Macrofauna in floodplain pools and dead branches of the Pripyat river, Belarus

22 augustus 2002

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Preface

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Introduction

1.1 Background of the problem

The Institute for Inland Water Management and Waste Water Treatment (RIZA) in the Netherlands is using the Belarussian Pripyat river as a suitable reference object for ecotoxicological investigations in the Dutch. The morphological characteristics of Pripyat and its altitude are similar with the Rhine river. In the same time Pripyat has very few anthropogenic influences from the past to nowadays. Investigations of the RIZA showed that the sediments of the Pripyat are much less contaminated with metals, PAH's, PCB's and pesticides than those of West European rivers.

Most lowland rivers and flood plains have been changed in quality, morphology and hydrology. Pripyat has the natural weakly disturbed water ecosystems (wetlands) in its flood plain and it is one of the most valuable rivers of unique Polesye region in South of Belarus. Internationally the Pripyat is one of the least influenced lowland rivers in Europe. At many places all former river branches and other water bodies from the past are still present in nearly natural condition because of the agrarian management is still extensive and landscape morphology, hydrology and water quality is still practically natural. Such stretches of Pripyat are situated at Turow—Chlupin area where that project investigations were fulfilled.

A natural river landscape is characterized by numerous water bodies influenced by a river. The most typical water bodies are backwater connected to main stream at downstream end only, dead river branches, occasionally inundated backwaters (oxbows), wet woodlands, fens and marches, which are depended on the river characteristics. Variable water bodies adjoined to the river-bed fulfil very powerful function such as refuge and place of feeding for juvenile fishes, amphibian and birds and many different insects. In common it is part of system of the organic matter transformation and the river system nutrient supplies regulation. These water bodies keep water supply in the flood plain to the middle of summer.

A reduction in diversity of species and number occurs when habitats are affected by a decline in water quality or engineering. River micro-habitats, such as weed beds, backwaters, small tributaries and even ditches, which fry use as nursery grounds, are easily damaged during even routine maintenance. Canalization and other engineering, works can prevent periodic flow fluctuations from «flushing out» accumulated silt and mud.

Thus, as a result of the reduction of hydrological connectivity between river and its flood plain, backwaters silt up. This often lead to the development of anoxic conditions unfavorable tolerant species.

Thus the species community composition in total and some tolerant species could be used for estimation of conditions river function and its « health».

Taking into consideration the character of landscapes in floodplain of Pripyat river, it is obvious that the different way of water feeding could be possible on the different landscape patches: precipitation (rain and snow), soil and underground waters and high water of rivers at time of spring as well as the sheet flow from neighbor forests and bogs.

Undoubtedly, both the water feeding type and the soil character as well as hydrochemical characteristics form the species composition and fauna richness of the wetland pools. Also the hydrological and hydrochemical characteristics are strongly reflected in the type of communities, living in reservoirs, which adjoin to the river-bed.

In fact, hydrobiological investigations can characterize very well the peculiarities of these pools in the river floodplain. In less disturbed and more vulnerable regions it was expected to find the presence of some sensitive species. Because of the poor knowledge of water fauna biodiversity of wetlands in Belarus, first of all it was been necessary to determine what is the macrofauna species composition of water bodies influenced by Pripyat river and which rare and abundant species are living there. This will be compared with experiences in other parts of Europe. For assessment we used the available autecological information about the most useful groups of aquatic invertebrates (Crustacea, Mollusca, Insecta).

Since the parameters of environment define the composition and abundance of populations, the specific species complexes could be used as indicator of trophic status of systems. It is necessary to emphasize that these complexes characterize the natural weakly disturbed water ecosystems (wetlands) in the river plain of the most valuable rivers of unique Polesye region in South of Belarus.

In agreement with the above the goals of the project were:

- to give insight in the morphological, hydrochemical and biotic characteristics of the water bodies in the floodplain with more and less relations to the river;
- to give an idea of the species diversity and their abundance in the different water bodies;
- on the ground of these investigations to create the possibility to place the water bodies investigated by the RIZA in the obtained series.

1.2 Characteristics of Pripyat catchment

1.2.1 Geography of Polesye region

Polesye lowland is situated at territories of the north-west Ukraine, the South of Belarus and western area of Bryansk region, Russia and it has an altitude 100 - 200 m. The lowland arose on the place of the ancient Palaeozoic tectonic cavity filled in more late deposits of different geologic epochs. The modern surface of lowland was deposited by sandy and sandy clay both water-glacial and river alluvions with occasional moraine outthrusts like that gibber clay sands and loam.

The northern part of Polesye lowland is famous as Belarussian Polesye and covered 58 thousand sq. Km. Its surface is monotone plain or wavy, sometime it has small hills. That region is characterized by weak drainage of ground-water and it has a lot of valley fens and boggy soil with pine and deciduous forests. During Palaeozoic period the Polesye lowland underwent many-sided movements. It was a bottom of Sea basin during foundering periods while during upheaval epochs it was a lowland. The maximal See extension was during Oligocene and to the end of that epoch (20-25 million years BC) sea came away last. When Neogene was the erosive and accumulative processes were prevailing. At last the glacial epoch superinduced the line of gradual changes of the landscape thanks four advances of glacier and their waning. In spite of the fact that the last Vurme glacier was not on Polesye area but its melting waters formed largely the overflow land platform. On base of band deposits of area witnessed the distribution of wide lake basins (Brest and Jaselda at the West, dateless Chervonoe at the middle part of area and Vasilevichi, etc at the West). They could be filled in by both glacial melting waters from the North and water of West Bug river and southern rivers which are now as right tributaries of Pripyat river. The outlet of these ancient lakes

could be only through low parts of tributaries directly to Pripyat (Dementiev,1952; 1956). The feeding rivers ancient lakes could be kept during Riss-Vurme interglacial epoch diminishing in bulk by natural drainage. So the connection between river basins of Middle and South Europe is very archaic. The water fauna and flora exchange could be fulfilled through them. Nowadays the bolsons of Vurme lakes are conspicuous on the lowland landscape and are accompanied by peatlands and residual lakes (Vijgonovskoye, Sporovskoye, Chervonoye, Bobrovitskoye, Chernoye and others).
The morphological peculiarities of terrain features let to select the line of geomorphologic region of Belarussian Polesye. The biggest region is Pripyat Polesye limited by divides of basin Dnyepr and Wisla from the West, Dnyepr and Pripyat from the East and Mozyr plain - Volyn moren drum from the South.
Pripyat Polesye is very plain area with only 20 meter slope along Pripyat river flow over a distance 300 km from Dnyepr-Bug channel to Mozyr. The interfluve territories are unhomogeneous and could be as dry sand lowlands with forests and bushes as peatlands of lowland bogs. These lands are characterized by high level of underground waters and are covered with wet alder-birch forests and alder-osiery bushes.
Turov and David-Gorodock islands of lowest overflow land terrace look a fly in milk with above-mentioned area. They are founded by dust loam marl alluvium of Goryn and Stviga rivers. High hardness of underground waters of these rivers conduced feasibly to carbonate accumulation in alluvium. The result of that is high level of a fertility of vegetable and humus - carbonate soils which arose on these grounds and considerable tilled soils instead of former oak-hardbeam forests.

1.2.2 Pripyat river and its tributaries

Pripyat river is a biggest by size and water supply tributary of Dnyepr river which runs into the Black Sea through Belarus and Ukraine lands. The origin of Pripyat begins 1 km NE from village Gladin of Lubomlskogo region, Volyn areas (Ukraine) at an elevation of above168 m the sea. Length of Pripyat is 761 km. The high part is on Ukraine (204 km), the middle part is on Belarussian territories (500 km) and the last 57 km before the influx into Kiev reservoir are on Ukraine lands again.
The catchment of Pripyat is 121000 km^2, including 51370 km^2 on Belarussian lands. For Belarus the Pripyat catchment is about 30% of the territory of the Republic.
Main tributaries are: Styr, Goryn, Ubort (right hand side) and Jaselda, Slutch, Ptitch rivers (left hand side).
A lot of tributaries (especially left hand side of Prepay)are almost or particularly channeled. Rivers of Pripyat catchment have small slops, free meandering, strong ramification and meandering, moreover it is heavy to select the main channel-bed. The situation in Europe, the Pripyat catchment area and some details are given in figure 1.

1.2.3 Morphology of Pripyat

The Pripyat valley in the beginning and in the end of river is overflow lands and has an inexpressive character with 70-75 km breadth but in the middle (near Mozyr drum) it is trapeziform and 5-8 km , width . The shore are gently sloping but somewhere they are abrupt with terraces. Slops are 8-30 m high. The river bed wide is 4-15 m to a estuary of Stachod river, 50-70 m farther , about 100-200 m in the low part and to 405 km before Kiev reservoir influx. The common river dropping down is 69,5 m. The middle slope of water surface is 0,1 ‰ .

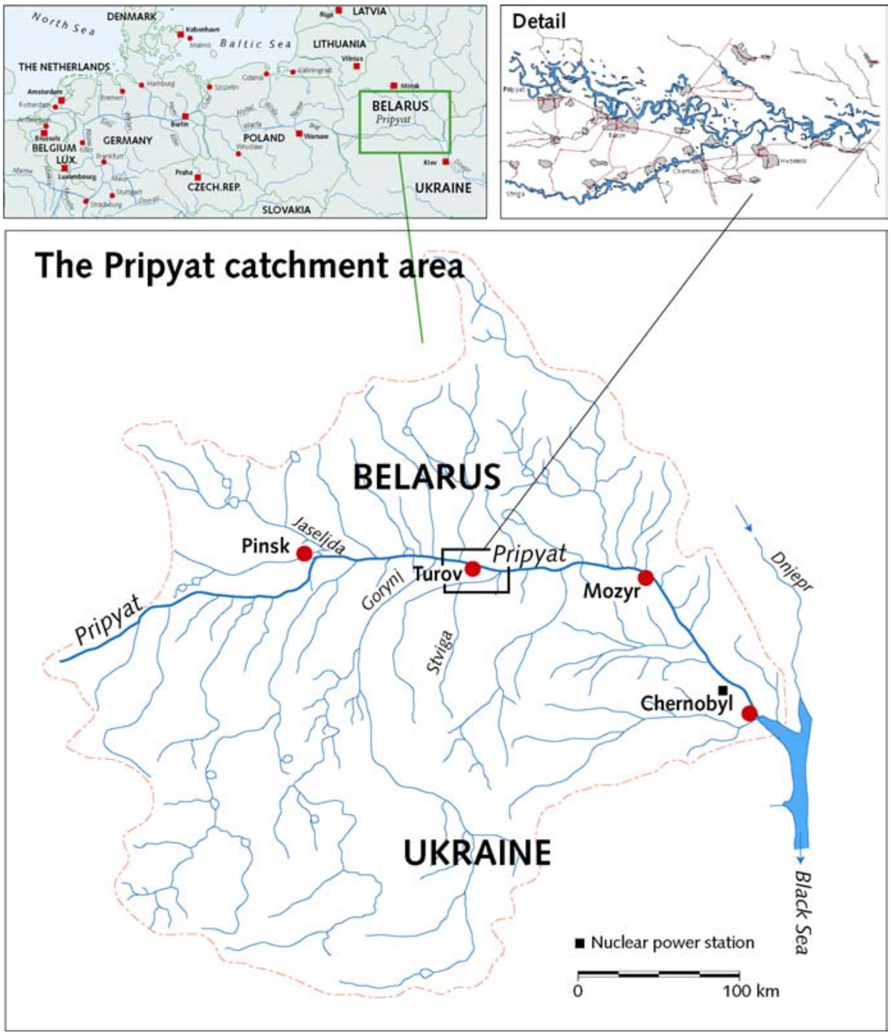


Figure 1
River Pripyat:
Situation in Europe, catchment area and detail

It have been selected pojma and two over pojma platforms. The flood plain are two-sided with width from 2 to 10-18 km. The surface is traversed by old-rivers branches and channels, it is covered by wooded ridges of sand mounds and has mainly sandy and peat soils. The bottom is plain, sandy or sandy-silt. The first platform is expressed up and down river (1-8 km to 18 km width) with the exception of Petpikov-Mozyr stretch . The second platform has its width from 200-500 meter to 28 km.
The natural water-net density is 0.30 km/km^2 but it is about 0.43 km/km^2 together with melioration system channels and ditches.

1.2.4 Hydrology of Pripyat

The feeding of the river is supplied by water from melted snow, rains and subsoil waters. The regime of river levels is characterized by extended and diminished flooding and by relative low summer-autumn lowest water-level with increasing of water level in autumn as result of long time of rains.
The spring water level increasing begins in the first decade of March with intensity 5-10 cm/day and lasts about 25-30 days. The maximal levels are observed in the first half of April (from 2 to 5 days), after that the slow decreasing come. The flooding duration is about 4 months per year.
The summer-autumn lowest water level duration is from 3-4 months for Pripyat river to 6-6.5 months for small rivers (tributaries). Sometimes there are high water level during all summer period. The lowest levels are observed typically in August-September.

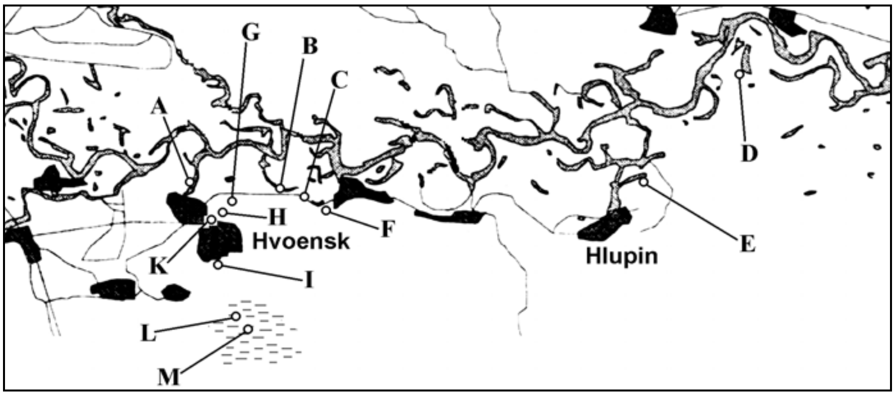
The winter lowest water level is more stable and high than summer-autumn one. Almost every year there are the waves of rain flooding in summer and autumn by low water supply. The autumn flooding are long enough (to November-December). During autumn flooding the water level increasing on the flood plain are more rare and short than in spring.
The levels of winter lowest water level are more stable and it is at 0.5-0.8 m higher than in summer-autumn. During warm winters they increase to 3 m beyond it is before a flooding.
Pripyat is covered with ice almost simultaneously along all its extent in the first half of December . In the end of March Pripyat is free from ice. The middle duration of ice covering is 95-105 days but it could be increased to 130-135 days during in cold winters. The maximal ice thickness is 50-60 cm in the end of February (average value is 30-40 cm).
The earliest date of flood plain release from flooding is in the third decade of March - beginning of April, the latest one is in the first decade of July. The most late terms for the stopping of flood plain lands flooding were observed to the end of August.
In total Pripyat river area is unique and very specific thanks to its attitude position, numerous tributaries and very weak anthropogenic disturbance level.

2 Description of sampling sites

2.1 Introduction

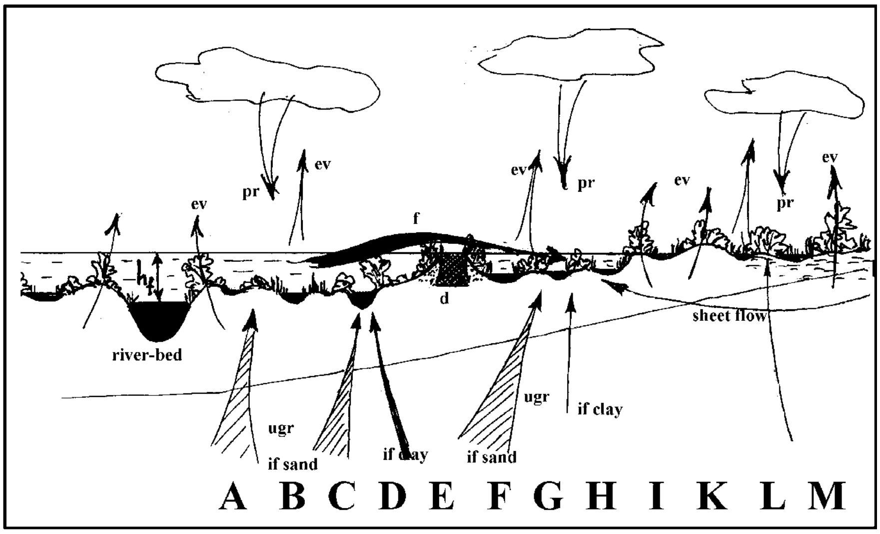
The study area was located between the villages of Hvoensk and Hlupin, 15 km east of the town Turov (Fig. 2). At this point the flood plain of the river is approximately 5 km broad. The flood plain, known as pojma, is comprised of a complex of oxbows, dunes, meadows and woodland. The oxbows have a varying degree of influence of river and ground water. Beyond the reach of the river is a zone of purely groundwater fed marshes. At this point forest cover also becomes more substantial. These marshes grade into purely rainwater fed bog higher up.

Figure 2
The map of Pripyat in area of the investigations and the sampling sites



Human influence in the region is slight. There are no dams or heavy industries upstream. The course of the river has not been altered by canalization and boat traffic is almost absent. The natural morphology of the stream bed is largely intact. Agricultural practice is poorly developed. Drainage is minimal, resulting in a very high water table. The flood plain is used only for the grazing of cattle.

Figure 3
Schema of different sources of water receiving in 3 types of water bodies at the river floodplain



Larger areas of wetland have only been reclaimed upstream of some of the tributaries. Vast expanses of marsh and forest in the watershed are pristine and uninhabited. In short, the system is representative of the situation lost in most of Europe many centuries ago. The selection of sampling sides was fulfilled with a proceeding from total impression about souses of water feeding for different type of water bodies in the river flood plain (Fig. 3).

2.2 Hydrology of the investigated area

The investigated dead branches of the Pripyat river are influenced by the river at one side and the higher grounds at the southern side of the flood plain. According to their source three types of water can be discerned.

2.2.1 Water from Pripyat

The water level in the river Pripyat can fluctuate yearly from 1 to 7 meter. In periods with low water level most dead branches have no contact with the river, during flooding the river water will entry more or less into these oxbow lakes. In most years the level is highest from March to May, but sometimes the high water period lasts longer. Also in summer or autumn flooding is possible, for shorter or longer periods. After falling of the water the smaller water bodies in the flood plain will partly dry up. According to de Mars (in prep.) the concentration of minerals and also eutrophication can become very high (conductivity up to 700 µS/cm). For the Pripyat itself de Mars gives a conductivity of 435 µS/cm, pH 7,28 and HCO_3 220 mg/l. In dead branches reducing by evaporation and decomposition of algae will play an important role.

2.2.2 Deep ground water

The ground water levels in the region are in general very high. Locally for agricultural purpose the ground water level has been lowered. In former times this was also the case in the woodland in behalf of felling woods. In the flood plain the deeper ground water will rise wherever the soil is more or less sandy. This means that in several dead branches the river water can be mixed with rising ground water and that some of these branches will have a more or less constant feeding with ground water. De Mars (in prep.) found in a ditch near Bechi, south of Hvoensk, a conductivity of 385 µS/cm, a pH 6.74 and HCO3 246 mg/l. These values were not significantly different from water bodies filled with Pripyat water.

2.2.3 Rain water

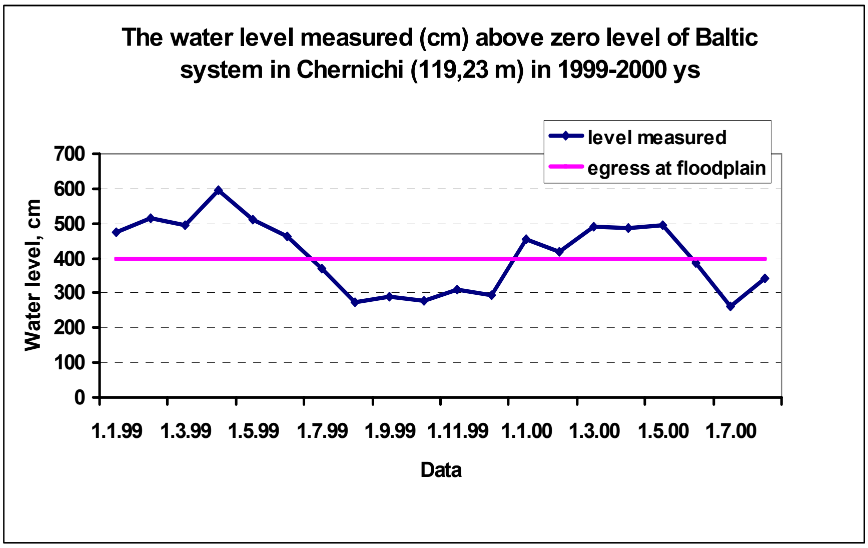
After establishing the nature reserve most ditches were dammed and the bogs and woods got a higher water level. Because of the fact that the rain water was less drained off, the upper layers in the reserve got more rain water than ground water quality. De Mars (in prep.) and we also found in the bogs conductivity from 20 to 40 µS/cm and HCO3 0 - 12 mg/l. At places where ground water is rising much higher values can be found. Where water from superficial layers flows down into pools or oxbow lakes, the lower values of conductivity, alkalinity etc. will be characteristic. Such influence from more superficial layers are also possible in dead branches near to higher grounds. After long raining periods the amount of rain water will be more important.

Summarizing can be said that the water in the dead branches will be a mixture of these three water types. The influence of Pripyat water is dependent of the water level in the river, the influence of deeper ground water is dependent on the situation in the dead branch and the (very local) permeability of the soil and the influence of rain water and superficial ground water are dependent from the situation and the rainfall.

2.3 Hydrological and trophic situation in the year 1999

On account of heavy snowfall in March of 1999 the water level from March until June 1999 was extremely high (highest level since the beginning of the regular observations in 30th Ys). (Fig. 4). All channels and oxbow lakes at the northern (river-)side of the dike formed a part of a vast sheet of water between the dike and the river Pripyat. Near Pererov and Hlupin the water had flowed over the dike. Between Hvoensk and Pererov the water had passed through four culverts during one or two weeks. In May only one culvert was open (between localities C and F) and water was flowing back from F at the south side in the direction of the river at the northern side.

Figure 4
Water level dynamic {m of BS (Baltic System)} at the point Chernichi (top) and Mozyr (bottom) in January 1999 – August 2000. The horizontal line shows the level of water uotcrop (m) on pojma of the Pripyat river.



