and therefore non-point source pollution caused by mineral fertilisation in this region is not considered a serious problem. The high nitrogen surpluses can be caused by high animal density per ha. The stocking rate over 2,1 LU/ha can cause net-balance surplus over 100 kg N/ha; in this case organic fertilisation can be considered a serious pollution source

The average net nitrogen surplus in private farms in other parts of Slovenia is 46 kg/ha. It is a little bit higher than Slovenian average in 1994 (40 kg/ha). While in state farms is nearly three times higher than Slovenian average - 117 kg/ha.

In the Karst region of Trnovsko-Banjška Planota with limited growing conditions for crops (climate, soil depth, shallow soil) just small increase of livestock density can cause considerable nitrogen surplus. For that reason the restrictions for the application of chemical fertiliser and manure on hilly karstic regions had to be more rigorous than in plains.

Slovenian legislation intends to level this situation with quite strict regulations which are in agreement with EC Nitrate Directive and Code of Good Agricultural Practice.

2.8. FAUNA IN SELECTED KARST SPRINGS FROM THE TRNOVSKO-BANJŠKA PLANOTA (A. BRANCELJ)

2.8.1. Introduction

Copepoda is one of the most diverse and widespread group of so called "lower crabs - Entomostraca". Their body size usually ranges between 0.5 and 3 mm (HUYS & BOXSHALL 1991; EINSLE 1993). In inland waters they occupy very diverse of habitats, particularly taxa from groups Cyclopoida and Harpacticoida. They inhabit all types of permanent waters as well as some perennial ones (as for example puddles). They are very common members of subterranean communitus in sinking rivers, springs and percolating water. In sinking river abundance and number of epigeic species decline along the river, but number of subterranean taxa increase (BRANCELJ 1986). In percolating waters prevail stygobitic taxa, also in rare occasions some epigeic taxa are found there. This happens when thickness of ceiling is small and epigeic water bodies are in a vicinity. There is a lot of endemits among subterranean taxa, especially in that inhabiting percolating waters (SKET & BRANCELJ 1992). In some springs beside specimens of Copepoda, Ostracoda, Amphipoda, Ephemeroptera, Plecoptera and Coleoptera are present, too.

In the area of the "Karsthydrogeological Investigations in SW-Slovenia" within the framework of the ATH-project we made in 1993 a preliminary analysis of copepod fauna in four springs. No similar work has been carried

out in those springs before. The aim of analysis was to locate the sites with hypogeic taxa, i.e. cave-dwelling species, especially that of Copepoda.

Selected sampling localities were: the spring of the Vipava river, the caption in town Vipava, spring Kajža and spring Ajba. Sampling took place on March 23 1993. Material was collected by hand net with mesh size of 60 μm. Samples were stored in 4 % formaldehyde solution and transferred to a laboratory, where we use stereo microscope to pick out specimens of Copepoda, Amphipoda, Plecoptera and Ephemeroptera. Only specimens of Copepoda were determined to the species level, using determination keys of DUSSART (1967, 1969) and PETKOVSKI (1983).

2.8.2. Results

Nine species of Copepoda were determined; eight of them belong to group Cyclopoida and one to Harpacticoida. Undetermined specimens of Ostracoda, Amphipoda and Plecoptera were present in spring Kajža, too (Tab. 2.23). Specimens of Amphipoda are probably *Niphargus cf. stygius,* known from some localities nearby.

Five copepod species from Table 2.23, out of nine, are known as stygobitic, i.e. they live exclusively in subterranean habitats. Two of them, *Diacyclops slovenicus* and *Elaphoidella cvetkae*, are known from relatively small area.

Tab. 2.23: Faunistic list and localities; stygobitic taxa are indicated with asterisk.

	spring of Vipava	caption in Vipava	Kajža	Ajba
CYCLOPOIDA				
*Diacylops clandestinusKiefer, 1932				xxx
*Diacyclops languidoides (Lilljeborg 1901)			xxx	
Diacyclops languidus (Sars, 1863)			xxx	
*Diacyclops slovenicus Petkovski, 1957			xxx	
*Diacyclops zschokkei Kiefer, 1931				xxx
Eucyclops serrulatus (Fischer, 1851)	xxx			
Megacyclops viridis (Jurine, 1820)	xxx			xxx
Paracyclops fimbriatus (Fischer, 1853)	xxx			
HARPACTICOIDA				
*Elaphoidella cvetkae Petkovski, 1983			xxx	
OSTRACODA			xxx	
*AMPHIPODA			xxx	xxx
PLECOPTERA			xxx	xxx

Ostracodans are represented by shells only and detail determination was impossible. Shells were of different shapes and they probably belong to at least two species, one of them with restricted distribution.

