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10 YEARS' RESEARCH WORK AT THE DEPARTMENT OF ZOOLOGY (1969—1979)

In the first 50 years of the University having moved in 1920 from Kolozsvár to Szeged, in the Departments of General Zoology, Zoomorphology then of Systematics, professors ISTVÁN APÁTHY, JÓZSEF GELEI, BÉLA FARKAS, AMBRUS ÁBRAHÁM and GÁBOR KOLOSVÁRY, together with their research workers, carried out generally recognized neurohistological, protistological, histological physiological and taxonomical investigations. In 1969, in the united Department of Zoology, besides the above-mentioned ones, the domain of entomological research was also introduced. By the change in profile ten years ago, the educational work of the department was also favourably affected. By means of the most modern 35 audiovisual slide-units, developed in the meantime, with 80 slides each, and the tape recorded texts belonging to these, as well as of the cinematographic colour film materials, amplified partly with sound and made by ourselves, the education have been raised up to the forefront, even beyond our frontiers.

In the meantime, the number of lecturers and research workers has, unfortunately, not increased, at best, with the passage of the years, they were, of course, partly substituted. In 1969, there were active in the Department: six lecturers (Dr. FERENC BICZÓK holder of a candidate's degree, reader, Dr. ANDOR HORVÁTH holder of a candidate's degree, reader, Dr. MAGDOLNA FERENCZ senior lecturer, Dr. IMRE HORVÁTH senior lecturer, Dr. MÁRIA CSOKNYA senior lecturer) and four researcher (Dr. JÓZSEF KORMOS holder of a candidate's degree, senior member of the Institute, DR. ARANKA STAMMER holder of a candidate's degree, reader, Dr. DÁNIEL GÁL research fellow, Dr. JÁNOS GAUSZ junior member), in 1979 there were eight lecturers (Dr. IMRE HORVÁTH holder of a candidate's degree, reader, Dr. ARANKA STAMMER holder of a candidate's degree, reader, Dr. MÁRIA CSOKNYA senior lecturer, Dr. MAGDOLNA FERENCZ senior lecturer, Dr. LÁSZLÓ GALLÉ senior lecturer, Dr. KATALIN HALASY research assistant, Dr. ERZSÉBET HORNUNG contractual research assistant) but only two researchers (Dr. DÁNIEL GÁL research fellow, Dr. GYÖRGY GYŐRFFY junior member) were on active payroll. It belongs to the efficiency of our work that approximately thirty persons took their doctor's degree of our special subjects, one became the holder of a candidate's degree in biology, the applications of two for a candidate's degree are under way. The lecturers and rese-

archers of the Department published 214 articles during these ten years, on 4267 pages. Of these, the number of general and popular scientific publications is 47, in an extent of 1220 pages. On the other hand, scientific results are contained in 167 papers, in an extent of 3047 pages. The development of entomological researches is indicated by the 77 publications on entomological subject, made overwhelmingly by four entomologists on 1340 pages, by the abstracts of three lectures, as well as by 33 audiovisual units (each 80 slides) by one volume of lecture notes on ecology, this with a content of 211 pages, as opposed to the fifty publications of the Department on histology, protistology and hydrobiology on 875 pages, to 37 abstracts of lectures, as well as to 2 audiovisual units by, to six volumes of university lecture notes on 388 pages.

In the Department, apart from the research work on systematics, ecology and ethology, referring mainly to entomology, the previous researches on protistology and morphology have, of course, also been continued. Mentioning only the outstanding results: one of the investigations on protistology is that of the photoinduced motion phenomena of *Tetrahymena pyriformis* L. G. sensitized with xanthin stain. There were observed well-perceptible connections between the effects of O_2 consumption, the speed of movement, the photo-oxidation-induced electron-microscopic structural (mitochondrial) changes, as well as those of ATP, temperature, the enzyme inhibiting and reactivating agents (BICZÓK). By other investigations in protistology the interpretation of the energetic processes taking place in the rhizosphere were approximated (BICZÓK).