After rise of temperature in May large parts of the pojma were covered by mats of algae. According to information of Ivan Chizhik this eutrophication was much stronger than normal. It seems to be the result of decaying of grasses and other organic material. Also de Mars (in prep.) mentions the importance of decaying algae in spring 1998. Especially the fact that also from July until September 1998 the pojma had been covered by water can have led to mass decaying in the whole area.
Therefore it can be that the hypertrophies situation and oxygen deficit in the water is not the result of drained matter along the river but more the result of processes in the pojma itself. In the woods south of the dike the algae were lacking. Possibly the high water levels caused there less rapid decay of organic material. Also in the Netherlands the increase of phosphate after inundation of flood plains is a well-known phenomenon.
During the first sampling period (May 25 – June 5) the water was falling. The water level at the end of May was about 1,3 m lower than the maximum early April. In August under influence of the very dry summer the water level was still much lower: one and a half, locally about two meter.

2.4 Sequence of samples

Because of the fact that the first project goal of the investigations is to give insight in the characteristics of the waters with more and less relations to the river the water bodies are placed in a sequence according to the river influence.

The opposite end of the gradient would be the bog, but our research didn't extend so far (except Odonata). As outermost water is considered the water with highest percentage of superficial groundwater.
A problem is that the influence in spring was quite other than in summer. The chosen sequence has been especially influenced by the spring situation. The sampling point in the woods near Hlupin (**D**) was hardly to place in the row. For the other points (Fig. 2) the arguments for their place are the following:

A **-** arm of Pripyat between Hvoensk and river; in spring river water was flowing here; sand banks by erosion; in summer still in contact with river and fluctuating with river level.
B **-** in spring slow flowing channel between Hvoensk and Pererov; in summer stagnant water; more erosion and sandy bottom than C;
C - channel near 7 (and in spring open contact with it) but only partly with visible flow and very locally a sandy bottom; in summer partly with thick layer of organic silt;
D - in spring 1999 flowing channel in forest near Hlupin; in summer a small oxbow lake in the same part of the forest;
E - end of open channel system near Hlupin, edge of forest, without flow; next points are situated at the south side of the road (dike) and therefore less influenced by river
F - dead branch near C, in March flow through culvert from river side, end of May only water flow in northern direction; in summer stagnant branches and ditches;
G - dead branch near Hvoensk, south of road; as **F**, but probably less water from northern side;
H - pool in swampy land south of **G**, more inland, at damaged bridge; in spring more or less in contact with **G;**
I **-** pool still more inland, south of Hvoensk at the edge of the forest, near old railway-track (in March high water level, but possibly no direct influence of Pripyat water)
K **-** pool in Hvoensk west of railway (probably no influence of Pripyat water); the only pool with much influence of superficial ground water: low conductivity, alkalinity etc.

other samples
In the flood plain (pojma) on May 31 some qualitative samples of Chironomidae have been taken. In the bog some other groups have been investigated on June 2 and September 6 (pools **L** and **M**).

2.5 Morphology and vegetation of the water bodies investigated

WATER BODY **A**

situation
A 60 - 80 m (in spring 100 m) broad channel, connecting the village of Hvoensk with river Pripyat. The whole year round the water level is fluctuating with the level of the river.

Spring
The eastern side of the channel was end of May nearly fully covered with blue-green thread algae, both floating and in a thick layer on the bottom. (Fig.5a). At the western side digger-out soil from the bottom of the channel had been deposited. Samples were taken between vegetation of the sedge *Carex acuta*.

Summer
In September the water level was more than 1 meter lower. However: the level had been still 80 cm lower few weeks before sampling. It is not clear if all animals already returned to the sampling places.
At the eastern side the sandy shore was flat with sparse pioneer vegetation. At the western side samples were taken on sandy bottom near to a closed vegetation of sedges (Fig. 5b).

Bottom
The soil consisted of sand, locally clay, with only in May an up to 3 cm thick layer of coarse and fine organic material.

Figure 5
Waterbody A: a station 1, spring
B station 2, summer

a

b

WATER BODY **B**

Situation
A channel north of the road Hvoensk-Pererov, the same as investigated by de Jonge e.a. (1999) and named P2. Breadth is about 50 m. We took samples only along the southern bank.

Spring
In June this branch was at both ends in open connection with river Pripyat; at that moment it was a channel Our sampling point was at a more sheltered locality than that of RIZA so that current was obviously less.

Figure 6
Waterbody B: a spring
B summer

a

b

Summer
In September the branch was separated from river and totally stagnant. Although water level had decreased more than one meter the total situation had not changed much.

Vegetation
Neither in June nor in September there was a dense vegetation along the southern bank. In June halophytes as *Carex* and *Eleocharis* were most important. In September almost only *Nuphar lutea* and *Ceratophyllum demersum* were present (Fig.6a, b).

Bottom
On the sandy bottom with some small organic particles 0-5 cm organic silt was present.

WATER BODY **C**

situation
A cut of channel at the northern side of the road Hvoensk-Pererov, near to the latter village.

Spring
Until end of may the channel formed a part of the immense flood plain north of the road. Locally some flow was visible. Samples were taken at the south-western edge of this area, near to (C1) and between (C2) a row of willows. C1 was taken on a more or less sheltered shallow place with loose vegetation of sedges.

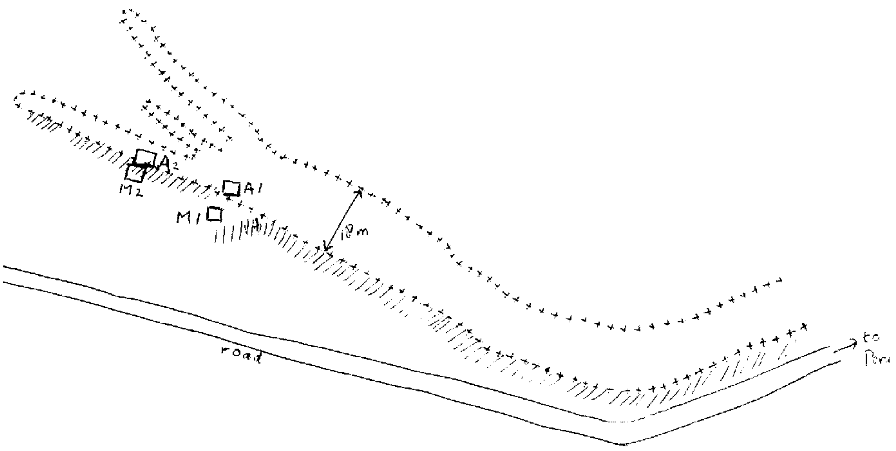


Figure 7
Schema places of sampling at water body C. M1 and M2 stations for samplings in spring (May), A1 and A2 stations for samplings in summer (August). The road has the right hand direction to Pererov and the left hand direction to Hvoensk.

Summer
End of August when the water level was about 1 1/2 m lower, the landscape had changed into a grassland with an oxbow lake, fully separated from channel B and Pripyat. The sampling points had to be moved because of the lower water level. C1 was situated now along an 18 m broad branch with much open water, C2 along a much narrower (8 m broad) branch with many *Nuphar lutea*, close to the row of willows.

Vegetation
In May C1 had a moderately dense vegetation of sedges with many thread algae on the bottom (Fig.8,a). In August at this (moved) point the sparse vegetation consisted of scattered *Sagittaria sagittifolia, Nuphar lutea* etc. At C2 along the water edge *Carex acuta* was dominant up to the darker parts under the willows. In the open water *Nuphar lutea* was abundant (Fig.8b).

Bottom
In May the samples have been taken on clay bottom, fully covered with only partly decayed organic material, respectively dead grasses (C1) and remains of

twigs and leaves (C2). In August sample C1 was taken on sandy bottom, locally with 2-3 cm organic silt, C2 on 35 cm thick organic silt.

Figure 8
Water body C: a station 1, spring
B station 2, summer

a

b

WATER BODY **D**

situation
A channel in the middle of woods east of Hlupin, in an area named Zarechovje. In September the same place could not be reached. A nearby more or less similar water body has been investigated (Fig. 2).

Spring
A slow flowing channel with much shadow from trees. Samples taken at the northern bank, in more or less open stretch between willows.

Summer
Isolated ox-bow lake in woodland. Northern bank.

Vegetation
Spring samples in loose vegetation of *Phragmites australis* (reed) and *Carex riparia*.(Fig. 9). In the summer locality there was only a sparse vegetation near the shore.

Bottom
In June fine roots, together with more or less decayed dead organic material, forming a thick dense layer with organic silt within. In September a thick layer of organic silt.

Figure 9
Water body D: spring

WATER BODY **E**

situation
Along an oak wood near the cemetery east of Hlupin, in June in open contact with the river by means of other channels in the pojma. This lake is more or less the end of this system of dead branches. It was hardly shadowed by trees and shrubs. Some influence of the frequently present cows around the lake is probable.

Spring
Rather (50 m?) broad lake nearly totally covered with dense vegetation in different zones (Fig.10a).

Summer
Water level decreased about 80 cm. Further more or less as in spring (Fig.10b).

Vegetation
In June samples were taken in a zone of *Carex*, in September in zone of *Potamogeton natans* (E1), respectively *Nuphar lutea* (E2) (only the latter at the north-eastern side near the oak wood). In September the vegetation was more dense than in June but otherwise had not changed much.

Bottom
Samples on organic bottoms, mostly with living or dead undecomposed parts. C2 in September in a layer of more than 20 cm organic silt.

Figure 10
Water body E: a station 1, spring
B station 1, summer

a

b

WATER BODY **F**

situation
A cut-off channel system at the southern side of the road Hvoensk-Pererov, opposite to water body C. In periods of very high water C and F are connected by a culvert, which had been closed after penetration of much river water in March 1999. Moreover water has been flowed over the road for several days in March.
Agricultural land at the eastern side had been mannered several years. The other sides of the area covered with more or less natural grassland or wood, which have not been mannered. Within the low plain only very small willows were present. The southern edge was a line of dense willow bushes.

Spring
In May the whole area was covered with water so that it seemed to be one water body, nearly one kilometre long and about 300 meter broad (Fig.11a). Samples F1-3 were taken at the eastern side on places which were field in summer time. F4 was taken in the western part in more natural environment.

Figure 11
Water body F: a station 3, spring
B station 3, summer
C station1, summer
D station 4, summer

a

b

c

d

Summer
In late summer (Fig.11b) open water was limited to a ditch (Fig.11c) and some narrow natural channels in the eastern part and a 40 m broad rather long ox-bow lake along the willow bush at the southern edge (Fig.11d). F1 was taken in the ditch. F4 (the only other sample) in the western part of the broad oxbow lake. The latter was still very deep: just along the peat, more or less floating bank water depth was about 1.2 meter.

Vegetation
End of may samples have been taken in more or less loose vegetation of sedges and grasses, partly dead and lying on the bottom, on deeper places (F3) already decaying. In September sample F1 was taken near to the water edge, along a dense sedge vegetation. In the ditch the vegetation was more loose and formed a varied structure.
The vegetation on the floating peat of sample F4 consisted of *Stratiotes aloides*, *Carex acuta*, *Nuphar lutea* and many other species.

Bottom
In May the clayey soil was mixed and covered with plant remains and some organic silt. In September at F1 the nearly decayed organic matter formed a layer of 10 cm on the clay. At F4 the bottom consisted only of brown to black silt peat.

WATER BODY **G**

situation
The structure of water body **G** resembles that of **F. G** is situated about 5 km more to the west, near to Hvoensk (see Fig. 2). According to our information only very indirectly water of the river will have reached this area, much less than in the case of **F**. The total environment of **G** is more natural than in the case of F. Probably hardly or not the land will have been mannered. It is separated from the village by a dike.
At the south-eastern side an oak wood is situated. The southern side is a marshland, nowadays with many young trees and shrubs on all higher parts (see fig.12).

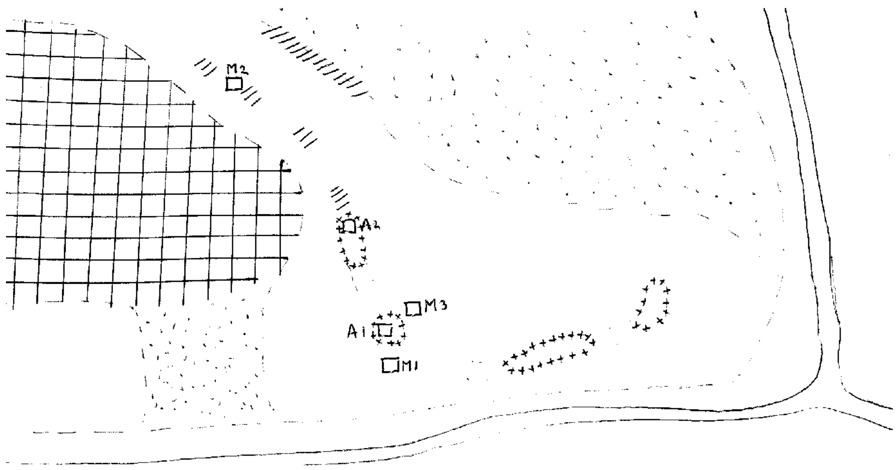


Figure 12
Schema of sampling places at the water body G.

M1, M2, M3 stations in spring (may).
A1, A2 stations in summer (August)

The road has the right hand direction to Hvoensk and the laft hand direction to Pererov. In spring it was wide flooded area (see dotted line space) but in summer there were only few little waterbodies (see cross line spaces). The left hand squared off area is the oak forest. The right hand doted region is boggy area covered with vegetation.

Spring
Whole area was covered with water, except the oak wood became partly dry at the end of May (Fig. 13a, c)

Summer
In September only parts of a very old and narrow branch formed pools with water in the peat former river bed (Fig.13b, d)

Vegetation
In large parts of the area the grass *Glyceria maxima* or sedges were dominant. In May the samples were taken at places with loose vegetation of different types of plants. In September pool G1 had a border of *Glyceria maxima* but hardly any vegetation in the pool itself. In pool G2 *Nuphar lutea* was covering 80% of the total surface.

Figure 13

Water body G:
- a station 1, spring
- B station 1, summer
- C station 2, spring
- D station 2, summer

a

b

c

d

WATER BODY **H**

situation
Pool H lies in the marshland near the village of Hvoensk on a place where formerly had been a bridge. The pool must be very old and was still very deep. Many pieces of wood from the bridge were still laying or staying in the pool (Fig.14).
The pool was separated from G only by marshland with many trees and shrubs. In March the river water can have reached pool H but will have been mixed with rain water and ground water from the southern part.

Spring
A other small part with open water surrounded by a zone of *Stratiotes aloides* and a marshland with sedges, grasses, *Salix* shrubs etc. The water was brown, many dead water plants were present in the water layer.

Figure 14
Water body H: station 1, spring

Summer
The water layer in August was only 50 cm lower than in May. Possibly the pressure of ground water is relatively high in this old and deep pit (reason for bridge ?). The vegetation had not changed much in comparison with that in May. Only the open water surface was smaller.

Vegetation
Besides *Stratiotes aloides* many other species played an important role: among others *Glyceria maxima, Comarum palustre, Equisetum fluviatile* and *Carex* species. *Lemna trisulca* was floating in great numbers, in the open water in summer covering 90 %.

Bottom
Except very near to the banks the sandy bottom was covered with thick layers of organic material, in May only partly decayed, in August mainly as brownish-black organic silt.

WATER BODY **I**

situation
Pool in the edge of the forest, at the south-eastern side of the village Hvoensk. It is situated about 2,5 km from the road Hvoensk - Pererov, but nevertheless the water level in March had risen more than one meter. If the river water itself has reached this pool is uncertain; there is no dike between F-G-H and this pool.

Spring
The water level early June reached up to the edge with *Carex riparia* and other helophytes. An important part of the bottom was covered with true water plants (Fig. 15a).

Summer
The water level end of August had decreased about 1.25 m. (Fig. 15b). Only the edge zone was overgrown with water plants, most of the bottom was open. More than in June thread algae were present, although not very abundant.

Vegetation
As it was mentioned above the amount of plants decreased dramatically from June to August. During the whole period *Elodea canadensis, Potamogeton acutifolius* and *Potamogeton trichoides* were most abundant. These species indicate a rather good water quality. Only in spring a few *Charophyta* have been found.

Bottom
The bottom, partly clay, partly sand, was covered with a layer of partly decayed organic material. This layer was in June 1/2 to 3, in August about 10 cm thick.

Figure 15
Waterbody I: a spring
B summer

a

WATER BODY **K**

situation
A relatively small pool in the marshland near Hvoensk, fully separated from Pripyat and also from marshland round pool H by dikes with sand roads.

Spring
End of May the open water was about 40 m long and 15 m broad, near to the road. Around the open water and especially at the western side a marshland covered with 50 cm water was present up to 50 m from open water. At the side of the road the slope was rather steep (30% or more) and overgrown with Salix and Betula.

Summer
End of August the open water was restricted to about 20 x 15 m and the water level was about 1 m lower so that nearly the whole marsh was dry (Fig.16).

Figure 16
Water body K: station 3, summer

Vegetation
In the vegetation around the open water *Stratiotes aloides* was dominant with rather much *Hydrocharis morsus-ranae* and *Salvinia natans*. In the open water *Utricularia* cf. *vulgaris* was almost the only higher plant species. The marsh was dominated by *Carex vesicaria* and other halophytes; between them the moss *Drepanocladus* was abundant.

Bottom
The soil consisted nearly everywhere of partly decayed plant material. In the deeper places of open water the organic material was more decayed with especially in May more organic silt.

Additional water bodies for the sampling were:

WATER BODY **L**

situation
An artificial small pool near the path through a bog, about 2 km S Hvoensk.

Spring
End of May the open water was about 30 m long and 10 m broad. Around the open water a belt of emergent vegetation 1-1,5 m wide. Along a shore it was covered with *Salix* bushes.

Summer
End of August the open water was restricted to about 25 x 8 m and the water level was about 0,8 m lower.

Vegetation
The shore line had Salix bushes and emerged vegetation such as *Carex acuta*, *Filipendula ulmaria*, *Deum rivale*, *Carex vericaria*, *Iris pseudacorus* L, etc.

Bottom
The soil consisted nearly everywhere of partly decayed plant material.

WATER BODY **M**

situation
An methotrophic, largely rainwater fed bog 2,5 S Hvoensk fully separated from Pripyat. From the bog to West flow small stream under the bridge on a path.

Spring
End of May the open water was small stream which flew under the bridge on the path.

Summer
End of August the situation was almost the same.

Vegetation
All area was covered with strong *Equisetum fluviatile* L. and with patches of *Iris pseudacorus*. The shore line is overgrown with *Salex.*

Bottom
The soil consisted of partly decayed plant material and peat.

2.6 The comparative bottom characteristics of the water bodies

Explanation of tables 1 and 2 :

organic silt	in cm; (+) = much silt present within other material (no silt layer)
coarse organic material	++, + or -
sand dominating	+ only if sand is dominating in upper 5 cm
clay present	+ when clay in upper 10 cm
halophytes - thread algae	+++ = covering > 75 % ++ = covering 25 - 75 % + = covering 5 - 25 %
shadow	++, + or - (sampling place shadowed by plants , shrubs or trees on banks)

Table 1
Bottom characteristics of the water bodies by biotopes (spring)

Pool N	date	depth (cm)	organic silt (cm)	coarse organic material	sand dominating (+ or -)	clay present (+ or -)	helo-phytes	Strati-otes	Elodeids etc.	Lemnids	larger floating leaves	mosses	thread algae	shadow (++, + or -)
A1	28.05	40-70	2	-	-	+	+						+++	-
A2/3	28.05	20-60	2	+	-	+	+							-
B1	1.06	25-50	?	?	?	?	+							-
C1	26.05	10-30	(+)	++	-	+							++	-
C2	26.05	10-100	(+)	++	-	+								++
D	3.06	60-80	(+)	++	-	-	++	+						+
E1	4.06	25-40	(+)	++	-	+	++						+	-
E2	4.06	100-110	(+)	++	-	-	+	+					+++	-
F1	25.05	15-50	(+)	++	-	+	+							-

Pool N	date	depth (cm)	organic silt (cm)	coarse organic material	sand dominating (+ or -)	clay present (+ or -)	helo-phytes	Strati-otes	Elodeids etc.	Lemnids	larger floating leaves	mosses	thread algae	shadow (++, + or -)
F2	25.05	15-50	(+)	+	-	+								-
F3	25.05	100	-	++	-	-								-
F4	26.05	20-40	(+)	+	-	+	+					++		-
G1	27.05	100-120	(+)?	++	-	-	+				+			-
G2	27.05	100	(+)	++	-	-				+				+
G3	27.05	30-50	-	++	-	-						++		-
H1	30.05	50-70	(+)	++	-	-	+	+			+			+
H2	30.05	120	>20	+	-	-		+		+				-
H3	30.05	30	-	++	-	-	++							+
I	5.06	40-100	-	++	+	+			++					-
K1	29.05	100-120	(+)	++	-	-		++			+			+
K2	29.05	40-60	(+)	++	-	-	++					++		-
K3	29.05	100-120	>10	+	-	-			+					-

Table 2
Bottom characteristics of the water bodies by biotopes (summer)

Pool N	date	depth (cm)	organic silt (cm)	coarse organic material	sand dominating (+ or -)	clay present (+ or -)	helo-phytes	Strati-otes	Elodeids etc.	Lemnids	larger floating leaves	mosses	thread algae	shadow (++, + or -)
A1	7.09	2-30	-	+	+	-								-
A2	7.09	20-100	-	+	+	-			+					-
B1	2.09	80-100	5-20	+	+	-			+		++			-
B2	2.09	40	0-3	+	+	-			+		+			+
C1	31.08	20-50	0-3	-	+	-								-
C2	31.08	10-30	35	-	-	-	++		+		+			+
Da1	4.09	40-70	>30	+	-	-								+
Da2	4.09	40-60	20	-	-	-								+
E1	3.09	20-40	20	+	-	-		+		+	++			-
E2	3.09	50	>20	-	-	-		+	+	+	++			-
F1	1.09	40-60	10	-	-	+				+	+			+
F4	1.09	120	>20	-	-	-	+	++			+			+
G1	5.09	10-20	0-5	-	+	-							++	-
G2	5.09	40-60	>40	+	-	-		+	+		+++			+
H1	30.08	40-50	10	-	-	-		++		++	+			+
H2	30.08	40-50	>10	-	-	-		++		+++	+			-
I	29.08	40	10	+	-	-			++				+	+
K1	28.08	40-60	5-10	+	-	-		++	+		+		+	-
K3	29.08	80-100	2	+	+	-		+	+					-

3 Methods and Materials

3.1 Hydrochemical measuring methods

The measurement of hydrochemical parameters were fulfilled in situ just during the sampling with the Hydrochemical express laboratory (Merck R) (HEL), Viscor testkit Alkalinity AL 7 (AL 7) and Coring R Chackmate System with changed sensors (CCS) (Table 3).