Amphipodas are represented by few young specimens of genus *Niphargus*. Representatives of this genus are common in different types of underground waters.

Plecoptera is one group of insects. In two locations Plecoptera were represented by larvae. Whilst adults fly around, mate and lay eggs in water, larvae develop in water. They are very sensitive to organic or inorganic water pollution and are indicators of oligosaprobic water status. Adult females in some species prefer to put their eggs into springs, usually quite far from the entrance.

2.8.3. Discussion

One location, caption in town Vipava, has no animals at all, due to the fact that the water flow was too fast and therefore no animals can persist.

In spring of the Vipava we sampled just at the mouth of the spring. Fauna there was poor. We got only three taxa of Copepoda, beside some specimens of Mollusca (*Bythinia sp.*). All three taxa of Copepoda are known from epigeic habitats, including surrounding of springs. They are among the most common, and tolerant, species of Copepoda. According to previous experiences, they out competed (or preyed) subterranean species in springs.

The most interesting fauna we found in spring Kajža, actually in small puddle, c. 10 m from the entrance. Beside larvae of Plecoptera, which originated from outside, we found three interesting taxa of Copepoda: *Diacyclops languidoides*, *D. slovenicus* and *Elaphoidella cvetkae*. Whilst *Diacyclops languidoides* is common also in subterranean waters, are *D. slovenicus* and *Elaphoidella cvetkae* exclusively inhabitants of subterranean waters. We found them in SW part of Slovenia and in vicinity of Triest (Italy). Finding of both taxa indicate that water coming to the spring has no direct connection with epigeic water bodies. Origin of water in spring is solely percolating water.

Similar situation we found in spring Ajba. Specimens of *D. zschokkei* and *D. clandestinus,* beside *Niphargus* sp., indicate that water in the spring has no direct connection with epigeic water bodies. Few specimens of *Megacyclops viridis* found together with previous mentioned taxa shed slightly different light on the problem. *M. viridis* is a very common species in many oligotrophic and slow-running epigeic water bodies. At the same time it is common in sinking rivers quite far from the sink hole. Presence of specimens of *M. viridis* in spring Ajba is probably a result of human transport with water from somewhere else and not via water channel through the massif.

Springs Kajža and Ajba can be considered, according to fauna composition,

as springs with juvenile water, i.e. water filtered through soil and bed-rocks. Fauna doesn't confirm any direct connections between constant epigeic water bodies and mentioned springs. At the same time it doesn't exclude any connections through dry channels, or temporary overflowed channels, in the recharge area. Presence of relatively rich subterranean fauna, with relatively small number of specimens indicate that concentration of organic material, like communal sewage or water from waste dumps, is low.

2.9. VEGETATION CHARACTERISTICS OF THE TRNOVSKI GOZD (T. PIPAN)

Trnovski Gozd can be placed in the Dinaric phytogeographic region but forms its extreme north-western part. There is represented, therefore, a kind of transitional zone between the Dinaric and Alpine phytogeographic regions. This is most clearly reflected in the smaller number of Dinaric (Ilyric) samples of flora and the larger number of Alpine species. The southern margin of the Trnovski Gozd towards Vipava valley forms the direct border with the Submediterranean phytogeographic region. Because of the configuration of the terrain, the border is very sharp in places, the zone of transitional vegetation being mostly narrow.

Due to its characteristic geographical position, Trnovski Gozd is a kind of cross-roads of different species of flora in miniature. At the margin towards Vipava valley and on up the Čepovan valley, there are examples of quite a number of Submediterranean species. On the plateau, however, the Dinaric-Ilyrian meets with the Alpine. The most well known tract with all three types of flora mixed is Čaven where an extraordinary variety of flora flourishes. The Paleoendemit parsnips discovered by Hladnik, *Hladnika pastinacifolia* also thrive in the Trnovski Gozd, growing only on the Čaven and Poldanovec. The reason for the mixture of species, is not known; studies show that neither darkness nor temperature are causes.

The entire plateau of the Trnovski Gozd, except frost place tracts, is covered with the Dinaric plant association of beech and fir (*Omphalodo - Fagetum s. lat.*). A height zone at between 900 to 1,000 meters and 1,300 to 1,400 meters is formed in the Dinaric phytogeographic region. The combined beech and fir forest grows on other tracts of our mountainous karst (Snežnik, Javorniki, Hrušica and Kočevski Rog) besides in the Trnovski Gozd. It is distinguishable from the similar plant association of our Alpine tracts by the presence of Dinaric-Ilyrian species in the undergrowth and by the presence of a number of Central European species. However, the number of Dinaric-Ilyrian species are considerably less when compared to other tracts of the mountain karst as the Trnovski Gozd represents a kind of transitional zone between the Dinaric and Alpine regions.