There were carried out surveyings on the Rhizopod fauna of the river Tisza, the zooplankton of the Tisza reaches above Kisköre. In the zooplankton of the Tisza Dead-Arm at Kisköre two maxima were observed annually. Below Szolnok, the Tisza proved to be of meso-saprobic character (GÁL). Similarly, at investigating the water ecosystem, the alkali lakes were classified on the basis of the dominant taxonomical groups of zoobenthos (Ceratopogonida, Chironomida and Oligochaeta) and other abiotic factors into groups and the verticaldist ribution of zoobenthos was examined (FERENCZ). From the waters of the rivers Tisza and her tributaries, on the basis of examining hundreds of samples, 64 species were demonstrated from the Cnidaria, Kamptozoa, Platyhelminthes, Annelida, Tentaculata and Arthropoda, and established that the heaping of alluvial deposit (before and after impoundment) is connected with the increasing of the individual numbers of the detritophagous annelids (FERENCZ).

In the cyto-genetic researches belonging into the domain of bioregulation, the investigation into cell organization took a part. The pharyngenial types of Gymnostomata could be delimited (KORMOS). We have described the simple and composed infraciliary structures, mainly in the groups Oligotricha and Gymnostomata, and characterized the full series of the types of the cellular proliferation (KORMOS). The ontogenetic and phylogenetic organization of Ciliata was also outlined (KORMOS).

Comparative neurohistological investigations have been continued by the students of Professor AMBRUS ÁBRAHÁM who is now as a professor emeritus extremely active. The researches on receptors were closed in 1973 (STAMMER). In the course of studying the hormonal system and neurosecretion, the connections of the sympathetic nerve in the innervation of the pineal body of the pigeon and bat could be neuromorphologically demonstrated (STAMMER). In the sections of the digestive tract of the different frog's species some differences characteristic of the species, in the

histological layers of the heart and in the vegetative ganglia so far unknown nerve terminals have been demonstrated (HORVÁTH). The effects of water pollution were observed by studying the gills and kidney of fishes. We have observed the destruction of mitochondria, the accumulation of lysosomes and the appearance of the most different membrane configurations (STAMMER—HORVÁTH). The respiratory epithelial cells of the fish's gill, the cells of the kidney, the chloragogenous cells covering the typhlosolis of the earthworm are considerably damaged by hydrogen sulphide (HORVÁTH). Studying the innervation of the digestive tract of birds, we have described pressure sensitive receptors (CSOKNYA).

In the course of the taxonomic-faunistical researches, the monographic elaboration of the Hungarian recent and Pleistocene Mollusca and the summary of several ecological observations were, unfortunately, prevented from being concluded by the death of the author (A. HORVÁTH) in tragic circumstances.

In the last ten years, the following researches on entomology were going on at the Department.

Between 1969—1972 we participated in a detailed exploration of the animal kingdom of Hungary, the elaboration of the world material of taxonomic units and in complex auto-ecological and ethological researches. From 1972, we have mainly worked in the main direction at ministerial level, taking place in the plan of the Hungarian Academy of Sciences, in the theme: Protection of man and its natural environment (biosphere). These are: I/ Comparative researches into the terrestrial ecosystems, divided into two branches: the first one is the analysis of the natural, modified and cultural ecosystems, taking into consideration structures, function, energy flow and productivity. II/The second theme investigated into the regularity of the supraindividual organization going on in the biosphere, mainly in nature reserves. The Department has dealt with the latter theme at the level of ecosystem. Theme II is the research into water ecosystems, with regard to the Tisza I and II river barrages.

The Department was entrusted in contractual way by the Hungarian Academy of Sciences with elaborating the following theme between 1978 and 1980: "Animal-ecological investigations in the area of the Kiskunság National Park, in the *Astragalo-Festucetum rupicolae (=sulcatae)* ecosystem".