Table 3
Hydrochemical parameters measuring methods

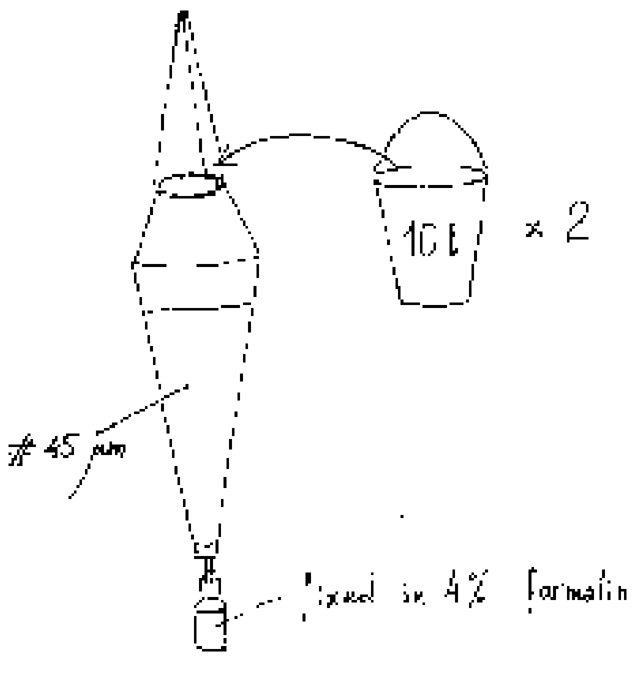
Parameter measured	Unit	Methods
conductivity	uS/cm	CCS
pH		CCS
temperature	°C	CCS
oxygen saturation	%	CCS
oxygen content	mg/l	HEL
hardness total	°dH	HEL
hardness carbonate	°dH	HEL
alkalinity	meq/l	AL 7
NH_4^+,	mg/l	HEL
NO_2^-	mg/l	HEL
NO_3^-	mg/l	HEL
PO_4^{3-}	mg/l	HEL

3.2 Plankton sampling methods

3.2.1 Quantitative methods

The quantitative samples of plankton were collected by plankton net with pores # 45 μ . The water volume 20 liters was percolated through the net and animals were fixed with 4% formaldehyde (Fig. 17).

Figure 17
Scheme of plankton sampling



3.2.2 Qualitative methods

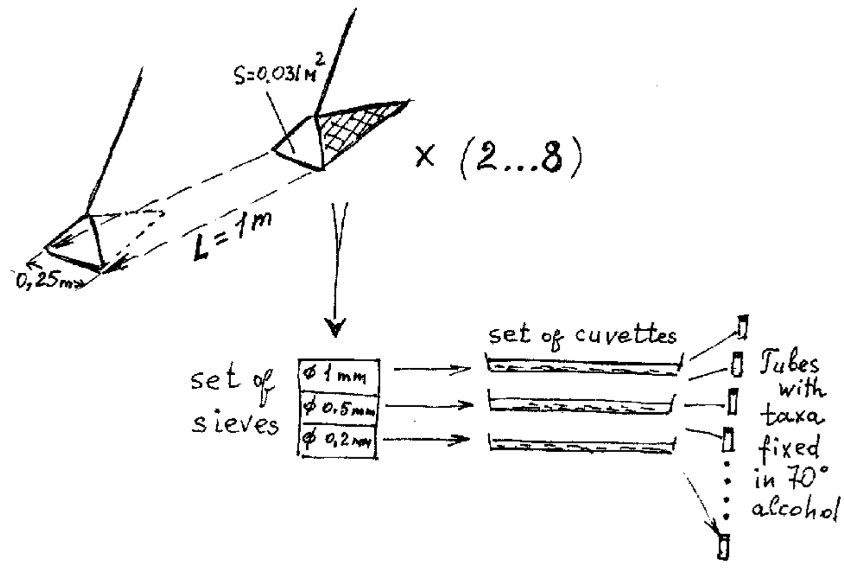
The qualitative samples of plankton were sampled by the same methods for small pools with depth less 30 cm and with reach vegetation. In big size pools and by open water the sampling was by dragging through the water volume. For qualitative samples the net #70 μ was used. In every case we sampled various biotopes with different vegetation and depth.
The treatment of samples was done with binocular microscope MBS-9 by magnification 56. The identification of animals was done with microscope Jenaval with magnification to 1500. The dissolution of soft tissues with Cl - content liquid Belizna was used for the identification of Rotatoria by construction of mouth apparatus .
The number of very small animals was counted in 1/20 or 1/50 part of a sample. The full sample or its 1/10 part were looked through for counting of numerous or rare species.
The identification of species was carried out by the Keys of Manuylova (1964), Kutikova (1970), Montchenko (1974), Borutskyi (1952, 1960), Identification freshwater invertebrate of Russia (1995), as well as Guides to the identification of the Microinvertebrates of the Continental Waters of the World (vol. 1-12) (Nogrady et al.,1995; Segers, 1995; Smirnov, 1976; 1992; 1996; De Smet,1996; De Smet , Pourriot. 1997). Rotatoria Bdelloida were not been identified because of it could be done with alive animals only.

3.3 Benthos sampling methods

3.3.1 Quantitative methods

The benthos samples were been sampled by hand dredge net with mouse hole 0,031 m^2 (Fig. 17). This hand dredge was dragged over bottom surface) with putting it to the depth to take with 3 -5 cm of sediments. One replicate had 1 meter of the way of dragging with 25 cm width. It means that one replicate sampled 0,25 m^2 of the bottom. For every sample that procedure was done from 2 to 8 replicates to embrace different locality of a biotope. The replicates number depended on the sediment type. If the station was characterized by strong and muddy deposits we used less replicates.

Figure 18
Scheme of benthos sampling



More suitable for sampling station let to use more replicates. Than the total sample (all replicates together) was washed through the sieve set with holes 1,0; 0,5 and 0,25 mm and every fraction was selected to taxa in the field.

Separate taxa were fixed with 70% alcohol in tubes. Species were identified further in the laboratory, their population density was counted. Binoculars MBS-1, Euromex and Microscopes Novex and Zeiss were used for magnification. Identification was fulfilled by using Keys for Ostracoda : (Klie, 1938; Bronschtain, 1947; Sywula, 1974; Meisch, (MS) 1996;) Mollusca: (Zhadin, 1952; Gloer,& C.Meier-Brook, 1998; Gittenberger E.& Janssen (red), 1998; Piechotski, A.,1979) Coleoptera (Galewski., Tranda 1978; Hansen, 1987; Jach, 1993.; Lafer, 1989.; Wiezlak W. 1986; Zaitsev, 1953) Heteroptera (Jansson A. 1986; Kerzner , Jaczewski , 1964; Wroblewski, 1980).

3.3.2 Qualitative methods

The additional qualitative samples are been discussing for every group (Chironomidae, Coleoptera, Heteroptera, Odonata, Mollusca, etc.) in their issues, accordingly.

Macrofauna in floodplain pools and dead branches..........

4 Results and discussion about seperate groups

4.1 The hydrochemical composition of water bodies investigated

4.1.1 Results

The area of our sampling was situated between two Pripyat tributaries named Stviga and Uborot. These rivers were characterized by low common mineralization and high maintenance of organic matter. They typically had 60-80% of oxygen saturation and unusually high iron (Fe^{2+}, Fe^{3+}) amount (3,5-7,5 mg Fe/l) (Sivko, 1956). Because of their boggy catchment the organic matter were presented by humic acids and their salts and fulvoacids and their salts (Kagan, Gelfer, 1956). From the other side the influence of Pripyat river to nearest lands is obvious both with flooding and underground water pool. It was noted that the hydrological peculiarity of Polesye is the hydraulic relationship of various aquifers because of sand deposits dominance. Waters of all aquifer are hydrocarbonate-calico with a middle mineralization level (Ostapenya, Kagan, 1956). Pripyat had the increase of humic compounds and the common mineralization decrease from an upper part to lower reaches of a river. The accent of Pripyat is oxygen deficiency even in summer (60-80 % of saturation) (Sivko, 1956).

The sampled water bodies had mainly a weak alkali reaction (pH was between 6,3 and 8,5) and only the bog pools has acidic water (pH 4,7-5,5) (Fig. 19) (Tabl.4). In total more alkali water had the water bodies (**G1-G3; I,** and **C1-C2**) which were characterized by the rich macrophythes development and a high level of photosynthetic activity. In summer we can see the tendency to a alkalinity of pools (mainly oxbow **A1-A2, G1** and even **L**, which was as artificial bog pond) while pH of real bog water dropped down to 4,8.

An alkalinity of water is specified by the sum of anions of CO_3^{-2}, $HCO_3)^-$, $H_2SiO_4^-$, and $H_2BO_3^-$ acids (mainly first twine) which are hydrolyzed with OH-ions forming. Just the buffer system CO_2 - $(HCO_3)^-$ - Ca CO_3 keeps pH in 4.0 -9.0 limit for normal content waters. Figure 20 demonstrates the trend to decrease of alkalinity from river bed to long distance situated pools but some of them (**H** in spring and **C1, H** , and **F2** in summer) had the alkalinity which were very close to polls **A** ⇒ **C** by river bed. These stations were disturbed with a human activity in the past. As result their clay layers were removed and they probably had the underground water influence increasing through sand on the bottom .

The carbonate hardness is formed by sum of Ca^{2+} and Mg^{2+} cations associated with HCO_3 - and CO_3^{2-} anions. Sampled water bodies demonstrated clear trend to decreasing of alkalinity along their gradient from a river to a bog except for **C1, F2** and **H** places (see mentioned above). In summer the decreasing of carbonate hardness in 1-2 German degree generally were shown (Fig.21).

The total hardness is the sum of the carbonate and residual hardnesses. It is as sum of all Ca^{2+} and Mg^{2+} ions. According to Hütter (Hütter, 1988) the total hardness from 0 to 6 °d indicates very soft water, from 6 to 11 °H soft, from 11 to 17 °d medium hard and from 17 to 22 °d hard water. Our data characterize the distant from river water bodies as «soft» (and even «very soft» for pool **K, L** and **M**), while oxbows situated by Pripyat bed were «medium hard» in spring (Fig. 21). An increase of total hardness was shown for water bodies **C** and **H**. In

summer the tendency to increasing of total hardness was marked almost for all line of pools except for **A, K** and **M** where the decrease was marked. In the same time the evidences for water bodies with underground water flux (**C1, F2, H**) were distinguished again.
The mineralization could be estimated with a conductivity/TDS (Fig. 23-24). Both in spring and in summer the tendency to decrease of their values from a river to a bog were noted. The same exceptions as above were marked for water bodies **C1, F2** and **H,** where the anthropogenic factors was in the past. In total the conductivity of water bodies investigated lie in the middle part of scale for normal fresh water 0 -1900 uS/cm as the same as TDS (0 - 1800 mg/l . It is interesting that by the mineralization to 500-640 mg/l (Belarus, the central part of Ukraine, western Russia) the hydrocarbonate class of the water is safed and Ca^{2+} ions are prevalent. At forest-steppe and steppe area (south of Ukraine, Crimea, Moldova) the mineralization increase to 650-1800 mg/l the prevalent ions are sulfate and natrium/ magnium and waters overgo at hydrocarbonate-sulfate class (Byzgu, 1964; Romanenko et al., 1982; Aleyokin, 1951).
Ammonium was missing totally in all water bodies investigates both in spring and in summer.
Nutrients were estimated as ions of nitrite, nitrate and orthophosphate.
Water bodies situated by dum roads **B, E, F, G** and **K** had nitrites in spring but in summer only **E** and **H** had nitrites (Fig. 25). It seems to be the nitrites in pool **H** as result of a mineralization processes of organic matter deposits from a deep pit of the pool.
Nitrates were found in **E** and **F** water bodies in spring only (Fig. 26). It is necessary to emphasize that all water bodies enumerated were used as watering-places by herds from villages, and pool **E** was situated by the ploughed fertilized field.
Orthophosphates had high level in spring in all water bodies, especially in the pool just near the river bed (**A-C**) (Fig. 27). Unfortunately in spring we used the kit with the limit of high scale level 0,43 mg/l. In real situation the orthophosphate content was much more (to 1 mg/l) for the water bodies fed by river water **(A - D**). In summer orthophosphates were dropped down owing to using by biota. Only water bodies **C, D** and **H** had enough high orthophosphates level. The reason could be both the destruction of a vegetation supply and an underground water nutrition. It is necessary to mention that water body **L** (artificial pond on the bog) had high orthophosphate maintenance in summer too.
According to phosphorus content the water bodies investigated were high eutrophic in spring and less eutrophic in summer. Some inner pools (**I, K** and boggy **L, M**) were weak eutrophic or passing into mesotrophic position. It is necessary to pay attention to the changing of phosphorus content situation in area. Phosphorus loading of a system enhanced more than 5 time since 60^{th} years, as result of a land-improvement activity in up-river tributaries of Pripyat (Sivko, 1956; Garasevich, 1985; Polischuk, 1968).
The maximal maintenance of many hydrochemical values were in the water bodies, which are the real oxbows arms are situated not far from the Pripyat river bed. It is a clear trend to decrease of line of parameters such as pH, conductivity / TDS, alkalinity, hardness (both total and carbonate), phosphate (orthophosphate) along water bodies gradient. Nevertheless there were some unusual peaks which show that the conditions were completely different in water bodies **C, H, F** (Figures 19-24; 27). In fact, these water bodies had traces of human activity in the past years.. Polls **C** and **F** are situated on both sides of dam road , and it seems to be used some sands and soil for its building. In the water body **F** the artificial channel was made to remove the water plenty after a flooding. Water bodies **H** has the result of railway bridge building (deep pit in

the middle of the pool at station **H2**). As a result of anthropogenic activity, the underground water did not have any blocks to contact with all volume of water bodies. So, these places had the rise of water feeding from underground waters.
It is necessary to be emphasized that oxygen saturation for all water bodies was about 40-90% only. As it was mentioned above the Pripyat region water have typically that feature. That peculiarity is because of unusually high level of organic humic matter (humic/fulvo acids) from bogs of the river catchment. The same situation were mentioned for Pripyat tributaries (from 34 to 70 % earlier on (Sivko, 1956). Our own unpublished data on Jaselda river and its floodplain demonstrated an analogic situation (about 45- 85% of oxygen saturation in spring-summer).

4.1.2 Conclusions

1. Pripyat floodplain waters is characterized by a big amount of an organic (humic) matter as well as **Fe** content from bogs of the river catchment especially after a flooding. The typical feature of waters from the middle part of the Pripyat catchment as well as a river itself is a deficit of the oxygen saturation (40-85%).

2. The decreasing of pH, conductivity and hardness both total and carbonate were mentioned along water bodies gradient from river to inner water bodies. There were a few exceptions from that tendency for a few pools **,** which were differed by the increasing of these parameters. It seems to be the underground / run-off waters contribution in water souses feeding at these points.

3. pH of water bodies investigated let to characterize them as mild alkaline (6,5-7,5 in spring and 6,2—8,5 in summer) and only bog pools are really acidic waters.

4. Pripyat lowland waters are mild mineralized. They belonged to hydrocarbonate-calcium II type. Conductivity of water bodies investigated decreased from oxbows by river to inner pools varied in 1,6 time in spring (400-250 uS/cm) and in 10 times in summer (460-54 uS/cm). These value lied in the middle part of the scale for fresh waters.

5. The alkalinity decreased from oxbows by river to inner pools within 2,0-3,0 (2,55-3,4 for stations **C2, F2, H**) in spring and 2,0-3,3 (4,6-3,3 for ones) in summer. These increasing probably were provided for run-off waters in the pool patches. In total alkalinity was not changed in a great measure from 60^{th} years.

6. The carbonate hardness decreased along the water bodies gradient mentioned above from 12 to 4 °dH in spring and from 10 to 2 °dH in summer, in the same time localities **B** and **C** had values 11-13 °dH.

7. The total hardness demonstrated distinct decrease trend from a river to inner pools - bog, changing from 13-15 to 4 ° dH in spring and from 11-18 to 3 ° dH in summer. An excess of values demonstrated again the localities **C1, F2** and **H**. So, oxbows by rivers bed as well as pools with underground water feeding should be characterized as «medium hard», (in spring especially), while inner pools are «soft» (and even «very soft» for pool **K, L** and **M).**

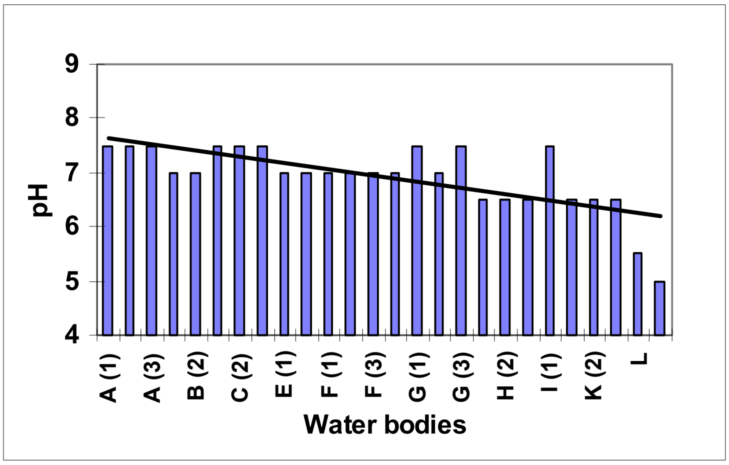
8. Ammonium was missing totally in all water bodies investigates both in spring and in summer.

9. The nutrients amount of water bodies investigated confirmed their euthrofic type. Orthophosphates were characterized by considerable high eutrophic value in oxbows situated by a main river channel **(A - D**) and regularly flooded by river waters, especially in spring after a flooding (>0,43 - 1,0 mg P/l), while in summer these value dropped down to 0,15-0,25 mgP/l. The inner pools had 0,05-0,25 mg P/l. Phosphorus loading of a system enhanced more than 5 time since 60th years, as result of a land-improvement activity in up-river tributaries of Pripyat.

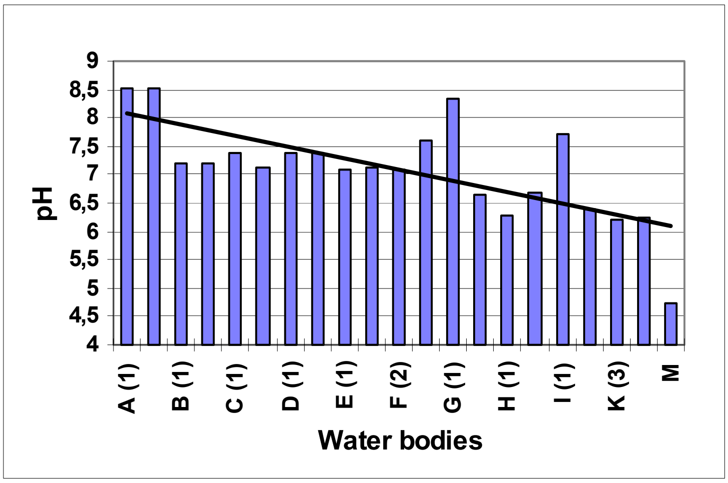
10. The nitrite and nitrate ions' content was high for the points (**E** and **F**), which were situated in the area with visible anthropogenic impact (water bodies **B, C, E, F** were used as watering-places by herds from villages, and the pool **E** was situated by the ploughed fertilized field).

11. The line pools (**C, F, H**) which had an anthropogenic alteration in the past showed the values which are close to oxbows by the Pripyat river. It seems to be a reason in the increase of underground water feeding.

Figure 19
pH trends along water bodies investigated
A = spring
B = summer

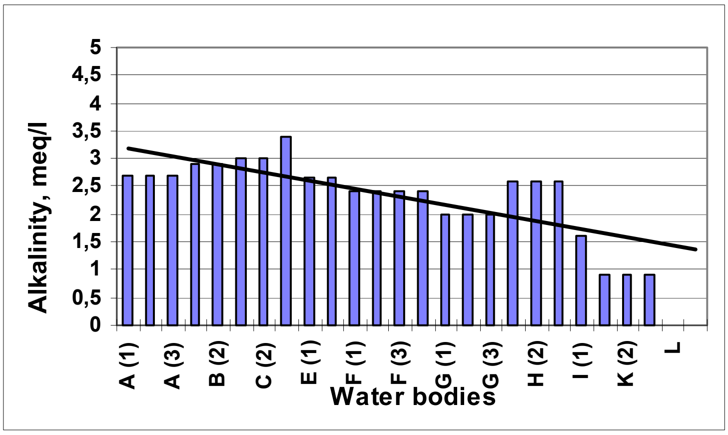


A

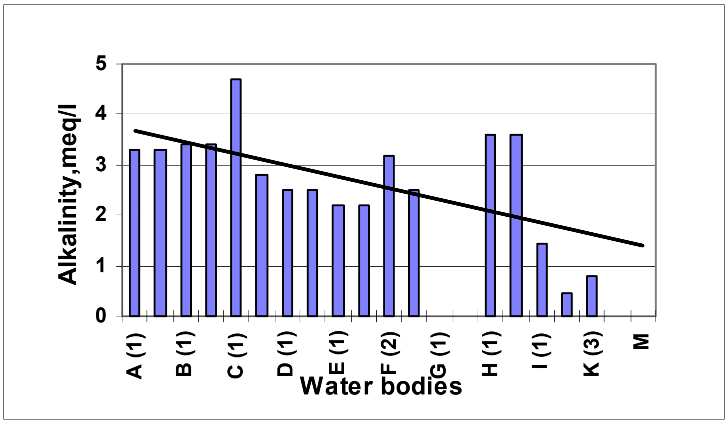


B

Figure 20
Alkalinit (meq/l) trends along waterbodies investigated
A = spring
B = summer

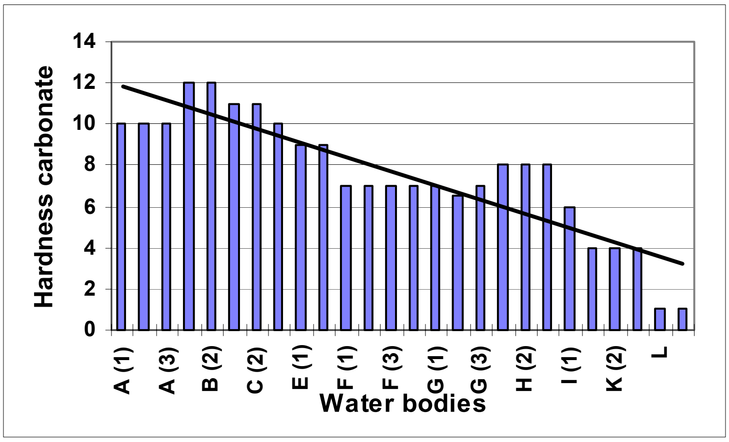


A

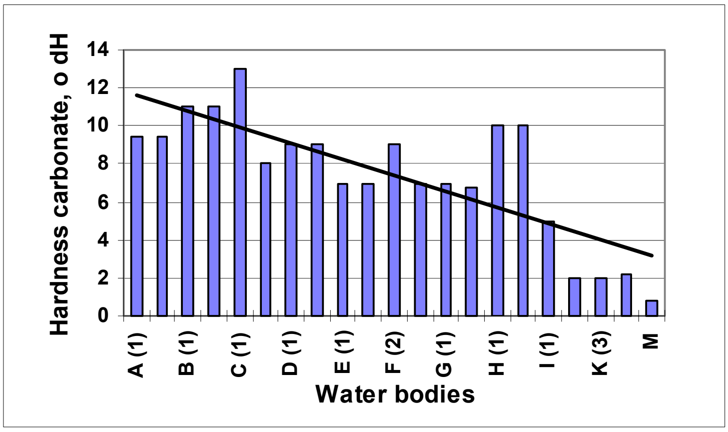


B

Figure 21
Hardness carbonate trends along waterbodies investigated
A = spring
B = summer

