Environmental and evolutionary changes in the Upper Triassic are of great interest recently. The type of ecosystems with a trophic structure similar to those of recent times, appeared for the first time in the Earth history. This was connected with global scale changes and several extinctions episodes. Some aspects involving origination of some groups of plants (e.g. modern conifer families) and animals (e.g. dinosaurs, mammals) characteristic for modern biota remain pending and still discussed. New fossils from southern Poland may fill gaps in knowledge about Upper Triassic biotic changes. Data published so far about vertebrates (e.g. from Krasiejów, Lipie Śląskie-Lisowice) and plants (e.g. from Patoka) are promising but much remains to be done. The Polish Triassic plants, especially conifers described until now have been sparse and poorly preserved. Even less is known about plant-animal interactions in Polish fossil record, especially from the Triassic. As plant-animal interactions are crucial element of modern ecosystems functioning their origin and evolutionary development are of great interest.

The main aim of the project is to describe and interpret evolutionarily, biostratigraphically and palaeoecologically diversified fossil assemblages from the Upper Triassic of southern Poland (localities Patoka, Poręba in Upper Silesia and Wyszyna Rudzka in the Holy Cross Mountains) which contain floras dominated by conifers with numerous traces of plant-animal interactions present on plant remains and associated arthropod cuticle fragments, clitellate cocoons and megaspores.

For the study, we will use palaeobotanical research methods including chemical treatment for the cuticle isolation, sieving, manual picking of specimens from residue, isolation of pollen grains preserved in situ in male cones. The cuticle structure is necessary for taxonomical determination and to define the plants' environmental adaptation. Permanent slides will be prepared. The cuticles will be investigated using a light and fluorescent microscopy, as well as SEM. Traces of plant-animal interactions will be documented on cuticles similarly like plant remains and described according to current research standards.

We expect to answer the following questions: (1) Which conifer families, including new taxa, were present in Polish Upper Triassic, (2) How intensive and rich were plant-animal interactions in Polish Upper Triassic, (3) How these interactions related to environmental and climatic perturbations and extinctions during Upper Triassic, (4) Is there any relation between appearance of modern conifer families and intensity of plant-animal interactions within this plant group, (5) What was the diversity of arthropods associated with plant remains based on their cuticle fragments, to which groups they belong, (6) What was the diversity of clitellate cocoons present, (7) What was the diversity of plants after which only megaspores remained.

Obtained research results allow to join the discussion about origin of modern conifer families and significance of this evolutionary event for development of plant-animal interactions. Stages of transformation from the primitive voltzialean conifers to evolutionarily advanced families of modern conifers (like Araucariaceae, Cupressaceae, Pinaceae) in the Triassic are so far insufficiently documented. New Polish material may help to fill this gap in knowledge. We plan detailed description of animal tracks on leaves and determination of their potential trackmakers. It helps explanation of pathologic changes on shoots in comparison with recent similar phenomenon. We also aim to find changes in the structure of epidermis (through examination of cuticle) that would be expected as plant reaction. It also helps to estimate the host plant response, what is of evolutionary significance. Well documented plant-animal interactions from Polish Triassic may be compared with other such interactions described from Mesozoic strata. Increased plant-animal interactions could be a symptom of weakening of plants due to environmental perturbations, as could be the gradations of pests caused by the disturbance of the ecosystems structure by humans today. So far documented plant-animal interactions from the Upper Triassic were present mainly on lycopsids, ferns and large-leaved gymnosperms, traces on conifers are very rare. As Polish material of traces is well preserved and associated almost exclusively with conifers it may provide new important data.

The plant-animal interaction is not only related to living plants, but also to the activity supporting the decomposition of remains. The involved groups include annelids, some insects and mites. Cocoons of clitellates from Poręba confirm such activity. The Clitellata are a class of annelid worms, characterized by having a clitellum - the 'collar' that forms a reproductive cocoon during part of their life cycles. To this group belong leeches and earthworms. Clitellate cocoons have not been reported from Polish fossil record so far. Materials from Poręba are also among oldest well dated clitellate cocoons in the fossil record.

Another study that needs to be carried out for complete picture of biota of analysed ecosystems concerns megaspores. Megaspores are important for Upper Triassic biostratigraphy and environment reconstructions and provide much information about heterosporous lycopsids not preserved as macroremains. Taxonomically determined megaspores may help better clarify age of source strata and provides information about co-occurring flora.