In the above themes, we could achieve the following outstanding results. In the area of taxonomy-faunistics: In the Academic series: Animal Kingdom of Hungary, fascicle Tenthredinoidea I, the division of subfamilia Ichneumonoidea and its fascicle IV were finished, partly by co-authors (MÓCZÁR). The new ant genus Sifolinia and two new species could be demonstrated from this country (GALLÉ). The animal identification handbook of the species Hymenoptera and Odonata in Hungary was finished (Móczár). With the cooperation of Slovak-Romanian-Jugoslavian-Ukranian-Austrian researchers, the interlingual list of the new Hymenoptera habitats of the Carpathian basin was made according to the zoogeographical map published in the National Atlas of Hungary (MÓCZÁR). The full elaboration of the world material Mesitinae was published, containing seven new genera and 51 new species for science (MÓCZÁR), as well as the elaboration of the materials Pompilidae, Chrysididae, Ceropalidae from the Mongolian, Southern-Asian expeditions (MÓCZÁR). The material of the world catalogue of Ceropalidae is ready in 70 per cent (MÓCZÁR).

In the domain of the complex auto-ecological-ethological research work, we ha-

ve demonstrated the climatic factors inducing daily activity rhythms of *Paragymnomerus spiricornis* (temperature, humidity), the micro-climatic peculiarities of the loess-wall serving as nesting site and determined the special features of the connection between the environmental factors and the wasp population. The detailed developmental cycles of the wasp population, several conducts of the life in groups, pointing at the beginning of social life, as well as some moments of the regularities of a supraindividual organization were cleared up (MÓCZÁR—GALLÉ).

In the field of the research of terrestrial ecosystems, the analysis of the insect population of hemp began; investigations into the Orthoptera population were carried out in the flood-plain of the Tisza, in alkali, sandy areas (GAUSZ).

At the structural and functional investigations into the insect communities of the agricultural ecosystems, after elaborating approximately 50,000 insects, the specific composition of the nutritive plant association of condiment paprika, the relations of dominance and abundance, the mutual relation between the groups of the way of life became elucidated. On the basis of the proportion of the entering and leaving species representations, as well as of their activity, we could separate the seasonal aspects of the nutritive plant associations from one another. The kinetic activity, population activity, the seasonal dynamics of the single species were clarified (GYŐRFFY).

From among the natural, resp., partially modified ecosystems, we have dealt with the Formicoidea species communities of the Tisza valley, characteristic mainly of grasses, as well as the physical environmental conditions and biological interactions, taking part in the regulation of the single populations. These investigations are particularly important in revealing the competitive effects between populations and within the populations. We have also studied the ecological energetics of some important ant species of the grasses along the Tisza. In the course of the field and laboratory investigations, it was demonstrated about *Formica pratensis* that the rhythm of its foraging activity was induced by exogenous factors. A colony of many netss consumes 11—23 kg food a year (dry weight), passing it with 1.6 per cent efficiency to the next energy level; *F. pratensis* can be used for the biological protection of the pine plantations. In this case, the efficiency of its use can be increased with guard-nets. We have demonstrated a special mechanism in the temperature control of nests as well (GALLÉ). On the *Formica* and *Lasius* species a group-effect was observed. In these individuals the parameters of the consumption of food and respiration change and, likewise, the productivity at group and individual levels also differ. We have determined the composition of ant communities characteristic of the single grasses and estimated the density of the single populations (GALLÉ). In the abovementioned natural ecosystems in the environs of Szeged, the macro-decomposing Isopoda fauna of grasses was studied. The role of an Isopoda *(Trachelipus nodulosus)* and a Diplopoda species *(Chromatoiulus unilineatus)* in material and energy flow was cleared up. We have investigated into the effect of the outer environmental factors on the parameters of energy flow and demonstrated particular differences in acclimatization between these species (HORNUNG).