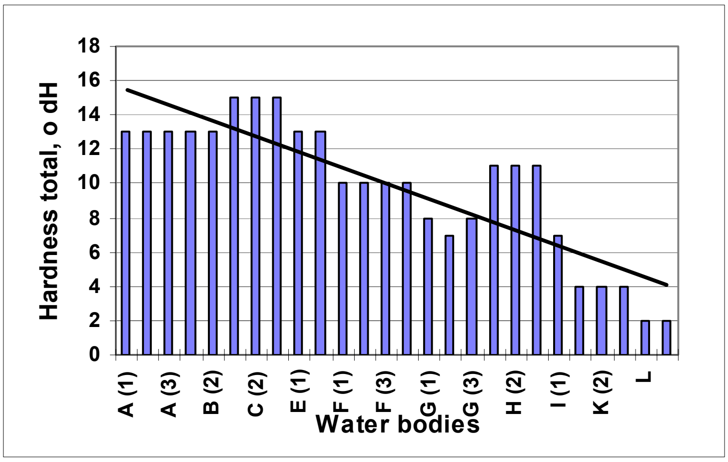


A

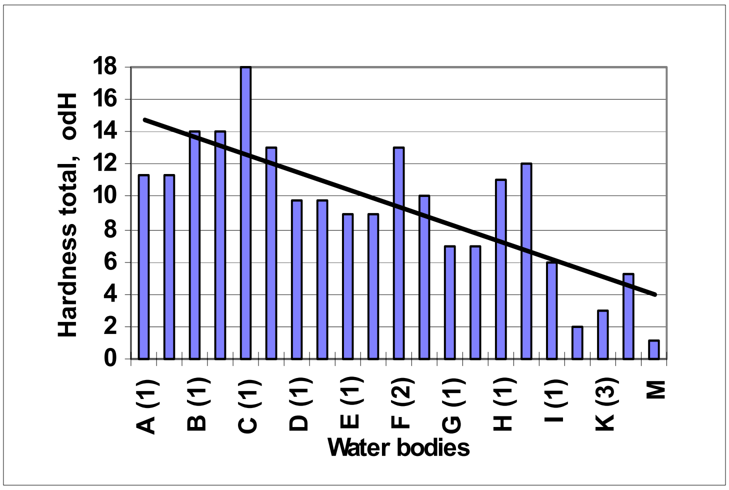


B

Figure 22
Hardness total trends along waterbodies investigated
A = spring
B = summer

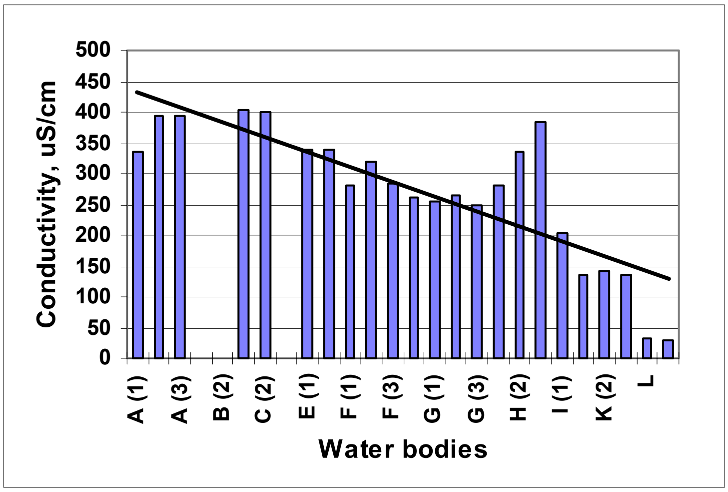


A

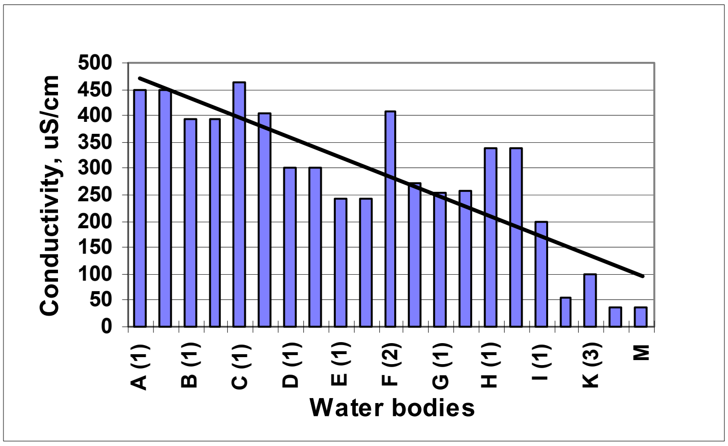


B

Figure 23
Conductivity trends along waterbodies investigated
A = spring
B = summer

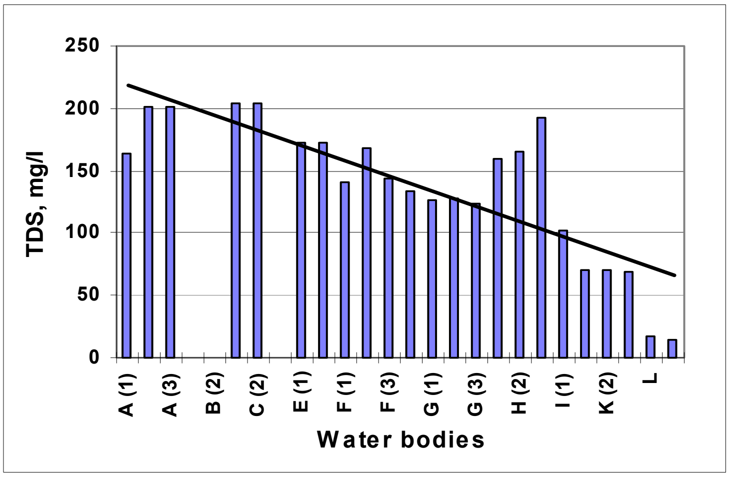


A

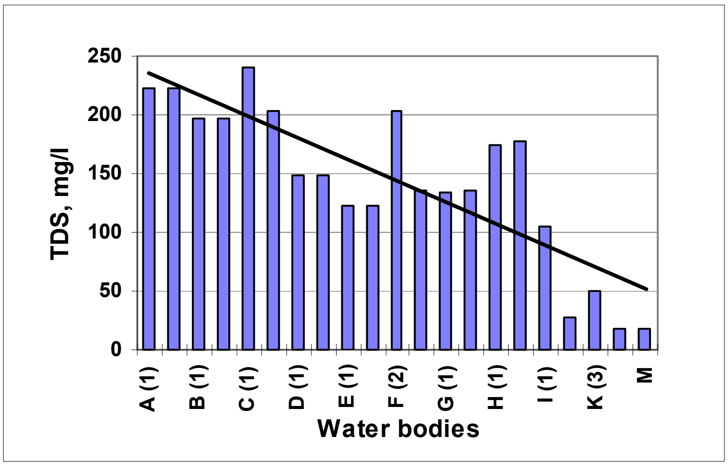


B

Figure 24
TDS (mg/l) trends along waterbodies investigated
A = spring
B = summer



A

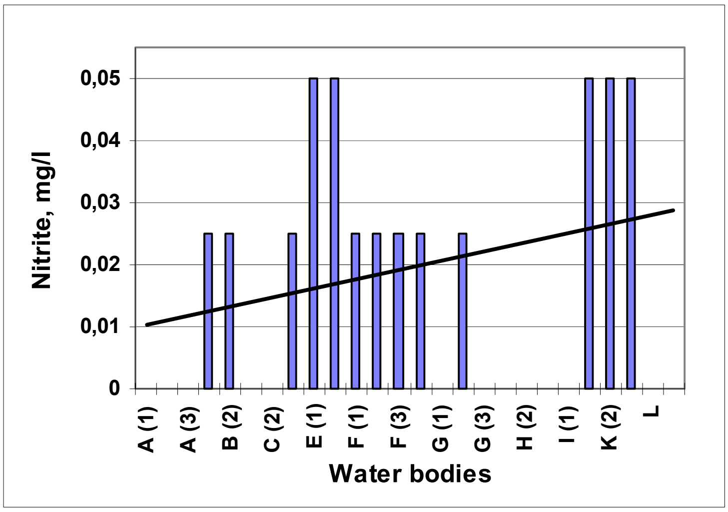


B

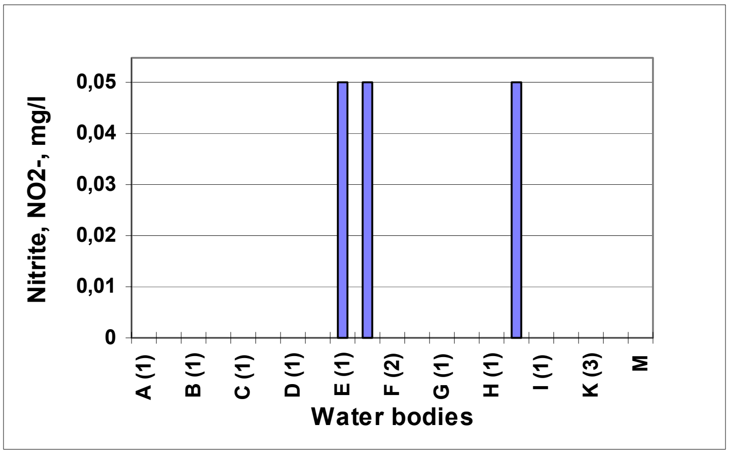
Table 4
Hydrochemical characteristics of waterbodies investigated

Pool	Date	pH	Alkalinity	Hardness total, ^{o}dH	Hardness carbonate, ^{o}dH	Conductivity, uS/cm	TDS , mg/l	NO_2^-, mg/l	NO_3^- , mg/l	PO_4^{3-} , mg/l
A (1)	spring	7,5	2,7	13	10	336	164	0	0	0,43
A (1)	summer	8,5	3,3	11	9,4	447	223	0	0	0,14
A (2)	spring	7,5	2,7	13	10	394	201	0	0	0,43
A (2)	summer	8,5	3,3	11	9,4	447	223	0	0	0,14
A (3)	spring	7,5	2,7	13	10	394	201	0	0	0,43
B (1)	spring	7	2,9	13	12			0,025	0	0,43
B (1)	summer	7,2	3,4	14	11	392	196	0	0	0,25
B (2)	spring	7	2,9	13	12			0,025	0	0,43
B (2)	summer	7,2	3,4	14	11	392	196	0	0	0,25
C (1)	spring	7,5	3	15	11	403	204	0	0	0,43
C (1)	summer	7,4	4,7	18	13	465	240	0	0	0,43
C (2)	spring	7,5	3	15	11	401	204	0	0	0,43
C (2)	summer	7,1	2,8	13	8	406	204	0	0	0,43
D (1)	spring	7,5	3,4	15	10			0,025	0	0,43
D (1)	summer	7,4	2,5	10	9	300	149	0	0	1
D (2)	summer	7,4	2,5	10	9	300	149	0	0	1
E (1)	spring	7	2,7	13	9	339	172	0,05	5	0,25
E (1)	summer	7,1	2,2	9	7	242	122	0,05	0	0,34
E (2)	spring	7	2,7	13	9	339	172	0,05	5	0,25
E (2)	summer	7,1	2,2	9	7	242	122	0,05	0	0,34
F (1)	spring	7	2,4	10	7	280	141	0,025	2,5	0,18
F (2)	spring	7	2,4	10	7	318	168	0,025	2,5	0,18
F (2)	summer	7,1	3,2	13	9	408	204	0	0	0,05
F (3)	spring	7	2,4	10	7	284	143	0,025	2,5	0,18
F (4)	spring	7	2,4	10	7	261	133	0,025	2,5	0,18
F (4)	summer	7,6	2,5	10	7	272	136	0	0	0,14
G (1)	spring	7,5	2	8	7	256	126	0	0	0,14
G (1)	summer	8,3		7	7	255	134	0	0	0,14
G (2)	spring	7	2	7	6,5	264	128	0,025	0	0,09
G (2)	summer	6,6		7	6,8	258	136	0	0	0,09
G (3)	spring	7,5	2	8	7	249	123	0	0	0,14
H (1)	spring	6,5	2,6	11	8	281	159	0	0	0.14
H (1)	summer	6,3	3,6	11	10	339	175	0	0	0,18
H (2)	spring	6,5	2,6	11	8	335	165	0	0	0.14
H (2)	summer	6,7	3,6	12	10	339	177	0,05	0	0,25
H (3)	spring	6,5	2,6	11	8	384	192	0	0	0,14
I (1)	spring	7,5	1,6	7	6	203	102	0	0	0,05
I (1)	summer	7,7	1,5	6	5	198	105	0	0	0,05
K (1)	spring	6,5	0,9	4	4	134	70	0,05	0	0,18
K (1)	summer	6,4	0,5	2	2	54	27	0	0	0,05
K (2)	spring	6,5	0,9	4	4	141	70	0,05	0	0,18
K (3)	spring	6,5	0,9	4	4	134	69	0,05	0	0,18
K (3)	summer	6,2	0,8	3	2	99	50	0	0	0,05
L	spring	5,5		2	1	32	17			0,25
L	summer	6,3		5	2,2	36	18	0	0	0,5
M	spring	5		2	1	28	14			0,25
M	summer	4,8		1	0,8	36	18	0	0	0,05

Figure 25
Nitrite in water bodies investigated
A = spring
B = summer

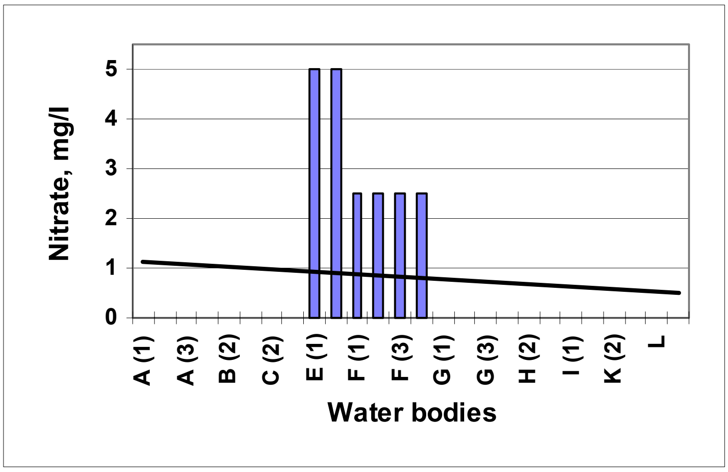


A



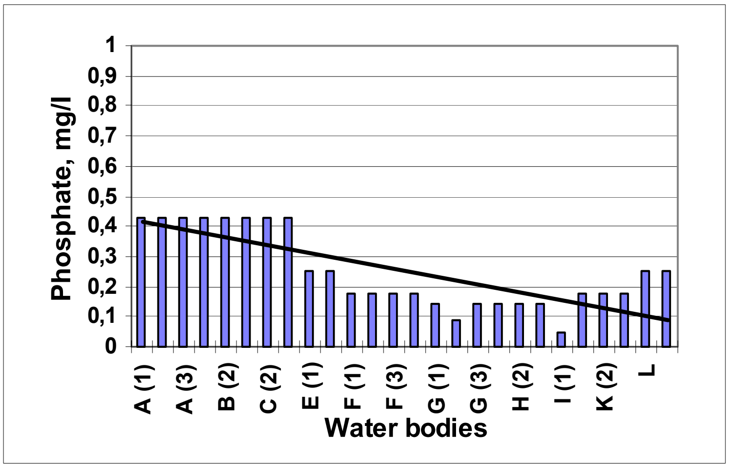
B

Figure 26
Nitrate in water bodies investigated
A = spring

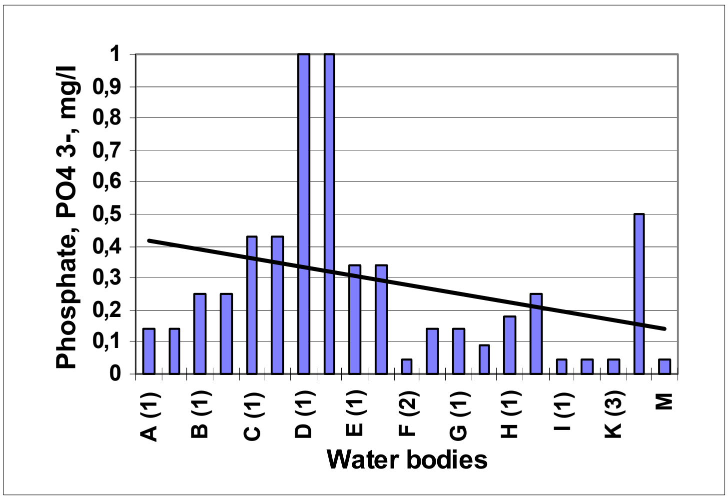


A

Figure 27
Phosphate (orthophosphate) trends along water bodies investigated
A = spring
B = summer



A



B

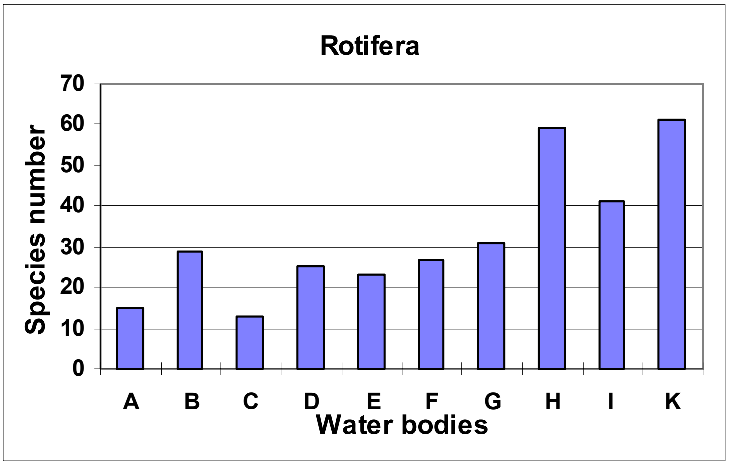
4.2 Fauna of water bodies investigated

4.2.1 Zooplankton (Rotifera, Copepoda, Cladocera)

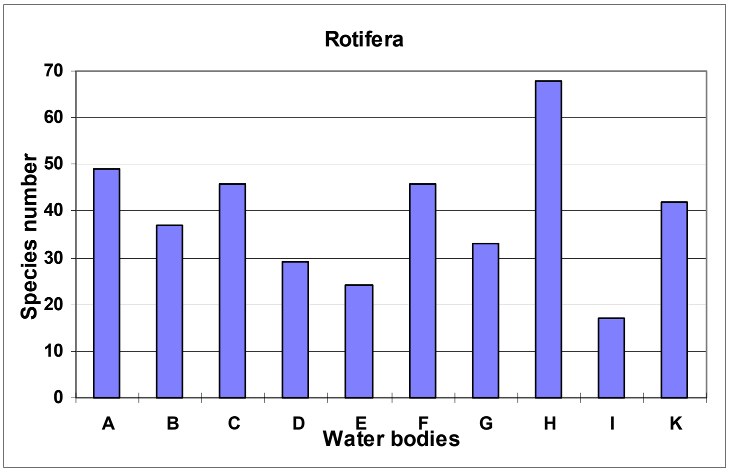
Number of species indentified
The **total number of zooplankton** from spring and summer samples was **267** species and forms. The prevailed species were **204 species and forms of Rotifera**. It was **38** species of «**Cladocera»** group and **25** species of **Copepoda** . The 188 species of zooplankton were revealed in spring collections, among them Rotifera dominated (136 species and forms) followed by Cladocera with 31 species and Copepoda with 21 species (Fig. 28-30).
In summer and spring a species composition differed not only in a number of species but also qualitatively. So between 267 species revealed 125 ones only were present both in spring and summer faunas. The 89 species of rotifers were present in both of these seasons. The fauna of In summer samples 202 animal species and forms were found among them 159, 27 and 16 species of Rotifera , Cladocera and Copepoda, respectively. A number of species in summer probes increased owing to rotifers, at the same time a number of Cladocera and Copepoda species copepods changed in the least extent and among 25 species the 17 were always present. In Cladocera 50 species were found in spring and summer. All that indicates essential changes in a species composition in different sampling periods.

The common published list of zooplankton of Belarus includes 294 species Rotifera, 64 species Cladocera and 37 species Copepoda (Galkovskaya, Veznovets, Rosthin,1992). We found 38 new species of Rotifera, which were not mentioned for Belarus fauna while there were no new cladoceran and copepod species.

