dr Jaime Muriel and Dr Martina Ferraguti; and 2 from the University of Göttingen: Dr Christoph Kleinn and Dr Lutz Fehrmann. Two staff attended from the conservation NGO - MBNS.

Figure 2. Dr Marcela Suarez-Rubio working with Myeik University staff and students on techniques in data analysis during the September 2019 workshop.

4 Indicators predicted and indicators reached (number of students and staff)

- MUP staff improved competences and skills in modern analytical techniques and teaching methods (see below course evaluation)

Pre-workshop **Post-workshop**



Questions:

1. I know/learned to select appropriate statistical tests/models to analyse my collected data
2. I know/learned to prepare the data in the appropriate format before doing statistical analyses
3. I know/learned how to selected in an appropriate way the sampling locations to assess the research question
4. I know/learned to interpret the outcome of the statistical analyses
5. I know/learned how to write the outcome of the tests into a report/text

5 Outcomes/outputs reached

- Improved academic and technical skills and competences (WP 2.8.1) including statistics, data analysis, data manipulation and exploration, presentation skills, teaching methods (learning-by-doing)
- Learned quality assurance (WP2.8.1)
- Evaluated the uptake of skills and competences by staff (WP 3.2)
- Interviewed and selected students for internships (WP5.3)
- Followed up on the approval and accreditation process of the curriculum (WP 2.5)
- Discussed expectations and provided recommendations for the MUP selected staff for the exchange visits to EUPs (WP 2.9)
- Examined requisites for course development and syllabus preparation (WP 2.3)
- Visited by an NGO Expert and interaction with the MUP staff (WP 5.1) (details as a separate report)

6 Remarks

- Training on skills and competences is an ongoing process linked to almost all work packages of MuEuCAP, particularly WP1, WP2.8 and WPs3, 4, 5, 6, and 7)
- Detailed reports of the activities of three groups (i.e., environmental variables, bird surveys, bird parasites) are below.

Figure 3. Myanmar students and staff presenting their work on 'bird surveys' to a combined European and Myanmar academic audience at the end of the September 2019 MuEuCAP workshop.

Before the small group activities, all Myanmar staff and students

- Discussed with European university mentors about how to analyze data and interpret results

- Were introduced to R (the statistical software package that will be used during the workshop) by European university mentors
- Recapped on how the different data was collected (and implications on their analysis)
- Discussed with mentors about efficient data structures.

Small group activities were divided into three, namely: 'environmental variables', 'bird surveys' and 'bird parasites'. More detailed reports for each group are provided below.

Figure 4. The Myanmar/EU 'Environmental variables' team at the September, 2019 workshop.

"Environmental variables" – supervised by Dr Lutz Fehrmann and Dr Christoph Kleinn
The task was to compile all relevant data collected in the field during the last workshops and to derive estimates of target variables that could be correlated against data from bird observations. For this task it was necessary to review the methodology that was used in the field and to apply the corresponding estimators for different target variables. At this stage, it was important to repeat the relevant aspects of statistical sampling and estimation and to make the participants aware, that the original data from a sampling study set the limitations for later interpretation of results.
The data sources used were:
(1) the plot measurements of trees and observations on landscape variables around the plots
(2) data that were derived from remote sensing imagery (NDVI computed from Sentinel 2 images)
(3) data derived from spherical images that were taken at each sampling location.

In a first step, common variables were computed for each sample point. Among them, the basal area per hectare, which is closely correlated to aboveground volume and biomass of trees, the number of trees per hectare and diameter distributions. From the satellite imagery we computed the Normalized Difference Vegetation Index (NDVI) which is a typical vegetation index. This index was derived for different surroundings around the bird observation plots to account for different influence ranges of 50, 100, 250 and 500m. The analysis was done in QGIS, which had been explained during earlier workshops. The idea behind this analysis is to eventually find correlations between vegetation cover and bird abundance. From the spherical images that were taken with a special camera at each sample point, we extracted the gap fraction. This might be an interesting explanatory variable for the number of birds, even if the relation between bird abundance and gap fraction is not clear. A low gap fraction might indicate a high proportion of tree cover inside forest, but at the same time it also indicates a low visibility, which might have negative effect on the detection probability for birds. The analysis of the gap fraction was done using a special plug in for ImageJ.