In the water ecosystems, first of all in the Tisza and Maros, the larval phases of *Palingenia longicauda* and, partly, the factors influencing the distribution of other Ephemeroptera and Odonata larvae, like a change in water level, water pollution, the study of oxygen content, are of entomological relation (CSOKNYA). It was established that the oxygen consumption of the young *Palingenia* larvae counted for

unit body-weight is higher than that for the consumption of old larvae. These values are further affected by the lack of light, substratum and the increase in temperature (HALASY). The streamline of the Tisza is optimum but the distribution and last-year development of *Palingenia* larvae are affected by a frequent and higher than one metre fluctuation of the level of water (HALASY). It turned out at the electron-microscopic scanning examination of the tracheal branchia that on these, in addition to the characteristic respiratory epithelial cells, there are probably some peculiar cell-groups, as well, being probably osmoregulative or receptor cells (CSOKNYA). From the zoobenthos of the Tisza several Ephemeroptera species were demonstrated, too (FERENCZ). In the zoobenthos of the waste-water canals, Diptera larvae (Ceratopogonidae and Brachycera) were dominating (FERENCZ).

With the grass-ecosystem investigations the Department of Zoology initially wanted to co-ordinate the terrestrial ecological investigations in some sites in the vicinity of Szeged (Ásotthalom, Körtvélyes, Kiskundorozsma), developing these further into a complex investigation in the framework of a uniform ecosystem. At the same time, our Malaise-trap investigations, carried out for years in these areas together with other examinations, played only a minor role. About the latter before hand only so much that the elaboration of more than 20,000 insects, collected in the course of 20 sampling during three years, is under way.

After informative surveys, we began the research in the Kiskunság National Park, in March, 1976. Our work was supported by the directors of the Kiskunság National Park, in addition to marking out the area, in both professional and technical fields. In the area of Kisbugac, on two hectares, a less pastured grassland, close to nature, was marked out for researches.

By a complex investigation into the grass ecosystem we understand both a methodological and a thematical complexity. In this sense, our aim is to reveal the structural characteristics of the grass ecosystem and their key-processes. We cannot undertake, of course, to draw every detail of these which are not too important from the point of view of the full working and regulation of the system (e.g., the specific quality of the populations of very low individual number having a part in these) or every part process (e.g., the determination of the energetic parameters of a population having an insignificant part in the material and energy flow) into the circle of our investigations.

We have approached three levels of the system; these are:

(1) The faunistical-ecofaunistical level. This is, in fact, the qualitative revelation of the specific quality of the population forming the zoocoenosis. For this, we have applied special instruments of collection, like the Malaise traps, introduced by the author in this country, in the same way, the covering traps, having been shown us at the ecological investigations in Tyrol. These function night and day continuously and give an insect material which is suitable for a comparatively high faunistical and ecofaunistical evaluation. These data are of real value in respect of the insect fauna living in the investigated area and reliable on its seasonal dynamism. The elaboration of this enormous material (about 98,000 insects) is also under way.

(2) By examining the structure-coenological level, we have expected some inforpmation on the construction and henomenology of biocoenosis.

(3) When investigating the functional ecological level, we have intended to clear up the part of the single members of biocoenosis in the trophic network of biocoenosis. At the same time, we have expected some information of the most im-

portant mechanisms of the regulation of the single energy levels and dominant populations and of the regulation of the whole system as well.

The study of the structure-coenological level and still more of the levels of energy flow and regulation demands a very large researcher team not only for surveying the place but also for elaborating the material. As this great task cannot be carried out by the four entomologists (lecturers and researchers) of the Department of Zoology, we are performing this work by drawing into the work two zoologists, resp. entomologists, Dr. LAJOS TANÁCS and SÁNDOR KOVÁCS, as well as some undergraduates. On the part of the Department of Botany, of the Attila József University in Szeged, the botanical field work is carried out by two undergraduates. The phytomass and its microclimatic measurements are, at the same time, the essential conditions of our investigations, as well. In addition to these, six undergraduates from the study group were also engaged in our work. Between 1976 and 1978, during three years, we worked all in all 292 days in the field, collecting in Bugac, during this time, more than 100,000 insect specimens.