Figure 28
Rotifera species richness in water bodies gradient.
A = spring
B = summer

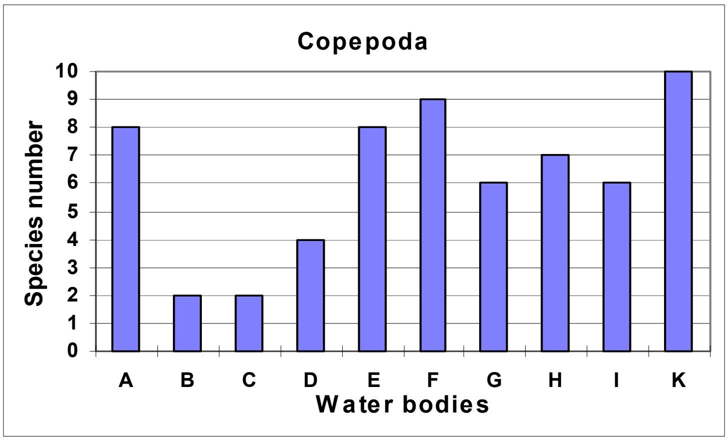


A

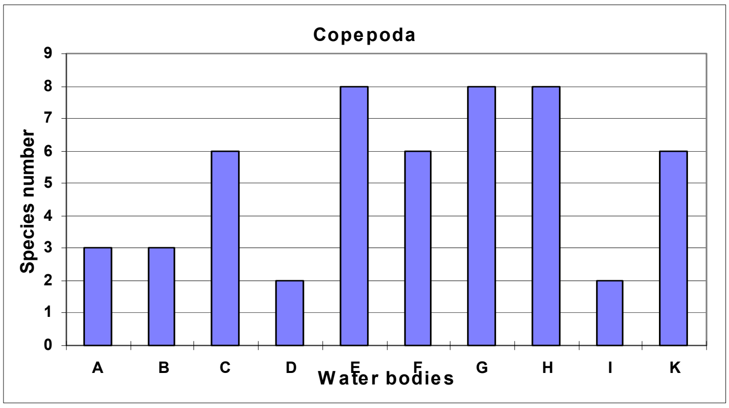


B

Figure 29
Cpopepoda species richness in water bodies gradient
A = spring
B = summer

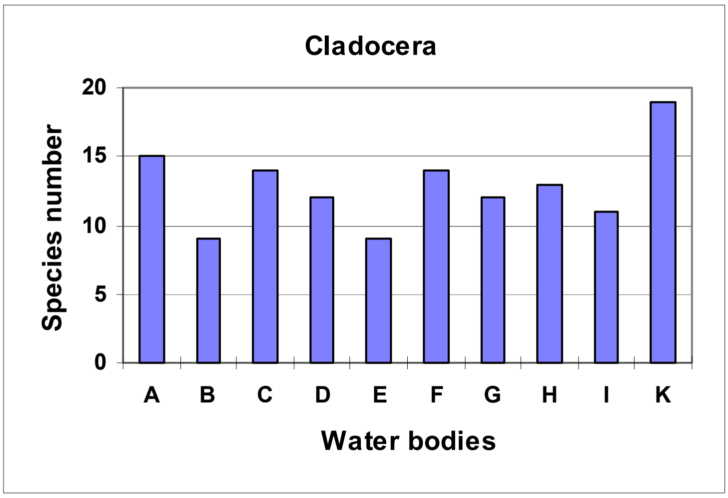


A

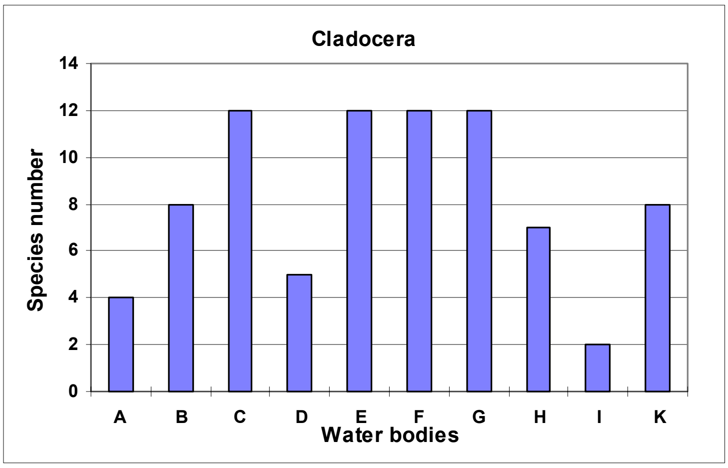


B

Figure 30
Cladocera species richness in water bodies gradient
A = spring
B = summer

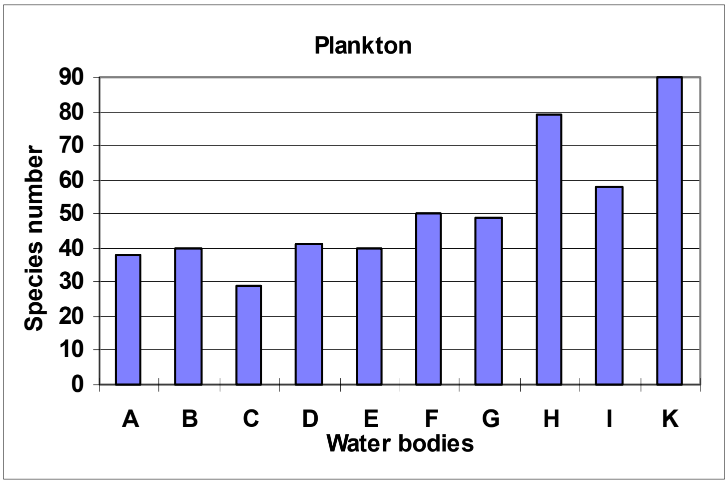


A

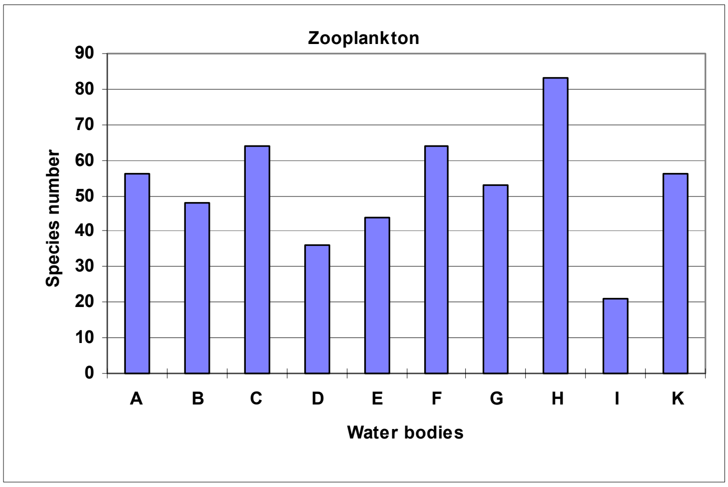


B

Figure 31
Zooplankton species richness in water bodies gradient
A= spring
B = summer



A



B

Taxonomic and ecological groupings

In Table 5 data are presented on species revealed in more than 50% of water-bodies studied. Species presented both in summer and spring faunas are typed in bold. In their systematic groups these species comprise 36% (spring) and 46% (summer) respectively.

The more frequently met common for both seasons species were Rotifera *Euchlanis dilatata, Lepadella patella, Mytilina muconata spinigera , Polyarthra dolichioptera , Synchaeta pectinata, Bdelloida*, Copepoda - *Macrocyclops albidus, Mesocyclops leuckarti, Thermocyclops hyalinus* , Cladocera - *Acroperus harpae, Chydorus schaericus, Scapholeberis mucronata*. Except fore species all above mentioned animals inhabit the bottom or littoral vegetation.

In group of common species presented in table 5 the "true plankton" organisms were 29% in spring and 35% in summer while about 60% ones belong to bottom and phytophilous species.

A quantitative development of a zooplankton differs significantly both between seasons and in a range of water bodies investigated. A population density of zooplankton was determined mainly by a quantitative development of rotifers. In spring the maximum density of zooplankton was registered in the water body **H** – 1 425 025 ind/m^3 and the minimum one in water body **C** 3440 ind/m^3 (average 368 317).

Table 5
Zooplankton species were found in more than 50% of water bodies investigated

Spring	Pool NN	**Summer**	Pool NN
Rotifera		**Rotifera**	
Bdelloida sp.	10	*Anueropsis fissa fissa*	9
Euchlanis dilatata dilatata	5	*Ascomorpha saltans*	5
Euchlanis dilatata unisetata	5	*Bdelloida sp.*	10
Keratella cochlearis robusta	5	*Cephalodella gibba gibba*	7
Keratella quadrata quadrata	5	*Colurella unsinata unsinata*	7
Lecane arcuata	5	*Euchlanis deflexa deflexa*	5
Lecane closterocerca	6	*Euchlanis dilatata dilatata*	5
Lecane luna luna	5	*Keratella cochlearis tecta*	5
Lecane lunaris	6	*Lecane bulla bulla*	8
Lepadella ovalis	7	*Lecane closterocerca*	9
Lepadella patella patella	6	*Lecane hamata*	7
Mytilina mucronata spinigera	7	*Lecane lunaris*	9
Mytilina ventralis ventralis	5	*Lepadella patella patella*	7
Polyarthra dolichoptera	8	*Mytilina mucronata spinigera*	5
Synchaeta pectinata	7	*Polyarthra dolichoptera*	10
Synchaeta tremula	8	*Postclausa hyptopus*	5
Testudinella patina patina	10	*Proales sigmoidea*	5
Trichocerca rattus carinata	7	*Synchaeta longipes*	5
Trichotria truncatum truncatum	5	*Synchaeta pectinata*	5
		Trichocerca pusilla	5
Copepoda		**Copepoda**	
Cyclops copepodit	10	*Cyclops copepodit*	10
Cyclops nauplii	10	*Cyclops nauplii*	10
Diacyclops bicuspidatus	6	*Harpacticoidae nauplii*	6
Diaptomus nauplii	7	*Macrocyclops albidus*	5
Eucyclops macruroides	5	*Mesocyclops leuckarti*	8
Eucyclops serrulatus	9	*Thermocyclops hyalinus*	5
Harpacticoidae nauplii	10		
Macrocyclops albidus	6		
Megacyclops viridis	8		
Mesocyclops leuckarti	8		
Thermocyclops hyalinus	6		
Cladocera		**Cladocera**	
Acroperus harpae	8	*Acroperus harpae*	6
Alona costata	6	*Alona rectangula*	7
Alonella exigua	5	*Chydorus sphaericus*	8
Chydorus sphaericus	10	*Pleuroxus truncatus*	8
Eurycercus lamellatus	8	*Scapholeberis mucronata*	6
Graptoleberis testudinaria	5	*Simocephalus vetulus*	5
Pleuroxus aduncus	6		
Pleuroxus truncatus	10		
Scapholeberis mucronata	5		
Sida crystallina	6		
Simocephalus vetulus	9		

So differences in quantitative development were more than in 400 times. In summer the minimal population density value (the water body **I**) was 15 150 ind/m^3 and maximal one 18 739 575 ind/m^3 (the water-body **G**). Thus, population density values differed in more than 1000 times (average 3 580 699 ind/m^3). An average density of zooplankton in all water bodies studied was in total 10 times higher in summer than in spring. These differences resulted from an increase of a density of rotifer populations and young developmental stages of copepods. At the same time a density of Cladocera populations changed negligibly.

The our own data for analogous pools from various Belarussian area demonstrated low zooplankton development. So, in floodplain of Berezina river (Svetlogorsk, May 1998) the average meaning of zooplankton abundance 135000 ind/m3, in flood-lands Neman river (Stolbtsy, July 1997) it was, correspondingly, 72000 ind/m3. In the floodplain of the Pripyat River (July 1953) the maximal value of the zooplankton population density was about 1 280 000 in lotic lakes and minimal value19 500 ind/m3 in closed lakes (Petrovitch,1956).

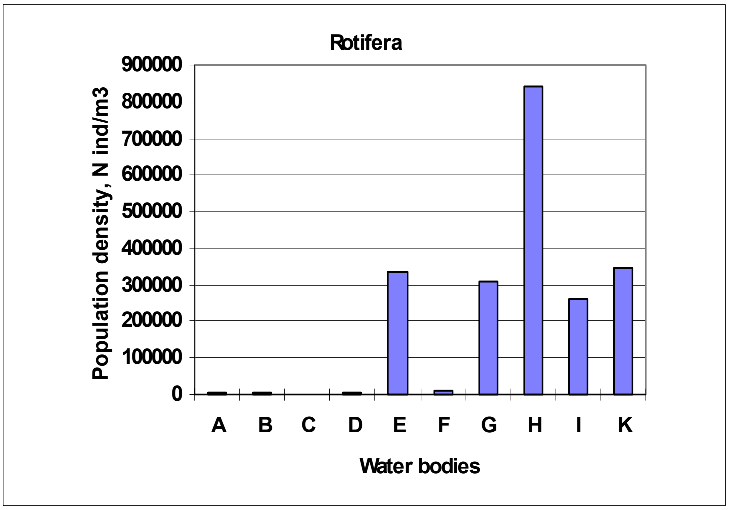
High values of the zooplankton density were obtained in investigated water bodies in comparing with data mentioned above in most cases due to improving of working characteristics of a plankton net.

The separated analyses of zooplankton assemblages from sites with open water and localities with plentiful aquatic vegetation had shown more rich fauna both according an abundance and the number of species. As it was shown earlier an estimation of biocenosis with a rich aquatic vegetation had not been used neither in Berezina nor Neman Rives investigations.

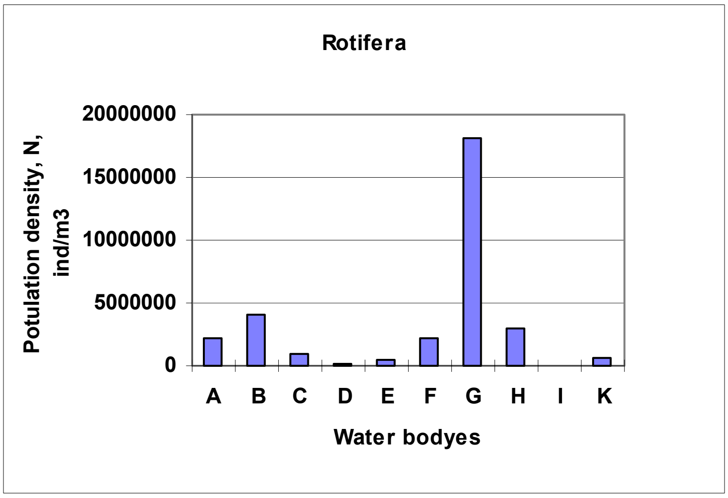
High density of zooplankton could be conditioned also by the accumulation of a big amount of allochthonic organic matter in investigated water bodies which were inundated considerable period during the extraordinary flooding in 1998-1999 years. The procedure of their destruction had been accompanied by detachment of biogenous matter which improve the food supplies of filtering plankters

Taking into consideration mentioned above references we can say that the Pripyat flood plain water bodies were characterized by a rich zooplankton development. On the basis of data concerning to the quantitative samples of plankton the water bodies investigates could be qualified as highly trophic ecosystems.

Figure 32
The Rotifera abundance along the water bodies gradient
A = spring
B = summer

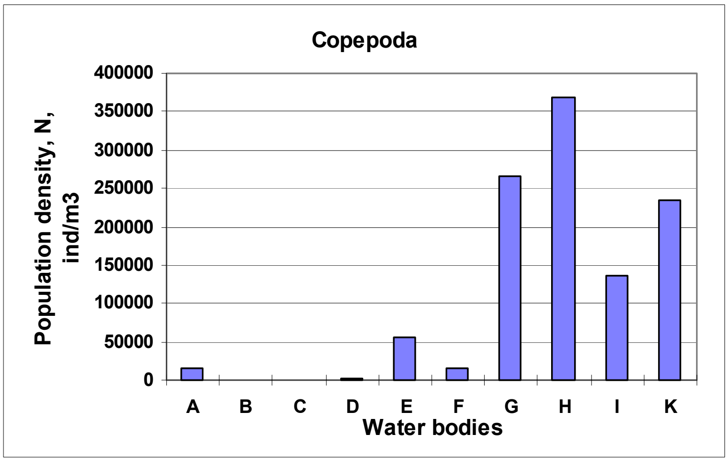


A

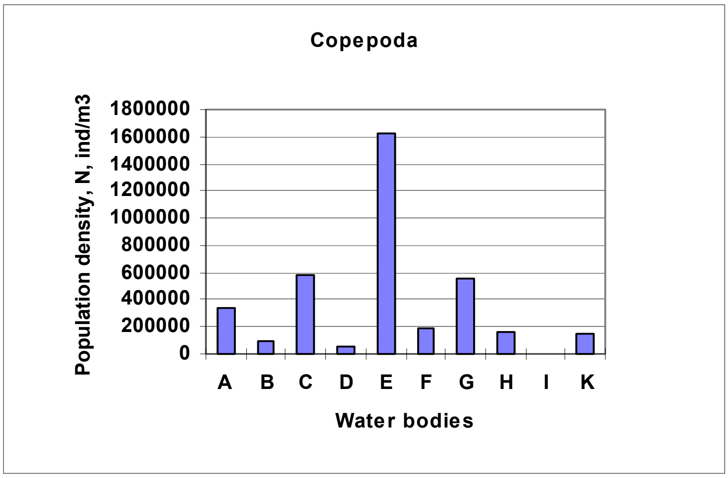


B

Figure 33
The Copepoda abundance along the water bodies gradient
A = spring
B = summer

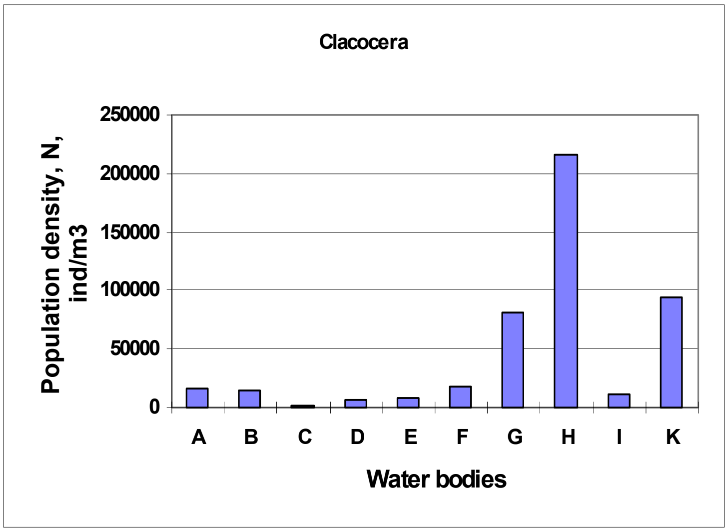


A

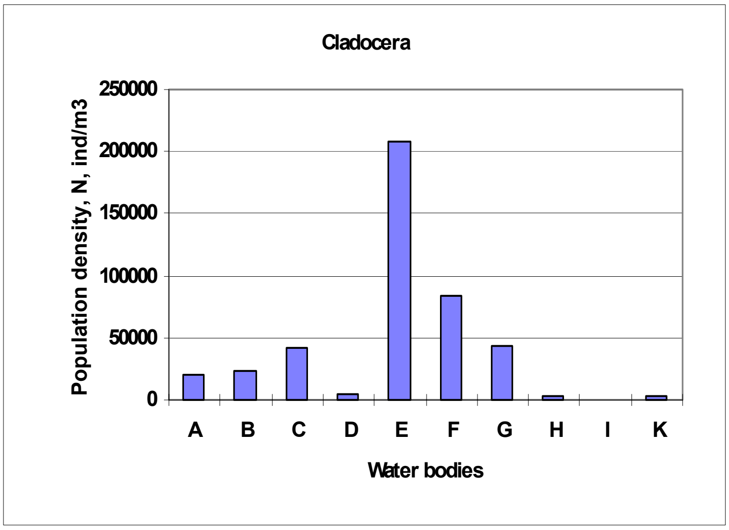


B

Figure 34
The Cladocera abundance along the water bodies gradient
A = spring
B = summer

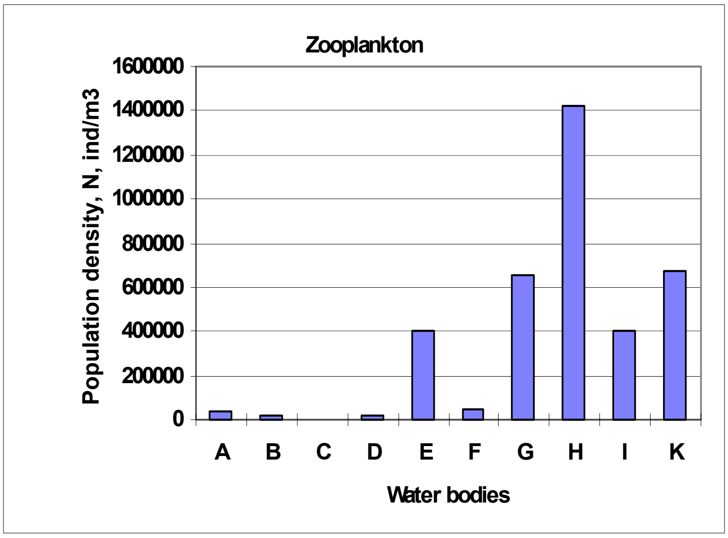


A

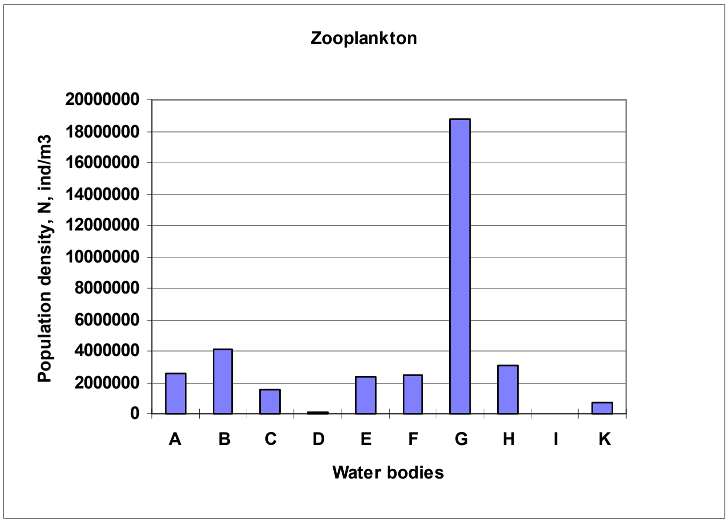


B

Figure 35
The zzoplankton abundance along the water bodies gradient
A = spring
B = summer



A



B

As a whole changes both in a number of species and a density of a zooplankton in a gradient of studied water-bodies was more regular in spring when a tendency of an increase of both parameters along with a distance of a water-body from the main river-bed was observed (Fig.35). In spring these density changes were determined by Rotifera and Cladocera (Fig.32, 34). This qualitative and quantitative development of a plankton in spring could be explained by the possible eating up by fry. Evidently in a flood period an ichtyofauna was transferred in higher extent in flood-bed water-bodies situated closer to a main river-bed and a zooplankton was exposed to more predator pressure there.
Irregular fluctuations of a species number and density in a gradient of water-bodies in summer may be resulted from a seasonal succession as well as a possible fish and invertebrate predation.

Conclusions

1. A zooplankton of studied water bodies was characterized by a high number of species. A total number of species and specific forms of planktonic organisms found us in all research period was 267, among them 204 species of rotifers, the 25 of copepods, and the 38 of Cladocera.
2. In a list of plankton invertebrates 38 species are new in the fauna of Belarus.
3. The 84 species of rotifers, the 14 of copepods and the 15 of Cladocera are registered firstly in the water fauna of the National Park "Pripyatsky".
4. In a gradient of investigated water-bodies a species number and a density of plankton invertebrates increased regularly along with a distance from the main river bed in spring. In summer these fluctuations were irregular.
5. The average population density of zooplankton were in 10 times higher in summer than in spring. In spring samples rotifers and Cladocera dominated in a number and in summer rotifers and different juvenile stages of cyclops were more numerous.
6. Some rare zooplankton species were found. There are *Drilochaga delagei* (Hirudinea parasite) and predator *Eothinia elongata elongata* from Rotifera.

4.2.2 Mollusca (Gastropoda and Bivalvia)

The sampling methods consisted of commonly used for quantitative samplings described above. However the additional qualitative samples were collected in various types of microhabitats within investigated water bodies according to the environmental preferences of mollusks. As a rule, in that case, the sampling places were appeared more numerous than that for quantity samplings. The sphaeriid mollusks were collected by the method consisted of the sieving of soil samples (1mm sieve) obtained from the surface of the bottom.

The data obtained were analyzed from different points of view:
1. species richness of mollusks in investigated water bodies
2. dispersion of mollusks along the gradient of investigated localities according their ecological preferences
3. the tendency in changing of mollusks species complexes in different type of localities in different seasons

For suitable presenting obtained data was used ecological code according to Limnofauna Europea (1978).

