

Bringing Awareness about Evolutionary Theory to the Academic Community and General Public of North Sulawesi, Indonesia.

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Evolutionary theory is not part of most curricula in Indonesia, even not on university level. Consequently, the mechanisms and results of natural and sexual selection remain poorly known and understood. This is especially unfortunate since Indonesia is a major biodiversity hotspot with for example, up to 79% of endemic mammals alone on the island of Sulawesi. With this project, we therefore aimed at increasing awareness and knowledge about evolutionary theory and Indonesia's own heritage.

We have focused our first activities to North Sulawesi, which is a biodiversity hotspot best suitable as an example for the mechanisms of natural and sexual selection (Whitten et al., 2002).

The word "evolution" is not so easily used in Indonesia for political and religious matters; we therefore have rather used the term "Biodiversity" while still explaining the evolutionary mechanism. As a result the audience easily accept to learn about evolution and the causes of biodiversity.

The planned activities have introduced evolutionary theories, looking amongst others at speciation by geographic isolation and species adaptive radiation (Groves, 1980) through various workshops, fieldtrips and multimedia materials.

From February to March 2012, we have implemented two theoretical workshops and two field trips for 125 students aged 12-14 from 3 junior high schools situated in the villages of Batu Putih, Pinangunian and Winenet, in North Sulawesi. One theoretical workshop has been organised with the help of local guides, specialists in the wildlife of Sulawesi in order to introduce the pupils to Alfred Russel Wallace's work and the endemic wildlife of the island. We organised one trip to the Tangkoko forest and introduced the students to the sexually selected characters of the crested macaques (*Macaca nigra*) (i.e. female sexual swellings, males' canines and bright red scrotum), in collaboration with the Macaca Nigra Project and the local guides.

We also carried out one trip to the Tasikoki wildlife rescue and education centre which enabled the students to directly compare the morphology of five of the seven endemic Sulawesi macaque species found there.

Finally, during the second workshop, we encouraged the students to compare the cranial morphology of three different species of Sulawesi macaques. Based on the work of Albrecht (Albrecht, 1978), this activity enabled the pupils to better understand the similarities and differences between the Sulawesi macaques due to their phylogenetic closeness and evolution from a likely common ancestor, which originally stemmed from the island of Borneo.

We originally planned to use replicates of crania from Sulawesi macaques for this activity, but time and financial constraints led us to seek another solution. However, we hope to create this material for the next school year.

To assess the educational success of our incentive, we gave evaluation questionnaires to the pupils before and after these educational activities. Amongst the questions asked, some items assessed their knowledge about the endemic wildlife of Sulawesi and the specificities of Sulawesi compared to the other Indonesian islands. The results were as followed:

- Concerning the endemic wildlife of Sulawesi: 27% of the pupils recognised the lowland anoa (*Bubalus depressicornis*) and 29% of the pupils recognised the babirusa (*Babyrousa babyrussa*) before the education activities. After the activities the percentage raised to 40% for the lowland anoa and 79% for the babirusa.
- Concerning the general specificities of Sulawesi: the students mentioned “endemic species found nowhere else”, “Wallace” and “seven species of macaques” in 2% of the questionnaire before the education activities while these specificities were highlighted in 20% of the questionnaires following the program.

These statistics show that these education activities related to evolution have clearly helped the pupils to improve their knowledge about their local fauna. Concerning the specificities of Sulawesi, evolution terms have been more included in their answers. Yet the percentages are still low, meaning that more efforts need to be made in order to increase their awareness and knowledge about evolution.

In April and May 2012, we have implemented various seminars related to Sulawesi’s flora and fauna and their evolution. This series of seminars was organised with the collaboration of Pacific Institute, the Macaca Nigra Project (a scientific collaboration between the German Primate Centre and the Bogor Agricultural University, Indonesia), and UNSRAT (University of Manado). A first seminar has been held on the 23rd April for 30 local guides and fire fighters in a village situated next to the Tangkoko nature reserve. Furthermore, two seminars held on the 26th April and 3rd May 2012 have gathered 70 bachelor students from the faculty of agriculture and forestry as well as young people interested in Sulawesi wildlife in the University of Manado (UNSRAT).

The funding accorded by ESEB enabled the creation and exhibition of media during our seminars. Examples of these media include posters and an animation movie about the Wallacea zone, the wildlife of Sulawesi and its migration routes. We also used the funds to elaborate evaluation questionnaires for high school pupils and produce reproductions of photographs of macaques’ crania for morphometric measurements and comparisons (original material from the Mammalian Crania Photographic Archive). Furthermore, the allocated funds have helped us to cover the transportation cost for the pupils to the Tangkoko Nature Reserve and the Tasikoki Wildlife Rescue and Education Centre. Finally, it has covered the interventions of local experts about Sulawesi wildlife during the school presentations and the seminars.

The funds were spent as followed:

- Creation of a 25 seconds animation movie: 150 Euros
- Posters for 3 junior high schools: 100 Euros
- Evaluation questionnaires photocopies and crania photographs’ reproduction: 150 Euros
- Pupils’ transportation to Tangkoko (125 pupils, 6 trips): 525 Euros
- Pupils’ transportation to Tasikoki (125 pupils, 6 trips): 580 Euros
- Local experts’ interventions (2 local guides): 250 Euros
- Logistics for seminars (organisation, room rental, speakers, transportation): 245 Euros

This innovative education programme about evolution has been highly appreciated by pupils and teachers, and has the support of the local government (Department of Education and Sports of the city of Bitung, North Sulawesi) to continue these activities on a long term basis. The programme also received attention from the media through regional newspapers and National Geographic Indonesia (link below).

We were able to raise more funds for our education programme for 2012-2013. However, we would still need financial support in order to continue and develop our education programme about the evolution and specificities of Indonesian wildlife. Therefore we would like to request an extension of 1500 Euros, in order to create three-dimensional replicates of the crania of some of the macaques from Sulawesi, as well as to expand our activities over more local high schools in our 2012-2013 programme.

Please find attached to this report the pictures of our education activities and seminars, the animation movie about Sulawesi fauna, one Power Point presentation given to the students seminar and the poster we gave to the schools involved in our programme.

Sources:

Albrecht, GH. (1978), The craniofacial morphology of the Sulawesi macaques, multivariate approaches to biological problems. In: Szalay FS, ed. *Contributions to Primatology* vol. 13. Basel: S. Karger, 1-151.

Groves, C. (1980), Speciation in *Macaca*: the view from Sulawesi. In: Lindburg DG, editor. *The macaques: studies in ecology, behavior, and evolution*. New York: Van Nostrand Reinhold. p 84–124.

Whitten, T., Henderson, G.S., Muslimin, M. (2002). *The Ecology of Sulawesi*. Gadjah Mada University Press.

Website of Mammalian Crania Photographic Archive:
<http://1kai.dokkyomed.ac.jp/mammal/en/mammal.html>

Article of National Geographic Indonesia:
<http://nationalgeographic.co.id/feature/2012/03/makaka-pendaulat-takhta>