In the course of our research work, apart from studying grass under natural conditions, in 1978 we also initiated to investigate into grazed grasslands drawn under human activity. After finishing the full theme, we hope to get some information, not only on the natural grass-coenoses but also on the ecological systems of anthropogenous regulation, in the possession of which we shall perhaps be able to render help to the most suitable and economical setting of the parameters of these.

Publications of the members of, and fellow-workers at the Department of Zoology and some outstanding educational publications between 1969 and 1979 are the following:

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(Structure of synapses in the cerebral cortex of sand-lizard *[Lacerta agilis]*). — Állattani Közl., *9:* 15—24. - -: Ultrastructure investigations on the cerebral cortex of the sand-lizard *(Lacerta agilis)*. — Acta Biol. Szeged, *19:* 99—116. - -: Electron-microscopic investigations on the heart of the European pond turtle *(Emys orbicularis)*. — J. Zool. Bhopal, India, *16:*44—52. - - (1974): ISTVÁN APÁTHY. Tribute to his memory on the occasion of the 50th Anniversary of his death. — Acta Biol. Szeged, *20:*27—35. - - (1975): Ultrastructure investigations of the ceroma of domestic duck *(Anas boscas domestica)*. — Xth Congr. Soc. Eur. Anat. Veter., Budapest. Congr.: 4 (Abstr.). - -: Electron-microscopic investigations on the heart of the European pond turtle *(Emys orbicularis)*. — J. Zool. Bhopal, India, *3*(1—2):1—11. - - (1976): Electron-microscopic examinations on the ceroma of the duck with special regards to Grandry's corpuscules. — Állatt. Közlem., *63:*15—37, Fig. 1—14 - - —STAMMER, A.+: Comparative light and electron-microscopic investigations on neurosecretory cells. — Int. Symp. Neurosecretory Cells, Leningrad: 7 (Abstr.) - -: Structure of synapses in the supra-oesophageal ganglion of the beetle *(Dytiscus marginalis)*. — Z. mikr.-anat. Forsch. *90* (8): 226—238. - - (1977): Ultrastructural features of the Herbst body. — In "Neuron concept 1976. Tihany". Budapest: 22. (Abstract). - -: Pathológiás elváltozások emberi glomus sejteken. (Pathological changes in human glomus cells). — Magyar Pathológus Társaság Nagygyűlése, Szeged: 85 (Abstract). - -: Fifty-Five years with neurones. — Ann. of Zoology. Agra, India: 1—16. - -: Ultrastruktúra vizsgálatok Herbst-féle testeken. (Ultrastructure investigations into Herbst-corpuscles). — Állatt. Közlem., *114* (1—4): 7—30, Figs. 1—9. - - (1978): Megemlékezés Dr. GELEI JÓZSEF halálának 25 éves évfordulója alkalmából. (Commemoration on the occasion of the Twenty-Fifth anniversary of the death of Dr. JÓZSEF GELEI). — MTA Biol. Oszt. Közl., *21*: 117—126. - -: Ultrastrukturelle Untersuchungen an der Wachshaut der Enten unter besonderer Berücksichtigung der Grandryschen und Herbstschen Körper. — Z. mikr.-anat. Forsch., *92* (1): 81—118. Figs. 1—16. - - —STAMMER, A.: Comparative light- and electron-microscopic investigations on neurosecretory cells. — Springer-Verlag Berlin, Heidelberg, New York: 183. (Abstract). - -: Az idegrendszer szerkezete a kerti csiga *(Helix pomatia)* gastrointestinalis rendszerében elektronmikroszkóp alatt. (Structure of nervous system in the gastrointestinal system of garden snail *[Helix pomatia]* under an electronmicroscope). — XIIIth Biol. Itin. Congr. Budapest: 58 (Abstract).

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