0 - freshwater in general, no specialization
1 - underground water, caves and psammon
2 - springs (krenon)
3 - brooks and small rivers (rhitron)
4 - rivers and large streams (potamon)
5 - lakes (standing water in general)
6 - temporary small waters, pools and ponds
8 - brackish water, estuaries
9 - inland salt water (salines, etc.)
10 - peat-bogs
13 - swamps, moist soil.

Number of species indentified

The total number of Mollusca we found in our samplings during both spring and autumn field works season was **43 species (29 Gastropoda and 14 Bivalvia**).
Species richness of mollusks in spring and summer demonstrated some differences in any substantial aspect. In spring we found the almost the same species number as in summer: **33** and **37** species respectively.
In table 6 the data are presented which were obtained from qualitative samples.

Table 6
Species list of mollusks according to qualitative sampling

Prosobranchia (spring)										
Species	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**K**
Viviparus contectus		+	+	+	+	+	+	+	+	
Valvata cristata	+	+	+	+	+		+	+	+	
Bithynia tentaculata	+	+		+				+	+	
Viviparus viviparus	+	+		+	+					
Valvata macrostoma	+	+					+	+		
Bithynia troscheli	+						+	+		
Bithynia leachi							+		+	
Valvata piscinalis	+									
Nspecies	6	5	2	4	3	1	5	5	4	0
Prosobranchia (summer)										
Species	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**K**
Viviparus contectus			+	+	+	+	+	+	+	+
Bithynia tentaculata	+	+	+	+		+	+	+	+	

Valvata cristata		+	+	+			+			
Valvata piscinalis	+	+	+	+						
Viviparus viviparus	+	+								
Theodoxux fluviatilis	+									
Nspecies	4	4	4	4	1	2	3	2	2	1
Pulmonata(spring)										
Species	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**K**
Lymnaeidae										
Lymnaea stagnalis	+	+	+	+	+	+	+	+	+	+
Planorbarius corneus	+	+	+	+	+	+	+	+	+	+
Planorbis planorbis	+	+	+	+	+	+	+	+		+
Segmentina nitida	+	+	+	+		+	+	+	+	+
Stagnicola palustris - complex		+	+	+	+	+	+	+		+
Physa fontinalis	+	+	+	+	+	+	+	+		
Bathyomphalus contortus	+	+		+		+	+	+	+	+
Stagnicola corvus		+	+			+	+	+	+	+
Stagnicola palustris	+	+	+	+		+	+	+		
Hippeutis complanatus	+				+	+	+	+	+	+
Radix ovata	+	+	+	+			+			+
Anisus leucostoma	+		+			+		+	+	+
Anisus vortex		+	+	+		+	+	+		
Anisus vorticulus						+	+	+	+	
Gyraulus crista	+								+	+
Radix auricularia	+									
Gyraulus albus									+	
Gyraulus riparius									+	
Nspecies	12	11	11	10	6	13	13	13	11	11
Pulmonata (summer)										
Species	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**K**
Lymnaeidae										+(j)
Lymnaea stagnalis	+	+	+	+	+	+	+	+	+	
Planorbarius corneus			+	+	+	+	+	+	+	+
Anisus vortex		+	+	+	+(j)	+	+	+		
Physa fontinalis			+	+	+	+	+			
Gyraulus albus	+	+	+		+	+				
Planorbis planorbis		+		+			+	+		
Radix auricularia	+	+		+						
Radix ovata	+		+	+						
Stagnicola palustris - complex		+			+			+		
Bathyomphalus contortus	+		+					+		
Segmentina nitida		+			+			+		
Stagnicola corvus		+					+			
Anisus vorticulus							+	+		
Gyraulus crista		+	+							
Gyraulus riparius		+	+							
Hippeutis complanatus						+	+			
Nspecies	6	10	9	7	7	6	8	8	2	2
BIVALVIA (spring)										
Species	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**K**
Sphaerium corneum	+	+		+			+	+		
Pisidium pseudosphaerium			+				+	+		
Pisidium milium				+				+		

Species	A	B	C	D	E	F	G	H	I	K
Pisidium casertanum	+									
Pisidium henslovanum	+									
Pisidium obtusale							+			
Musculium lacustre									+	
Nspecies	3	1	1	2	0	0	3	3	1	0
BIVALVIA (summer)										
Species	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**K**
Sphaerium corneum	+	+	+	+		+				
Pisidium henslovanum	+	+	+							
Pisidium subtruncatum		+	+	+						
Musculium lacustre	+			+		+				
Unionidae	+	+								
Pisidium amnicum	+	+								
Pisidium nitidum		+	+							
Dreissena polymorpha	+									
Pisidium casertanum	+									
Pisidium obtusale			+							
Pisidium pseudosphaerium			+							
Pisidium supinum	+									
Sphaerium rivicola		+								
Pisidium milium										
Nspecies	8	7	6	3	0	2	0	0	0	0

The percentage of species from different families is presented in Fig.36. The freshwater mollusks fauna is composed mostly of common, ubiquitous species with a fairly wide ecological range, characteristic of rather slow rivers and stagnant water with a moderate amount of water movement.

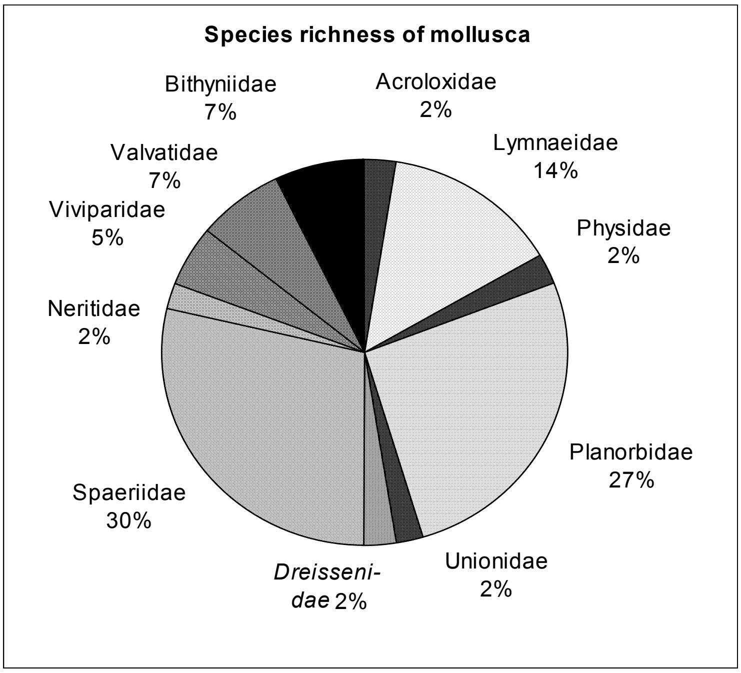


Figure 36
Representation of particular families of mollusks in the floodplain area of the river Pripyat (a number of species in taxa are in percent from total)

Taxanomic and ecological groupings
Only 20 common species were found in the 5 localities (50% pools) in spring and 11 once during summer. They belong as a rule to a gastropods species such as *P.corneus, V. cristata, H. complanatus, V. contectus, L. stagnalis, Ph. fontinalis, B. contortus, S. nitida, B. tentaculata*. From the bivalve mollusks so it was *Sph. corneum* the most common species in investigated pools.
A characteristic feature of spring mollusks fauna was a very poor species richness of pill-clams (f. Pisidiidae) and a complete lack of rheophilous species. The most typical Sphaeriidae inhabiting investigated water bodies were *Sphaerium corneum, Pisidium pseudosphaerium Pisidium milium.* Clams have been recorded in our spring samplings had a very broad ecological tolerance. It is worth admitted that all of founded in spring bivalve mollusks are good adapted to stagnant shallow water bodies due to capacity to feed not only by flirting suspension from water but as the secondary detritovorous grazers by means of consumption the particles from the surface of the plants and soil. Such species as *P. obtusale* has a greatest chance to be a subject of passive transport due to its exclusive occurrence in very shallow water (Kuiper,1970).
As mentioned above, during the extraordinary Pripyat flooding in1999 the numerous water bodies in the floodplain (oxbows, meadows, swampland, backwater) had morphological likeness despite of varying level of influence of river or ground waters. This habitats include such features as still water with large surface area with wide range of microhabitats suitable for mollusks species within which they exploit a variety of food resources. As the mollusks species assemblages are consequence and reflects the morphological development of flood plain so the increasing of stagnant mollusks species and lacking of reophilic ounces becomes understandable this year.
In summer samplings the bivalve mollusks (f.Pisidiidae) increased in number species (especially in the sampling sites **A, B, C**). Besides the rheophilous *Sphaerium rivicola, Pisidium amnicum, Pisidium supinum, Pisidium henslovanum*, high frequency of occurrence noted for stagnophilous form like *Pisidium subtruncatum, Pisidium casertanum, Pisidium nitidum, Musculium lacustre*. It should be mentioned that nearly all specimens of pill-clams were collected by us in habitats with high level of alkalinity, pH and dissolved organic carbon. According to Saunders and Kling, (1990) there must be reasonable certainly that the primary mechanisms regulating the distribution of *Pisidiidae* species are probably abiotic due to sensitive to changes in alkalinity. Competition for food or competition for space is unlikely to regulate the distribution of Pisidiidae species (Way,1988). Seemingly remarkable its distribution almost in the adjacent part of flood plain zone with the river. In summer season the loss of the former spring habitats and disappearance of pisidiidae species in pools **H,G** coincides with a replacement possible habitats (**A, B, C**) suitable for pill-clams.
We also mentioned there some reophilic mollusks such as *Thedoxus fluviatilis* (in site **A** only sporadically), representatives of juvenile Dreissenidae and Unionidae. These biotopes (sites **A, B, C**) were situated a very close to the river and as a result such species may colonize these habitats by passive dispersal effected by a number of factors.
In the mollusks assemblages of summer samplings there were no such species as *Anisus leucostoma, Bithynia troscheli, Bithynia leachi*. The habitat preference of these species as a rule were connected with temporary water bodies. It is probable that the time of considerable decreasing water area or ever drying up of water bodies in summer should be into agreement with various adaptation of life cycles of some mollusks. The life cycles affect directly the distribution of snails.
The greatest species diversity was mentioned in spring in water bodies **G** and **H**. It was the sampling sites where the most favorable conditions for mollusks

were provided due to high quality physical-chemical factors which are responsible for species diversity, rich macrophytes development and a high level of photosynthetic activity (Table 2, 4).

In summer the highest number of species were found in the locality **A, B, C**. At the same time in the sites from **E** to **K** the probably influence of the considerable decreasing water area or even drying up were the determining factor for malacofauna of these water bodies. Although more mobile species may be able to migrate with falling water, less mobile species, such as mollusks, may be significantly affected. Water level changes may also cause successional changes in the vegetation with loss of aquatic and wetland species and replacement by common terrestrial (The New River…, 1994). Mollusks likely to be affected by this situation because they feed on particular emergent species and often use such vegetation for shelter. In the context of these comments in pools **F, K** were recorded the relatively low alkalinity, pH, hardness.

Quantitative samplings

Data of our qualitative samplings of course broads the list of mollusks species. In the same time for the comparative and relative valuations it would be much more important to use analysis quantitative samplings. The species list of mollusks according to quantitative samplings consists of near 84% from that of qualitative once. Among 36 species found in the studied region 19 species were participated in the whole collection during two sampling seasons (See appendix). It is interesting that the dominating species among theirs assemblages of spring samplings differs from the mollusks species determined in summer. The variable domination of mollusks species is appeared one of the characteristic features of sampling seasons. In spring 12 species have been found in more than 5 sampling sites of which only 4 (*Lymnaea stagnalis, Planorbarius corneum, Viviparus contectus* and *Bithynia tentaculata)* occurred in 50% of our sampling habitats in summer (Table 7a, b).

Table 7a
The relative abundance of Mollusca from water bodies gradient. **Spring**

	Pool / pool NN		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**K**
NN	**Species**	**Code**										
1	*Planorbarius corneus*	0		+(j)	++	+	++	+++	+	++	+	+++
2	*Valvata cristata*	0	+	++	++	++	+++		+++	+++		
3	*Hippeutis complanatus*	5,6	++				++	+	+	+	++	++
4	*Viviparus contectus*	4 - 5			+++	+++	+++	++	+		+++	
5	*Lymnaea stagnalis*	0		+	++		+	++		+		+
6	*Physa fontinalis*	0	++	+			+++	++	+	+		
7	*Bathyomphalus contortus*	0	+			+		+	+	++		+
8	*Segmentina nitida*	5,6		+	+			+	+	+		++
9	*Bithynia tentaculata*	3 -5,8	++	+					+	+	++	
10	*Anisus vortex*	4,5			+	+		+	+	+		
11	*Planorbis planorbis*	0		+	+			+	+	+		
12	*Sphaerium corneum*	0	+	++		++			+			
13	*Viviparus viviparus*	3,4	+	+++		++	+					
14	*Stagnicola palustris - complex*	0	+		++				+			
15	*Bithynia troscheli*	3 - 6	+						+	+		
16	*Valvata macrostoma*	5,6,13	++						+	++		
17	*Anisus vorticulus*	5						+	+		+	
18	*Gyraulus crista*	0	++								+	+

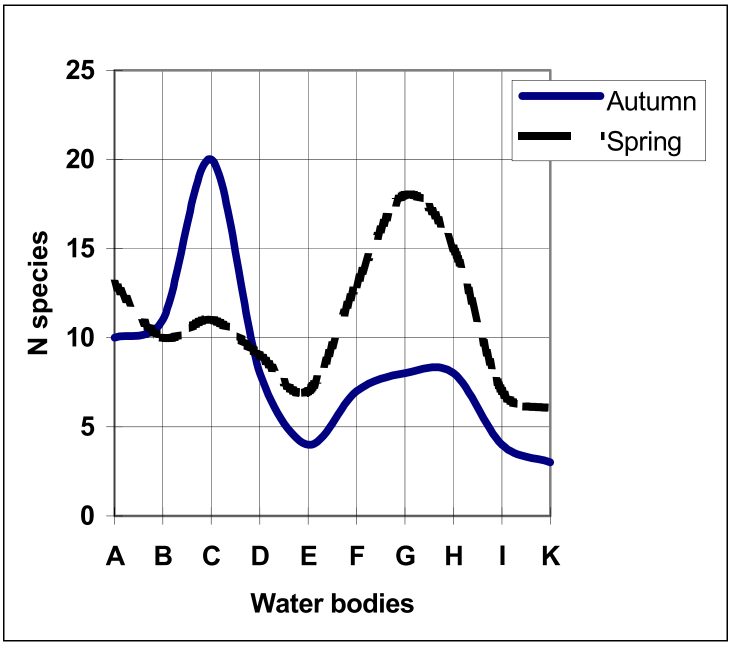
19	*Pisidium pseudosphaerium*	5			+				+	+		
20	*Stagnicola corvus*	5,6			++			+				
21	*Pisidium milium*	0				++				++		
22	*Acroloxus lacustris*	5,6,13				+						
23	*Radix auricularia*	3,4,5	++									
24	*Radix ovata*	0						+				
25	*Anisus leucostoma*	0							+			
26	*Gyraulus albus*	3 - 6									++	
27	*Pisidium obtusale*	5							+			

Table 7b
The relative abundance of Mollusca from water bodies gradient. **Summer**

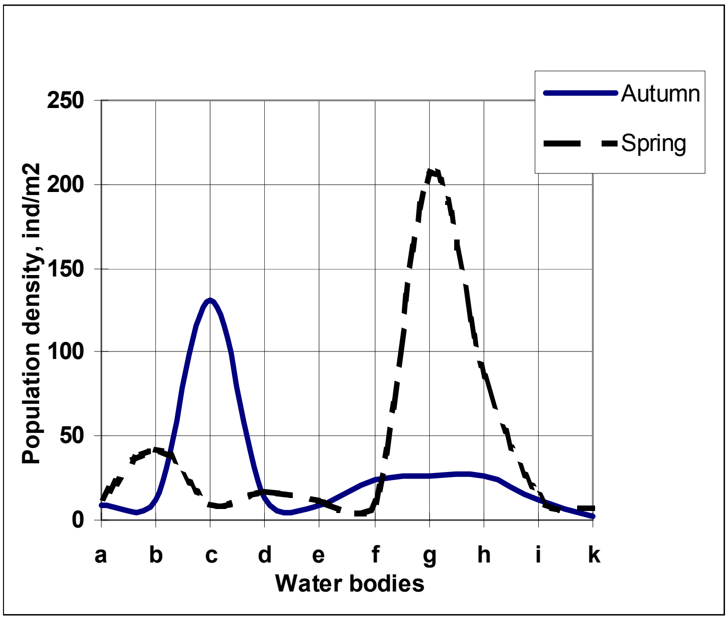
	Pool / pool NN		**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**K**
NN	**Species**	**code**										
1	*Lymnaea stagnalis*	0		+	+	+	++	+	++	+	+++	
2	*Planorbarius corneus*	0			**+**	**+**	**+++**	**+++**	**+++**	**+++**	**+++**	**+++**
3	*Viviparus contectus*	4 - 5			+		+++	+	+	+	+++	+++
4	*Bithynia tentaculata*	3 - 5,8	+	++	+	++		++		+	+	
5	*Acroloxus lacustris*	5,6,13			+	+	++		+	++		
6	*Sphaerium corneum*	0	**++**	**+**	**+**			**+**				
7	*Physa fontinalis*	0			++			+++	+			
8	*Pisidium henslowanum*	0	++	+	+							
9	*Valvata piscinalis*	(3),4,5	++		+	++						
10	*Gyraulus albus*	3 - 6	++		+							
11	*Viviparus viviparus*	3,4	+	++								
12	*Anisus vortex*	4,5			+			++				
13	*Planorbis planorbis*	0							+++	++		
14	*Valvata cristata*	0			++				+			
15	*Bathyomphalus contortus*	0			+					++		
16	*Radix ovata*	0			+	+++						
17	*Pisidium subtrucatum*	0			+	+						
18	**Succineidae**				+					+		
19	**Unionidae,jj**		++									
20	*Dreissena polymorpha*	3 - 5	+									
21	*Radix auricularia*	3,4,5	++									
22	*Hippeutis complanatus*	5,6							+			
23	*Anisus vorticulus*	5								++		
24	*Pisidium nitidum*	0			++							
25	*Pisidium pseudosphaerium*	5			+							
26	*Stagnicola palustris - complex*	0		+								
27	*Musculium lacustre*	0				++						
28	*Pisidium casertanum*	0	++									

The highest number of mollusks species in spring samplings were found in the locality **G** (Fig. 37 A). In a similar way this habitat demonstrated a highest population density of mollusks (Fig. 37 B).

Figure 37
The species number and the population density of molusks along the water bodies gradient
A = species number
B = population density (ind./m²)



A



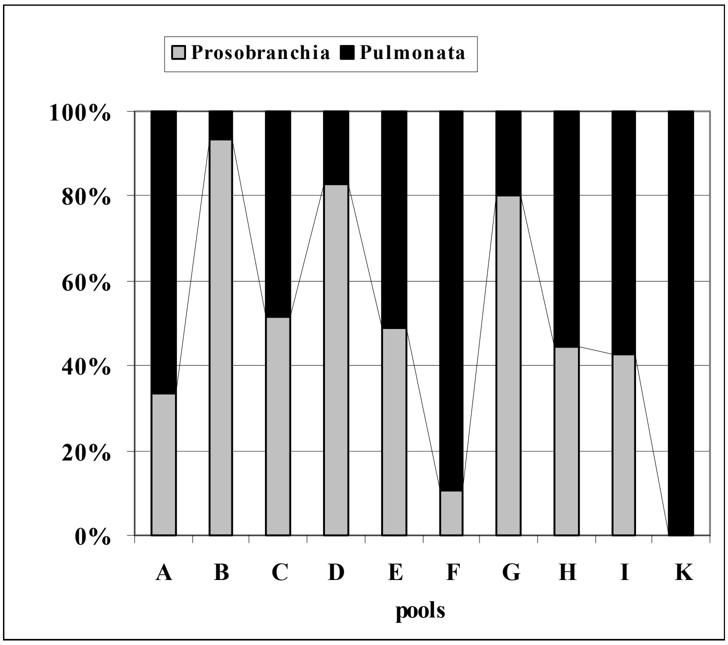
B

It is correct to say that basic amount of mollusks in these localities was defined nearly by *V. cristata* as well as the other species were in the same quantity range as compared with other investigated water bodies.
In summer the highest number of species and mollusks abundance were found in the locality **C.** Generally speaking, the mollusk fauna of sampling site **C** was characterized by its considerable diversity: out of 28 species occurring, the particular water bodies are inhabited by 18 species (64%). In this water bodies the primary significance appeared to the juvenile specimens of f. Pisidiidae (160 ind/m^2).
It was revealed the important links between the species abundance of mollusks and their life history peculiarities. Mollusks with the one-year life cycle demonstrate mass appearance of young individual in reproduction period (late spring or summer) with simultaneous extinction of adults. So in this period the quota of juvenile mollusks in population could average up to 54% (for

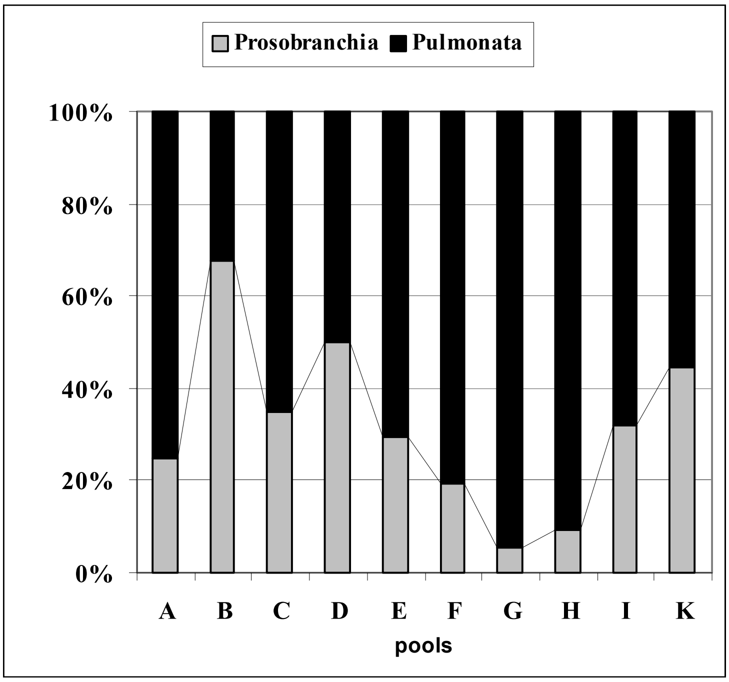
Pisidiidae) and 80% (for Viviparidae). Consequently the species structure and their changes in mollusk density were determined more by life histories than by water body persistence in particular season.
It is impossible to say about influence various kind of the bottom in the **C1** and **C2** (Table 2) in accordance with *Pisidiidae* species recorded there **C(1-2).** The species of *Pisidiidae* were found may occurs within a wide range the nature of substrate: from very soft mud (for *P.nitidum, P.obtusale*) and muddy substrates with much organic debris (for *P.subtruncatum*) to sandy ones (Kuiper,1970). It seems that the kinds of bottom do not affect directly the distribution of mollusks but they affect rather as a substrate for the growth of microflora (Strzelec,1988; Russel-Hunter, 1978). Such results are lend support to the view that the relationship between environmental abiotic and biotic mechanisms regulating the distribution of mollusks is complex.
The densities value we obtained seems relative low. But they did not reflect the real contribution of mollusk population and their role in such type of water bodies without taking into consideration the environmental preferences of the separate species. So for water pools of Pripyat flood plain the density of most common species such as *V. viviparus* may reach up to 200 specimens/sq.m, for *P.amnicum* - 67,5, *B. leachi* –25, *L. stagnalis* - 3,6, *Ph. fontinalis* - 6,8 (Arabina, Shalovenkova, Pecetskaya, 1981). In accordance to quantitative development of mollusks community there were significant differences between zones of water bodies with rich vegetation of aquatic plants and open water. According to the results of investigations the flood plain Pripyat river were carried out in 1949 the mollusks density in such types of localities were 5 –19 specimens/m^2 (open water) and 30 -136 specimens/m^2 (localities with rich vegetation) (Lyahnovich, 1956). The developing of malacological structure in investigated water bodies associated with the peculiarities of habitats forming a spatial heterogeneous even within the same pools. It is likely that one of the most important changes affecting species distribution will be a change of the type and structure of vegetation and, correspondingly, kind of the bottom. The colonization of water plants by numerous mollusks species may be associated also with a nutrient availability of periphyton developing on the plants.
It is worth to carry out the special research in this direction which can much contributed to gaining knowledge about quantitative impact of mollusk population in such type of water bodies.
The degree of dominating species were analyzing in gradient localities from A to K (Fig. 38).
From this point of views the existence of branchiate and pulmonata species in different pools was analyzed. As it is known there is a decreasing the number of branchiate mollusks species against simultaneous increasing of pulmonata ones, having moreover possibilities of water-aerial breathing, in gradient from running water to swampland in flood plain zones (Zadin, 1950). Water-aerial mollusks are better adapted to the habitats with stagnant waters. They have as a rule the advantageous life conditions within habitats with rich macrophythes and muddy bottom as well as oxygen deficit. For instance, the distribution of oxyphilous *Acroloxus lacustris* and *Physa fontinalis* in the pools with the water plants or floating leaves could be explained by its preference of helophytes-rich water conditions, which probably favorable for accessibility of oxygen.
According to our spring findings in four pools (**B, C, E, G)** were occurred more 50% branchiate mollusks species. In the pool **F** were found only 8% branchiate mollusks and absent at all in the pool **K**.
In summer sampling season the proportion of branchiate mollusks more than 50% from the total their number have been recorded in only 2 pools (**B, D)**. So the branchiate mollusks appear to live under unfavorable condition in more numerous investigated water bodies. It is noteworthy to mention that in our

investigation areas the Prosobranchia snails fauna were composed mostly of commonest Viviparidae which can distribute in wide range of habitat.

