Research Projects

Concluded projects, current works and studies in preparation

Project 1 - **Population dynamics**

A long-term study of population dynamics of a community of tardigrades, rotifers and nematodes in a carpet of a roof moss (H. cupressiforme group). Studies on interspecific competition and ecological niches as well as on abiotic factors affecting the entire community such as temperature and humidity.

Project 2 - **Collecting and preserving**

Studies on the taxonomy, morphometry and ecology of marine and limno-terrestrial tardigrades of all Europe, especially living in mosses and lichens. Special interests: marine biomes, silvea biomes of Central Europe and oreal biomes of alpine regions.

Project 3 - **Glacial tardigrades**

Collection of glacial tardigrades. Studies on cryptobiosis. Are there opportunities for cryogenical preservation in tardigrades surviving glacial epochs?

Project 4 - **Principles of tardigrade physiology**

Physiological experiments on effects of light (photoresponses, phototaxis and photokinesis), temperature, hydrostatic pressure and tensions of oxygen on the activity, the metabolism and the behaviour of tardigrades.

Project 5 - **Diurnal activity**

Experimental studies on factors regulating circadian rhythms of locomoter activity (diurnal activity) in tardigrades.

Project 6 - **Optical sense**

An attempt of modelling the structure and function of the pigmented eyespots (ocelles) associated with the lateral lobes of the cerebral ganglion. Some new biophysical and photobiological relationships are proposed.

Project 7 - **Uptake and transport of substances**

Experimental studies on uptake, transport and translocation of colouring pigments in the cuticle, through the digestive tract, the epithelium-lined space of the body cavity and the body cavity cells in living tardigrades.

Project 8 - **Culture techniques**

Development of culture techniques for freeliving tardigrades in the laboratory. Methods for the cultivation of tardigrades in axenic, monoxenic and xenic culture for ecological, physiological, biochemical and developmental studies and experiments

Project 9 - **Competition and coexistence**

An investigation on competition for space and food and the coexistence within a community of nematodes, rotifers and tardigrades considerating the vertical zonation in a moss cushion.

Project 10 - **Aggregated dispersion**

Laboratory studies on active aggregation or aggregated dispersion of tardigrades. Coincidence? Or are there reasons for a non randomly biological causality? Which interactions between individuals are possible? Is there evidence for the occurrence of chemotactical behaviour? Is aggregation, a special form of "group living", of evolutionary advantage (relating e.g. to predation or reproduction)?

Project 11 - **Community ecology**

Investigations on food webs and the trophic relationships within bryosystems. Influences of predation pressure in such food webs. Linkages and interaction strength. Experimental studies on possible effects of non predatory rotifers (belonging to the Bdelloidea) and predatory rotifers (belonging to the Monogononta) on population dynamics.

Project 12 - **Feeding experiments**

Feeding experiments in bryophilous tardigrades under controlled laboratory conditions. Influences of trophic relations on survival, reproduction and mortality. Are there food preferences?

Project 13 - **Photoresponses**

Investigations on the absorption spectra of tardigrade eye spot pigments connected with the photoresponses. Influences of wave length and intensity of light on phototactic behaviour and photokinesis.

Project 14 - **Magnetoreception**

Experimental studies on magnetoreception in tardigrades.

Project 15 - **Thigmotactic reactions**

Laboratory studies on thigmotaxis in tardigrades. Possible relations to food preferences.

Project 16 - **Body size and activity**

Investigation on the rate of (metabolic) activity in relation to the size of the body (body surface area) in tardigrades under constant temperature conditions and oxygen tensions.

Project 17 - **Survival**

Comparative experimental studies on the survival of lichen and moss dwelling nematodes, rotifers and tardigrades in extreme fluctuating environments resisting desiccation or deep or high temperatures by using physiological mechanisms such as anhydrobiosis (dehydration), cryobiosis (freeze tolerance), anoxybiosis (reduction in oxygen tensions) and encystment.

Project 18 - **Age structure**

Studies on the seasonal variation in age structure of tardigrade populations and the importance of abiotic factors affecting the structure of tardigrade communities and the reproductive cycles and strategies. Are tardigrades multivoline ? Relationships between abiotic factors (moisture, temperature), the availability of food, the body size, the potential natality and the mortality of bryophilous tardigrades (a model).

Project 19 - **Primary successions**

Investigations on the dynamics of primary successions (colonisation by algae, lichens and mosses and their associated microfauna including the Tardigrada) in glacier foreland (retreats of glaciers) and in the transition from marine habitats to terrestrial littoral cryptogams (marine algae, lichens and mosses).

Project 20 - **Reproduction and life history**

Experimental studies on the influences of nutrition and temperature on moulting, oviposition, reproductive modes, fecundity, hatching and embryonic and post-embryonic development in bryophilous tardigrades.

Project 21 - **Evolution and phylogenomics**

Studies of the origin and the phylogenetic position of tardigrades. Multi-gene analysis of the phylogenetic relationships among metazoans. Possible importance of analyses under reticulate evolution.

Project 22 – **RNA studies**

Studies on higher order structures of Tardigrade RNAs, especially mitochondrial tRNAs and rRNAs. Nucleic acid structure prediction and the use of RNA secondary structure in taxonomic and molecular phylogenetic studies. New insights into the evolution of mitochondrial tRNA structures.