At the end all derived environmental variables were compiled in an environmental vector, which contains estimates on all target variables for each single plot. Independent analysis of the environmental variables alone was conducted and descriptive statistics were derived to visualize the differences, e.g. for basal area and stem count, for the different clusters. The participants were asked to prepare a presentation and were responsible to derive the required figures and analysis by their own.

Figure 5. The Myanmar/EU 'Bird surveys' team at the September, 2019 workshop.

Fieldwork group "Bird surveys" – supervised by Dr Marcela Suarez-Rubio
Before working with the data, we discussed once again the research questions and hypotheses. This provided the framework for the following activities:

(1) Data preparation. In particular, we compiled the field data collected previously in the three cities, checked the spelling of species names, checked the code of the city, created a column for the habitat, and made sure there was one species per row.
(2) Data exploration. We used excel and learned how to create pivot tables. This information was useful to answer the questions like: what was the total number of species/observations (overall)?, total number of species/observations per city and per habitat?, what was the number of species per point per habitat per city?, what were the common species (overall, per city, per habitat)?. We also prepared the data so that it were in the appropriate format for R. In particular, the number of species, number of observations, and a matrix of community assemblages
(3) Data Exploration using R. We entered data into R, had an overview and introduction on how to work with R scripts and prepare some figures in R
(4) Data analysis. Based on the research questions, we discussed the appropriate type of test to use based on the type of data, and learn the steps to do an statistical test (Check distribution of the response variable, run the test, evaluate assumptions, visualize the results, test homogeneity of variances, test normality of residuals, run a posteriori test, interpret the results). Specific principles of statistics were discussed.
(5) Presentation. We discussed the principles on how to create a powerpoint presentation and what would be the relevant information to include. The presentation was done in front of the whole groups and was followed by discussion.

Fieldwork group "Bird parasites" – supervised by Dr Jaime Muriel and Dr Martina Ferraguti
The following activities were the primary focus:
- Data collection on avian biometric
- Molecular analyses of prevalence and genetic diversity of blood parasites from bird samples (carried out at the University of Extremadura (UEx) during August 2019)

- Analyses of field data with Excel tools and statistical approaches in R software.

In order to achieve greater clarity and optimal use of the workshop, the following sessions were held:
(1) Brainstorming about the hypotheses on the effect of urbanization on avian body condition and parasite infectious status, and reminding of the main variables obtained during bird capture (number of bird species captured by habitats and cities, body mass, tarsus and wing length, as well as the volume (height x width x length) of the uropigial gland).
(2) Checking and detection of errors in the database by accurate screening of each variables (many spelling errors in bird species names, incorrect date formatting and mistakes in decimal numbers).
(3) Calculation of new variables in the Excel spreadsheet such as body condition (by controlling weight and tarsus), volume of the uropigial gland (through the height x width x length), biodiversity indexes (Shannon, Evenness and species richness) and infection status (presence / absence of avian malaria parasites detected by PCR from blood samples).
(4) Data exploration using pivot tables and graphs in Excel.
(5) Introduction to R_Studio by using basic functions such as set the work directory, importing the database, installing packages, exploring the data, summarizing the variables, checking the normality of the variables, defining factor and numeric variables, and carrying out Linear Mixed-Effects Models (body condition, gland volume) or Generalized Linear Mixed Models (avian malaria prevalence).
(6) Some tips and guidelines for the presentation of the most relevant results in powerpoint format.

Figure 6. Myanmar/EU 'Bird parasites' team at the September, 2019 workshop.

Although these statistical methodologies were new for all staff and students of the group, the attendees successfully overcame the adversities of language and methodology, managing to present their results clearly, and answering the questions of the other attendees in a correct way. For the above-mentioned reasons, we consider that the objectives of this workshop were successfully achieved, since it was a bidirectional source of professional and personal learning.

Outreach – the September 2019 workshop was reported on the MuEuCAP Facebook page https://www.facebook.com/Mueucap/ with a reach of 1969, an engagement of 619, and 61 likes. In addition, it was very widely reported on the Facebook pages of the Myanmar staff and students who attended.