Figure 38
An occurrence of pulmonata, branchiate and bivalve mollusks in investigated waterbodies.
A = spring
B = summer



A



B

But it is worth to have in mind that there are significant differences between sampling sites within the pools which might level out differences by using of average value. For example in the locality **A1** we found in summer only branchiate gastropod snails (100%), but in locality **A2** they constituted only 10% of the snail fauna**.** This result were in a good accordance with the environmental peculiarities of separate investigated localities (Tabl.2). There is rare chance of direct negative consequences of parasitism which express in decreasing of mollusks density (Granovich, 2000). Although such biological mechanisms as predation may be involved too but probably the

distribution of mollusks are in equilibrium with the ability of colonization of local habitats and survival in it (Dussart,1979).
The tendency for changing the share of occurrence in the pools branchiate and pulmonata species was appeared more noticeable in summer season and probably reflects the real situation repeated every year and was a most typical for such aquatic system. To our opinion the testing of supposition can be solved only if to carry out the research in the season without the extraordinary flooding of the Pripyat River as in 1999.

Conclusions

1. It was revealed **43 species of Mollusca** (**29 Gastropoda and 14 Bivalvia**) during both spring and summer field works season. In spring we found the almost the same species number as in summer: **33** and **37** species respectively. The species list of mollusks according to quantitative samplings consists of near 84% from that of qualitative once. It is concluded that the method of quantitative sampling is capable of producing underestimation species richness and population density values of mollusk inhabiting water bodies in reality without taking into consideration the environmental Mollusca preferences.
2. The greatest species diversity was mentioned **in spring** in water bodies **G** and **H**. It was the sampling sites where the most favorable conditions for mollusks were provided due to high quality physical-chemical factors which are responsible for species diversity, rich macrophythes development and a high level of photosynthetic activity.
   In summer the highest number of species were found in the locality **A, B, C**. These biotopes (sites **A, B, C**) were situated a very close to the river and as a result mollusks may colonize these habitats by passive dispersal effected by a number of factors. The advantageous life conditions in this habitats be related to other environmental factor suitable for mollusks. In summer in the sites from **E** to **K** the probably influence of the considerable decreasing water area or even drying up were the determining factor for malacofauna of these water bodies. In the context of these comments in pools F, K were recorded the relatively low alkalinity, pH, hardness. In summer both in qualitative and quantitative samples the sites from E to K demonstrated a relatively low species diversity of mollusks . The probably plausible reason were the combination of the considerable decreasing water area or even drying up and influence of their life history peculiarities. However this general pattern is probably much more complex.. In the context of these comments in pools F, K were recorded the relatively low alkalinity, pH, hardness that also were the determining factor for malacofauna of these water bodies.
3. The effect of season sampling on mollusk species number has been studied. The variable domination of mollusks species is appeared one of the characteristic features of sampling seasons. In spring 12 species have been found in more than 5 sampling sites of which only 4 (*Lymnaea stagnalis, Planorbarius corneum, Viviparus contectus* and *Bithynia tentaculata)* occurred in 50% of our sampling habitats in summer.
   The mollusk species assemblages demonstrated the increasing of stagnant mollusks species and lacking of reophilic ounces in spring. In summer samplings the bivalve mollusks (f.Pisidiidae) increased in number species as well as some other reophilic species (in the sampling sites **A, B, C**).
4. The share of occurrence in the pools branchiate and pulmonata species differ in spring and summer samplings season. The tendency for decreasing the share of occurrence branchiate species was appeared more noticeable in summer season and probably reflects the real situation repeated every year for water bodies in floodplain of the river.

4.2.3 Ostracoda, Asellidae, Gamaridae, Laevicaudata, Notostraca

Number of species indentified

The total **Ostracoda** list has **42 species.** 34 from them were mentioned in spring samples and 22 in summer ones. 3 Ostracoda species were found in samples from bogs (**L** and **M** water bodies). That is rich enough area taking into consideration two time samplings. For Russian and Moldavian river systems sampled annual during many years the Ostracoda species number did not exceed 70 (Semyonova, 1980; 1993; Keyser, Nagorskaya, 1998).
Other Crustacea from benthic samples included **1 species Asellidae** - *Asellus aquaticus*, **2** - **Gammaridae** - *Gammarus lacustris* and *Synurella ambulans*; **1 - Laevicaudata** - *Lynceus brachiurus* and **1 - Notostraca** - *Lepidurus apus*.
So **in total there are 49 species of Crustacea** (without plankton).
The number of Ostracoda species changed from 6 to 15 per one pool in spring samples and from 2 to 11 species per one pool in summer (Fig. 39). The most rich were the water bodies **C, F, G** and **H** which were characterized by very diverse biotopes in spring and oxbow **C** which had different habitats for investigated biotopes in summer. It is necessary to emphasize that all these water bodies had feeding with underground water (see 4.1 chapter).
In summer it was tendency to decrease species number per pool in the water bodies gradient.

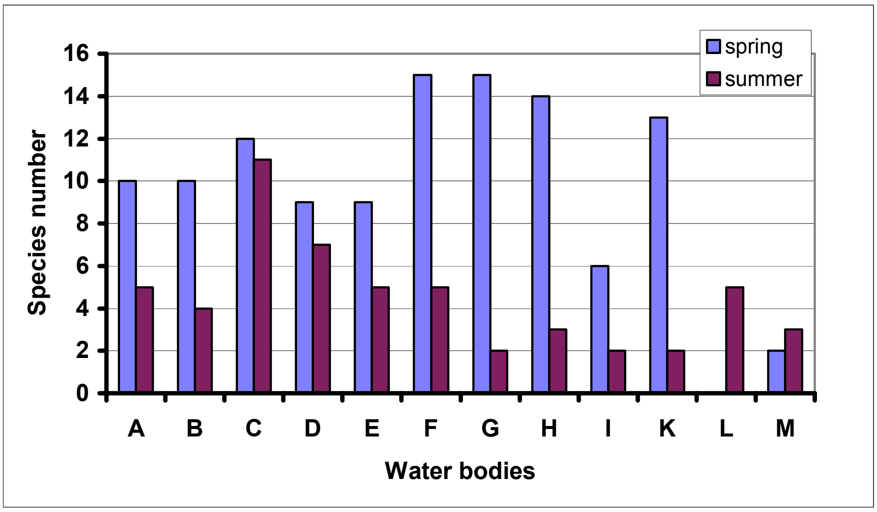


Figure 39
The Ostracoda species number along the water bodies gradient

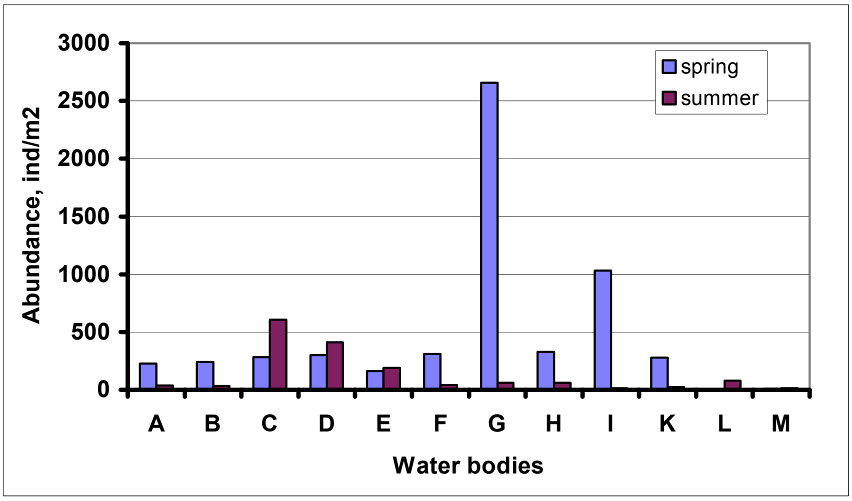
In contradistinction to *G. lacustris, S. ambulans, L. brachiurus* , just *Asellus aquaticus* was very numerous almost in all water bodies, especially in pool **A** which was the backwater connected to main stream at downstream end only (more than 2500 ind/m^2) and **G** and **F** (500-700 ind/m^2). Very rich local population of *A. aquaticus* was in the water body **M** (mesotrophic bog, where animals occupied overgrowth of *Equisetum fluviatile* (see chapter 2).
In the same time in summer *Asellus aquaticus* as well as some other species was met in a few localities and with low population density (see Appendix).
This species inhabit stagnant and lotic (with low velocity) water bodies with rich organic substance where form abundant enough populations.

The population density of Ostracoda

The population density of Ostracoda assemblages was characterized by relative not high values. In spring almost in all water bodies population density was

200-400 ind/m², and only in two pools that parameter was much more (>1000 ind/m² in **I** and 2600 ind/m² in **G)** (Fig.40).

Figure 40
The Ostracoda population density along the water bodies gradient



That influence of population density was as result of spring generation of *Cypridopsis vidua , Cypria ophtalmica and Candona compressa and Cypris pubera,* mainly.

In summer the population density of Ostracoda assemblages was characterized by values which were in 4-10 time less that in spring. The maximal meaning were 190 ind/m² in **G** water body and 190 and >600 ind/m² in **G** and **D** pool, correspondingly (Fig. 40).

It needs to say that sometimes even one species of Ostracoda could produce very abundant population by fortunate conditions (> 1 millions ind/m²) (Nagorskaya, 1988; Nagorskaya, Laenko, 1993). In that case they could do very significant nature forming role of ecosystems (Zhukova, Nagorskaya, 1994).

Taxanomic and ecological groupings

The relative abundance and some ecological characteristics of Ostracoda species (Klie, 1938; Walf, 1920; Sywula, 1974;1981; Martens, 1989; Martens, Dumont, 1984; Meisch, 1996; Semyonova, 1980; 1993; Scharf et al.,1995; Pietkowski, 1977; Malz, 1977; Mallwitz, 1984; Hartmann, 1966; Hiller, 1972; Hartmann, Hiller, 1977; Keyser, Nagorskaya, 1998; Meisch, 2000) are presented in the table 8.

The relative abundance of Ostracoda in spring illustrated on the first part of Tabl. 8 where it could permit to select three clear «clouds».

First of them are species group which were formed by more or less reophilic species lived mainly in rivers and streams. Here they were found in pools which are real oxbows (or dead branches of Pripyat) (**A, B, C** and **D**)

The second group are species which inhabit usually spring pools or drying up to the end of summer water bodies. The third group are Ostracoda species characterized by a high tolerance level. They formed strong populations almost in all water pools types.

That selection with different ecological groups are more distinct for the second part of the table 8 (summer). As it was mentioned above the 1999 year flooding was extremely high and strong, so many regular events, appearances and natural phenomenon were disturbed. So, probably to the end of summer the ecological groups of Ostracoda are corresponded to their habitat and ecological requirements in spite of the unsuitable season for many Ostracoda.

The second part of table 8 demonstrated 3 very clear selected groups. The first group are Ostracoda species with the preferences of river or oxbow conditions. Other group are species without specialisation, very tolerant to habitats conditions. At least the third group are Ostracoda which were found in the water bodies on the very right part of scale of habitat factors (pools **I, K, L** and **M** -bog).

In the same time we can select line of ecological groups according their habitat requirement position.

a) **Spring complex.**
Species belonged to spring complex are: *Cypris pubera, Bradleystrandesia reticulata, Dolerocypris fasciata, Limnocythere relicta.* It is necessary emphasize that the end of May is almost out of the period of spring Ostracoda complex development, which prefers the period from the middle of April to the beginning of May. So we sampled only few species from typically very rich spring complex.

b) **Ubiquist species.**
Ubiquist species group includes *Candona candida, C. neglecta, Cypria ophtalmica, Cyclocypris ovum* and *Heterocypris incongruens.* These species have no any special habitat preferences and they occupied every biotopes easy and enough quickly.

c) **Very specialised species.**
Notodromas monacha inhabits places which are very close the water surface film in the places with rich vegetation. The feeding of this species are filtration from the surface film.

d) **Stagnant water and reophilic species**
We found in the water bodies **A, B, C, D** some species which inhabite stagnant water bodies and are relatively reophilic such as *Ilyocypris decipens, Physocypria craepelini, Cypridopsis obesa, Pseudocandona insculpta*.

e) **Psammophilous species**
Some of Ostracoda which were found in the water bodies **A, F** and **H** are psammophilous - Ilyocypris decipens, Limnocythere inopinata, Candonopsis kingslei, Pseudocandona hartwigi, Ilyocypris gibba, Candona linderi, Fabaeformiscandona caudata. These species are a component of river fauna in numerous rivers (Semyonova, 1980, 1993; Sywula, 1972).

f) **Rare species**
In the investigated water bodies we found 12 Ostracoda species (31%) which are rare for Belarus as well as for some European regions (Martens, 1989, Meisch, 1996, 2000). They are: *Candona hyalina, Candona caudata, Candona acuminata, Cypria curvifurcata, Cypria lata, Cypridopsis elongata, Cypridopsis obesa, Iliocypris decipens, Limnocythere relicta, Physocypria craepelini. Pseudocandona semicognita, Trajancypris clavata.*

Habitat requirements
Habitat requirements vary between species with age and other factors, including the presence of predators. Nevertheless, Tabl.8 (See its left hand columns) summarizes the general habitat requirements of Ostracoda were found in the two season samples.

The filtration of data of the table 8 in accordance with some types of habitat requirements let to combine groups where are Ostracoda species with the same type of the necessity. We should to say that if not take in consideration ubiquist species, most other Ostracoda species keep their own ecological niches. For example some species such as *Dolerocypris fasciata, Notodromas monacha, Pseudocandona insculpta, Ps. pratensis* live in densely vegetated backwaters out of main current buy their life cycles, feeding type, behavioural peculiarities are completely different.

The extraordinary flooding in 1999 probably changed the situation which was more or less typical for line of years. Some amount of Ostracoda cysts was removed to new places which could not be used /mastered by young animals so fast and successful as the ubiquist species do that. In the same time in pools **C** and **G** where the underground water fed the Ostracoda habitats a diverse and rich assemblages were fixed.

Table 8
The relative abundance and ecological characteristics of Ostracoda from water bodies gradient in spring en summer

+++ if the number of specimens of this taxon is more than 25 % of the total number of animals
++ if the number of specimens of this taxon is more than 5 % of the total
+ if the number of specimens of this taxon is less than 5 % of the total
E,e/M,m preferences of eutrophic or mesotrophic conditions;
Ps psammophilic species;
Sw species which are good swimmers;
S,s/ R,r stagnant or reophilic;
P/tmp permanent or temporary water bodies;
D, d preferences in decayed organic matter;
VR rich vegetation in the habitats;
Relation to the hardness (h- high, m- middle, l-low colt contents)

The number-code (N Code) was used by means of Limnofauna Europea (1978) for the valuation of ecological preferences of investigated invertebrates.
0 - freshwater in general, no specialization
1 - underground water, caves and psammon
2 - springs (krenon)
3 - brooks and small rivers (rhitron)
4 - rivers and large streams (potamon)
5 - lakes (standing water in general)
6 - temporary small waters, pools and ponds
8 - brackish water, estuaries
9 - inland salt water (salines, etc.)
10 - peat-bogs
13 - swamps, moist soil.

Spring

E,e/M, m	Hard h,m,l	P/tmp	S,s/R,r	psm/sw im	D,d/VR	N Code	Pool / pool NN	A	B	C	D	E	F	G	H	I	K	L	M
E-m	H	P,tmp	S/R		D	0	*Candona candida*		x	x									
?	?	P	r		D,RV	4,?	*Cypridopsis obesa*	x		x									
e	h	P	S		D	5,6, 10	*Fabaeformiscandona protzi*			x									
M	h	P	R	psm	d	5,6	*Ilyocypris decipens*	x											
E	h	P	r	psm	D	5,6,9,1	*Limnocythere inopinata*	xx											
e-m	H	P/tmp?	S/r		VR,D	3,4,5,6 ?	*Physocypria kraepelini*	x							x				
E	h	P,tmp	S		D	5,6,3,8	*Fabaeformiscandona fabaeformis*		x					x			x		
e-M	H	P/tm	S		d	5,6,10, 13	*Fabaeformiscandona fragilis*	x	x	x							xx		
e	h	P,tmp	S,r		d	0	*Candona neglecta*		x				x						
e	m	P,tmp	r	psm	D	1,5,6,1 0	*Candonopsis kingslei*				x						x		
e	h	P,tmp	r		d	5,6	*Candonopsis scourfieldi*								x				
E	m	P,tmp	S		D	6	*Cypridopsis elongata*						x						
e	h	P	r		D	6,9	*Cypridopsis newtoni*							x					
m	h	P	R		d	5,6	*Cypria exculpta*				x								x

m-e	?	P/tmp?	S	swim	RV	5,6	*Cypria lata*						x						
m	h	P	S	swim	VR	5,6	*Dolerocypris fasciata*								x		x		
E	h	P,tmp	S	psm	D	5,6,1	*Pseudocandona hartwigi*						x		xx		x		
E	h	P,tmp	S,r		D,VR	5,6, 10	*Fabaeformiscandona acuminata*			x							x		
e	l	P,tmp	S		d	6	*Fabaeformiscandona holzkampfi*	x		x			xx	xx	x		x		
e	h	P,tmp	r	swim	D	0	*Cypria ophtalmica*	x	x	x	xx	x	x	xxx	xxx	x	xxx		
m	l	P,tmp	S		VR	5,6	*Cypridopsis vidua*	xxx	x	x	xx	xx	xx	xx	x	xxx	x		
E	l	P,tmp	S		D	5,6	*Cypris pubera*	xxx	xx	x	x	xx	xx	xx	x				
e	h	P	S		d	5,8	*Pseudocandona compressa*	x	x	x	x	x	xxx	xx	x	x	x		
							Candona juv	xxx	xxx	xxx	x	xx	x		xx	x	xx		x
							Pseudocandona juv				x	x	x	x	x	x			
							Fabaeformiscandona juv		x		xx		x		x		xx		
m	h	P,tmp	S	swim	VR	2,5,6	*Cyclocypris laevis*	x		xx		x	x	x	xxx	x	x		
E-m	m	P,tmp	S	swim	d	0	*Cyclocypris ovum*				xxx	xxx		x	x	x	x		
m	h	P	r		d	6	*Cypridopsis parva*		x			xx				x	x		
E	m	P,tmp	S,r		D	5,6	*Bradleystrandesia reticulata*			x			xx	x					
e	l	tmp	S		d	6	*Trajancypris clavata*						x						
E-m	m	P,tmp	S		d	0	*Hererocypis incongruens*						x						
e	l	tmp	S		d	6	*Pseudocandona semicognita*							x					

Summer

E,e/M, m	Hard h,m,l	P/tmp	S,s/R,r	psm/swim	D,d/VR	N Code	**Pool / pool NN**	A	B	C	D	E	F	G	H	I	K	L	M
E-m	H	P,tmp	S/R		D	0	*Candona candida*	x		xx	xx	x	x						
m	H	P/tmp	S/r	psm	d	2,5	*Candona lindneri*	x											
e	h	P,tmp	S,r		d	0	*Candona neglecta*	x	xx	x						xx			
?	?	P	r		D,RV	4,?	*Cypridopsis obesa*	x		x			xx						
e	h	P	S		d	5,8	*Pseudocandona compressa*			x			x						
e	h	P,tmp	S		D, VR	5,6,8,4	*Pseudocandona insculpta*			x									
m	h	P,tmp	S	swim	VR	2,5,6	*Cyclocypris laevis*			x									
e-M	H	P/tmp	S		d	5,6,10,13	*Fabaeformiscandona fragilis*			x	xxx	xxx							
e-m	m	P/tmp	S		d	5,6,10,13	*Fabaeformiscandona hyalina*			x									
e	h	P	S		D	5,6, 10	*Fabaeformiscandona protzi*			x									
E	h	P	r		D,VR	5,6, 10	*Fabaeformiscandona acuminata*			x									
?	?	P	R		d	4	*Cypria curvifurcata*				x								
							Pseudocandona juv	x		x	x								
							Fabaeformiscandona juv		x	xx	x	x							
							Candona juv	xx		xxx	xx	xx					x	x	
E-m	H	P/tmp	S,r		d	5,6,9,10,13	*Candona weltneri*					xx							
e-m	H	P/tmp?	S/r		VR,D	3,4,5,6?	*Physocypria kraepelini*				xx	x							
E	h	P,tmp	S		D	5,6,3,8	*Fabaeformiscandona fabaeformis*						x		x				
e	h	P,tmp	r	swim	D	0	*Cypria ophtalmica*	xxx	x	x	xx	x	xxx	x	xxx	xxx			
m	m	P	S	psm	d	1,5,6	*Fabaeformiscandona caudata*		xxx								xxx		
m	l	P,tmp	S		VR	5,6	*Cypridopsis vidua*	xx	xx	x	x		xxx	xxx			xxx	x	
m	h	P	R		d	5,6	*Cypria exculpta*				xx							x	x
E-m	m	P,tmp	S		d	0	*Hererocypis incongruens*											x	x
m	h	P/tmp	S	psm	d	1,2,3,6	*Ilyocypris gibba*											x	x
e	l	tmp	S		d	6	*Trajancypris clavata*											x	

Conclusions

1. In the water bodies in the Pripyat flood plain **42** Ostracoda species were identified. That testify the rich enough fauna composition.
2. The total species number per pool increased along water bodies gradient **A - K** in spring after flooding. In summer the trend to decrease of species number per pool along gradient from river bed to inner water bodies was fixed distinctly. In the same time there are the tendency to increasing of species number with diversity of biotopes per pool.
3. The population density of Ostracoda assemblages increased from the pools situated near the river bed to more isolated ones in spring. Its maxim meaning was in the big and diverse oxbows **F, G** and **H**. In summer it was back directed trend. The maximal population density of Ostracoda had the water bodies situated not far from the Pripyat River bed.
4. **4** species of Ostracoda, which are the component of **stagnant water bodies' fauna,** were found in the oxbows contacted periodically / constant with the Pripyat River main channel.
5. **12** species (**31%)** Ostracoda from water bodies investigated are **rare** for Belarus as well as for some European countries.
6. The analyses of a relative abundance and ecological peculiarities demonstrated distinct **ecological groups** which inhabited different water bodied in gradient. They are ubiquist, stagnant reservorirs complexes species and species were attracted by soft more inland water bodies.

4.2.4 Nematocera (midges) especially Chironomidae

Methods

The results are presented on account of different types of samples:

- the quantitative samples which were taken to get all groups of macroinvetebrates;
- special samples to gather exuviae of chironomids;
- some special samples in sand bottom and decaying Typha plants (only in summer);
- some qualitative samples with hand net in the pojma (only in spring);
- larvae and pupae have been got also from samples of exuviae and qualitative sampling of other groups as Coleoptera and Ostracoda.

For gathering exuviae a hand net was moved along the water surface between vegetation or at the water edge at a place where material more or less accumulated by wind. The exuviae were picked out by hand in the field; especially very small specimens can be overlooked but in general the light conditions were very good so that the exuviae could be seen well. It was tried to get at least 100 exuviae from each locality, but sometimes this appeared to be impossible within real time.
At a temperature of 15 – 20° C. the exuviae are floating about two days and can originate from other places, transported by wind and water flow. In isolated pools of course this is never the case. Exuviae samples give an idea of the inhabitants of the whole water body, whereas larval samples only contain the species living on the sampling place.

Number of species indentified

In spring and summer together **98 chironomid taxa have been found**. This would be low, if the total gradient from river up to the bogs would have been investigated. Especially in rivers and mesotrophic water bodies very many species can be found. For instance Caspers (1980) calls 71 species at one

station in the Rhine near Bonn a species-poor remnant-community. De Jonge e.a. (1999) found 88 chironomid species in the river Pripyat and its dead branches in 1998 and call it a poor macrofauna.
Also in mesotrophic conditions the species numbers can be very high. In one exuviae sample in a ditch near Vlijmen (the Netherlands) were found 37 species, in other samples in more eutrophic ditches in the neighborhood this number rarely exceeded 10 (Cuppen, 1993). In all our exuviae samples the number lied below 20.

Taxanomic and ecological groupings
The total number of chironomid species in the spring samples is **81**, in spring and summer samples together **98**. Most other Nematocera have been identified only to genus or family. Of the genus Chaoborus three species seemed to be rather common without strong influence of water type (*C. crystallinus, C. flavicans* and *C. pallidus*). To save time these species were not identified in most samples.
The sequence of the samples in the tables is chosen according to influence of the Pripyat river water in spring 1999, partly by visible information on the spot or on maps partly by information of local people.
Most species and other taxa have got one or more ecological codes concerning their presence in running or stagnant water, in more or less eutrophic water and in environment with more or less production or decay of organic material. These codes are on the base of West-European literature: Fittkau & Reiss (1978), Langton (1991), Moller Pillot & Buskens (1990), Saether (1979), Steenbergen (1993), Verdonschot e.a. (1992), Vallenduuk e.a. (1995). For some species also unpublished data have been used. Although most information is from western countries, most probably it will be applicable in Belarus too.

spring
The tables suggest three groups of sampling localities: A - C, F - G and H - K. In the samples of localities D and E too less chironomids have been found to confirm or oppose their place in the row.
Species more (R) or less (r) typical for river conditions are found nearly exclusively in the localities A -D; species more (S) or less (s) characteristic for stagnant waters are scarce in these samples.
In the localities A- G species more (E) or less (e) characteristic for eu- to hypertrophic conditions dominate. Species of more mesotrophic waters (M and m) have been found nearly exclusively in the localities H - K.
Nearly everywhere the fauna consists of species living in waters where production is dominating (P and p) as well as species more preferring decaying conditions (D and d).
At least three species are up to now not or hardly known from Europe: one on pt. H (Zavreliella spec. nov.), possibly one on pt. I (*Cricotopus cf. elegans*) and two or more on pt. K (*Acamptocladius*, *Paratanytarsus* * and possibly one or two *Tanytarsus* species).

summer
In general in August/September the numbers of chironomids, both larvae as well as exuviae and numbers of individuals as well as the species numbers, were much lower than in spring. Especially striking are the differences in numbers for some common genera and species as Ablabesmyia, *Acricotopus lucens*, Chironomus, *Cricotopus sylvestris* and Psectrocladius. Also Chaoborus

larvae were more or less scarce. More numerous were the numbers of exuviae of *Polypedilum sordens* and *Endochironomus tendens* and the numbers of larvae of the mosquito *Anopheles maculipennis* and the meniscus midge *Dixella amphibia*.
The decline was especially striking in the water bodies F, G, H and K, whereas in E more chironomids have been found. At some localities the bottom was covered with a thick layer of organic silt, but the decline was the same where such layers were absent (for instance G 1 and K 1).
In connection with the low number of chironomids assessment of water quality and other factors in summer in F,G, H and K was nearly impossible. In F and G however the differences between the places F 1 and F 4 and between G 1 and G 2 found clear expression in the sampling results as was the case between C 1 and C 2.
Some species have been found in summer just in other places than in spring. Most striking examples are *Endochironomus albipennis* (in spring nearly exclusively in F and G, in summer most numerous in A and B) and *Procladius sagittalis* (in spring nearly confined to A - D, in summer also elsewhere and most numerous in G 1).
The fact that the greatest difference lied between the ends of the gradient (A and B as distinct from I and K) remained in summer as in spring results.

Discussion
The number of species of larvae and exuviae cannot be compared very easy. Identification of exuviae of the genus *Chironomus* has left nearly undone because it is very difficult. The larvae of some other genera (*Tanytarsus*, *Parachironomus* etc.) often cannot be identified up to species level.
It is important to keep in mind that exuviae-samples give an impression about the species composition of all habitats present near the sampling place.

Table 9
Survey of chironomid larvae and pupae indicative for factors discussed in this report

In this table is reckoned with larvae and pupae from quantitative and qualitative samples

+++ if the number of specimens of this taxon is more than 20 and higher than 20% of the total number of chironomids
++ if the number of specimens is more than 5 and more than 5% of the total
+ in other cases

The following codes have been used:

E species dominating in eutrophic/hypertrophic environment
e item, but less pronounced
D species living in water bodies where decaying is dominating and passes rapidly
d item, but slower decay of organic material
M species mainly living in mesotrophic environment
m item, but less pronounced
P species living in water with high production
p item, where production is dominating, but passes more slowly
R species characteristic for running water
r species living mainly in running water (but also in large water bodies)
S Species characteristic for stagnant water
s species living mainly in stagnant water

In this table only taxa with codes E (e), M (m) or R (r) and some taxa mentioned in the text are included. Some other Nematocera, mentioned in the text, have been added.

Spring

	code	pojma	A	B	C	D	E	F	G	H	I	K
Thienemanniella flaviforceps agg	R			+								
Cricotopus bicinctus	e P r			+	+			+				
Nanocladius ? distinctus	r				+							
Dicrotendipes nervosus	e r											+
Anatopynia plumipes	dS	+				+						
Procladius		++	++	+++	+	++						+
Chironomus pallidivittatus	E D	+										
Chironomus plumosus	E D	+										
Chironomus annularius	E D	++	+	++	+++		+	++	++	+		++
Chironomus obtusidens	E D			+				+				
Endochironomus albipennis	e P S			+			+	++	+			
Glyptotendipes pallens	E P	+										
Parachironomus gr. arcuatus	E P		+		+			++	++	++	+	++
Cricotopus gr. sylvestris	E P	+++	+++	+	+++	+	+	+++	+++	++		+
Polypedilum nubeculosum agg.	e D	+		+	+	+		+	+	?+		
Ablabesmyia monilis agg.		+++	+++	+++	+		+	+	++	+	+	++
Chironomus indet.	D	++	+	+	++	+		++	++	+	+	+++
Chironomus luridus agg.	?d S			+	+			+++	+	+++		+++
Chironomus longipes	?m?dS									+		++
Acricotopus lucens	S							+				+
Cricotopus cf. elegans	?mp S										+	
Endochironomus gr. dispar	m p S							+	+	++		+
Einfeldia pagana	m S											+
Dicrotendipes lobiger	m p S											+
Guttipelopia guttipennis	m S										+	
Polypedilum uncinatum agg.	m d									+		+
Tanytarsus	(m) d						+	+	+		+	++
Zavreliella spec. nov.	?Mp S									+		
Zavreliella marmorata	M p S										+	
Zavrelia	M S										+	+
Acamptocladius	M S											+
some other Nematocera												
Anopheles	p S								+	+	++	+
Chaoborus	S		+				+++	++	+++	++	+	+++
Dixella amphibia	S				+	+			+			

(chironomid larvae and pupae)

Summer

	code		A	B	C	D	E	F	G	H	I	K
Paratanytarsus dissimilis agg.	r			+								
Chironomus acutiventris	r		++									
Dicrotendipes nervosus	e r			+								
Anatopynia plumipes	dS				++	+						
Procladius				+	+	+++	++	+	+			
Chironomus pallidivittatus	E D							+				
Chironomus plumosus agg.	E D		+	+	+							
Chironomus annularius	E D						+					?+

Chironomus obtusidens	E D			+								
Endochironomus albipennis	e P S		+	+		+	+	+	+			
Glyptotendipes pallens	E P				++		+					
Parachironomus gr. arcuatus	E P			+								
Cricotopus gr. sylvestris	E P		+	++			+		+	+		+
Polypedilum nubeculosum agg.	e D		++	++	+	+		+			+	
Ablabesmyia monilis agg.								+				
Chironomus indet.	D		+	+		+			++		+	+
Chironomus luridus agg.	?d S						+	+	+			
Cricotopus gr.cylindraceus/festiv.	m						+	+				
Endochironomus gr. dispar	m p S							?+	+	+		
Dicrotendipes lobiger	m p S											+
Polypedilum uncinatum agg.	m d							+				
Tanytarsus	(m) d		+	+		++		+				
some other Nematocera												
Anopheles	p S			+	+	+	+++	++	+	++	+	+++
Chaoborus	S			++			+		++		+	++
Dixella amphibia	S							++		++		+++

Table 10
List of Chironomidae exuviae indicative for factors discussed in this report

In this table the real found numbers of exuviae are mentioned.
For explanation of the codes see the survey of larvae and pupae.
* indescribed species M adult male
The sequence of taxa is in principle the same as in the survey of larvae and pupae.

Spring

	code	A	B	C	D	E	F2	F4	G1	G2	H	I	K
Potthastia longimanus	R			*4*									
Harnischia fuscimana	R		2										
Hydrobaenus pilipes	R				1								
Cladopelma virescens	R	1											
Cricotopus bicinctus	e P R	5	1	8									
Harnischia curtilamellata	r		1										
Nanocladius bicolor	r	1		1									
Dicrotendipes nervosus	e r	3		3					1				
Procladius sagittalis		4	2	1	1								
Chironomus pallidivittatus	E D			M3					M1				
Chironomus plumosus	E D	2											
Glyptotendipes pallens	E P	12	10	4	6		1						
Parachironomus arcuatus	E P	2	5	1					?1				
Cricotopus sylvestris	E P	31	3	33			19	47	30	8	12		3
Tanytarsus mendax		1	2				26	24	9	1			
Polypedilum nubeculosum	e D		2										
Ablabesmyia monilis agg.		28	61		2	4			3			11	1
Chironomus indet.	D	2	43	5				41	7		18	5	5
Acricotopus lucens	S						3	13	8	1	4		4
Cricotopus s.s. (other species)	?m												5
Endochironomus gr. dispar	m p S									2	1		1
Guttipelopia guttipennis	m S									1			8
Polypedilum uncinatum	m d												11

Ablabesmyia phatta	m S										1	
Zavreliella marmorata	MpS			1		4					16	
Tanytarsus usmaensis											8	
Paratendipes * genus novum											1	
Psectrocladius limbatellus	?m S								4			2
Psectrocladius brehmi	m S											1
Psectrocladius oligosetus	M S											1
Zavrelia	M S											2

Summer

	code	A	B	C	-	E	F2	F4	G1	G2	H	I	K
Paratanytarsus dissimilis	*r*	*14*					*1*						
Cricotopus intersectus	e P r	5											
Dicrotendipes nervosus	e r	5	8				1						
Procladius sagittalis		7	18	6			2		28			3	
Glyptotendipes pallens	E P	2	7	2		5	7	3				2	
Parachironomus arcuatus	E P	31											
Cricotopus sylvestris	E P	10	2									21	
Polypedilum nubeculosum	e D	9	13										
Ablabesmyia monilis agg.							2						
Chironomus indet.	D	1	3			5	8		2			2	
Chironomus longipes	?m?dS												
Endochironomus albipennis	e P S	19	8			7							
Cricotopus gr. cylindraceus/festiv.	m						3						
Endochironomus gr. dispar	m p S												1
Dicrotendipes modestus	m											3	
Polypedilum uncinatum	m d	1											2
Dicrotendipes lobiger	m p S											2	
Tanytarsus nemorosus	m											2	
*Zavreliella marmorata**	MpS											3	
Psectrocladius brehmi	m S											1	
Paratanytarsus laccophilus	M											5	

Commonly chironomids have been investigated by quite other methods as we did and therefore numbers of species are hardly comparable. We can state only that very species rich sampling points were absent in our investigations.
However the total number of species (98) shows that the total diversity is high, because nearly all water bodies were stagnant and more or less eutrophic. This high diversity will be caused by the fact that the total landscape in and around the flood plain of the Pripyat has a number of water bodies, which are different in many factors: dimensions, hydrology, frequency of flooding, development of vegetation etc.
Near Hvoensk we didn't find many larger water bodies which were hardly or not influenced by river water and not only dependent from rain water or bog. It is therefore not possible to say if the mesotrophic community between bog and river has been developed very well in this area.

Spring

River species were very scarce in the samples. All samples have been taken rather far from the Pripyat itself and also during the high water period in the months April and May the current velocity was low on the sampling stations. On the other side the true stagnant water species (such as *Endochironomus* and *Chaoborus* species) appear to have problems in such large water bodies as **A, B** and **C**, especially if water movement by current + wind is very strong as in spring 1999.

It is not clear why *Procladius sagittalis* seems to be confined to the first four localities; this species can live very well in stagnant water. Most probably the more open bottoms in these large water bodies are a condition of life for this species. Also the total scarcity of *Procladius choreus* is striking: this species is relatively common and numerous in this type of waters in the Netherlands.

According to de Jonge e.a. (1999) many species dominating in our samples are scarce or lacking in the main channel of the Pripyat, for instance *Ablabesmyia monilis*, *Chironomus annularius* and all stagnant water species. The large numbers of these species in the pojma cannot originate from the river. More likely a mass development of them in the pojma as in spring 1999 can cause a temporary increase of the population density else.

In all samples of the localities **A - G** the species of eu- to hypertrophic conditions dominate. In most cases these species belong to the species combination of group I of Moller Pillot & Krebs, 1981 (species of very dynamic water bodies as Chironomus species, *Cricotopus sylvestris, Endochironomus albipennis* etc.). Species of their group IV (of water bodies with good water quality) are lacking or very scarce. Most probably in all these localities the influence of less eutrophic water (from seepage or rain water) is not playing any important role. It seems impossible to estimate to what extent the special conditions in 1998/1999 can be the cause of this situation. Possibly the eutrophication will be relatively slight after some dry years.

Within this row of localities there are no striking differences. The stations **F** and **G** at the southern side of the dike appear to have hardly another water quality. However *Chironomus luridus* is more numerous here and in **G** some specimens of more mesotrophic conditions appear. Interesting is the distribution of *Acricotopus lucens* (see especially the exuviae list). This species inhabits more peat water bodies, independent of water quality. The presence in water bodies **F - K** suggest that the more developed succession plays a role in all localities south of the dike.

From this example appears that not only the trophic conditions are responsible for the differences between the three last and the former localities. The advanced succession finds expression in more dense vegetation and a thicker layer of organic material. This is more pronounced in the localities **H, I** and **K.** Moreover these three water bodies are much smaller than the others. The fact that among others the known M- and m-species are more or less confined to these localities proves that also the water quality is different. This is in agreement with the lower phosphate contents and the lower alkalinity. However: the trophic status of the last three water bodies is not really mesotrophic: chironomid species characteristic for high production rate (*Cricotopus sylvestris* and *Parachironomus gr. arcuatus*) are still rather numerous and the alkalinity is not too low for rather rapid decay of organic material so that Chironomus species are far more numerous than for instance *Polypedilum uncinatum*. The rather high numbers of Tanytarsus exuviae in I can be an indication that this water is the least eutrophic, but the ecology of these species is unknown.

Summer
Still more than in spring the river species and mesotrophic species were scarce. For typical river species the oxbow lakes were in summer no appropriate environment, because of the absence of current. The species characteristic for more eutrophic environment (E-species) still dominated in A and B, although the phosphate content of these water bodies was much lower than in spring. In the other water bodies the phosphate content had hardly changed and also the lower numbers of chironomids make assessment of the water quality here in summer more difficult. Also in summer M- and m-species were nearly confined to I and K.
The low numbers of most chironomids in summer cannot be caused by worsening of water quality. Indeed the measured oxygen content in C and G was very low and can have been 0 in parts of the night. However larvae of *Cricotopus sylvestris* and *Acricotopus lucens* declined here, which species can live in water with very little oxygen. The decline of Chironomus larvae in B, F and H cannot be explained at all in this way. Chironomus larvae are able to live in organic silt layers in large numbers. The life cycle of the greater part of the declining species and common experience elsewhere don't give any starting-point too (Sokolova, 1983; Goddeeris, 1983; v.d.Hammen, 1992; etc.). Also the numbers of other groups (Asellus, Oligochaeta) were low in the summer samples.
Analyzing the causes of the low numbers in summer is important, because of the fact, that you have to know for good research of such systems if there is much influence of the season of sampling and which factors are responsible for presence or absence of the greater part of the species. In literature lower numbers in summer samples are mentioned regularly. Sokolova e.a.(1983) give for Chironomus larvae two causes: worsening of trophic conditions and predation. In summer organic material in the water layer decays more quickly and often less of the nutritious material will be deposited on the bottom. Wróbel (1972) states that decay of terrestrial vegetation in spring after flooding of ponds causes a high production of *Chironomus thummi*. In August he found a decrease of number and biomass of the bottom fauna. Artificial increasing of the fish stock by Kajak e.a. (1972) caused a decrease of benthos biomass and increase of the biomass of the fauna on aquatic plants. The average weight of chironomid larvae decreased and the fish was feeding less on Chironomidae and Gastropoda and more on Trichoptera, Ephemeroptera, Odonata and Cladocera. It is a well-known phenomenon that some fish species like bream (*Abramis brama*) begin to feed on benthic chironomids in summer, for instance if zooplankton is exploited by other species or young fish (van de Bund, 1994; Lammens, 1986). Eriksson e.a. (1980) state that removing or disappearance of fish lead to increase of Corixidae, Chaoborus and Odonata.
In our case it seems to be probable that the numbers are heavy influenced by predation. Water beetles and fishes were in summer concentrated in much smaller water bodies than in spring. A strong indication in this direction is the fact, that some species of Diptera larvae where more common in summer samples as distinct from most other species. Most striking is this for *Endochironomus albipennis*, *E. tendens* and *Polypedilum sordens,* species which are living in small tubes in or close to plant stems and leaves and therefore less sensible for predation (Walshe, 1951, Kalugina, 1961). Also the larvae of Anopheles and Dixella where more numerous. These larvae are living within vegetation and also elsewhere appear to be much less predated than most chironomids.
Nevertheless also the better trophic conditions in spring, when grasses and algae were decaying on a large scale, will have contributed to the difference in chironomid numbers between spring and summer.

Conclusions

1. The typical river species as found in the main channel of the Pripyat (AquaSense, 1999) are nearly totally lacking in our samples.
2. The water in nearly all localities at the northern side of the dike and also in the water bodies **F** and **G** directly along the dike at the southern side was in spring and summer very eutrophic.
3. The more inland lying water bodies **H, I** and **K** show more advanced succession and are smaller, but appear to be also a little more mesotrophic. However they have still no true mesotrophic community. Also in these systems decaying of organic material is at least as important as production.
4. The (last year often and prolonged) flooded pojma is inhabited by species hardly living in the river, but rather common in the oxbow-lakes. Interchange between these systems can play a special role in this year.
5. The origin of the water seems to play hardly a role in the investigated water bodies: river and deep ground water had nearly the same composition (apart from phosphate); only pool **K** had more or less soft water, but no characteristic chironomid fauna.
6. Influence of the river seemed to be important in this sense that it caused higher trophy (through decaying material from pojma), sandy instead of organic silt bottom and other vegetation.
7. Within one water body more or less ground or rain water can cause locally great differences in chironomid fauna.
8. There are great differences between the fauna of spring and summer. Probably more predation in summer and more decaying plant material in spring are the main causes.
9. Taking into account that true river habitats and true mesotrophic water bodies were not included in the investigations the total diversity of the area is high.

4.2.5 Odonata(Dragonflies)

Dragonflies were observed at all sample sites, as well as at many additional sites in the study area. The breeding status of the species was established by collecting exuviae and larvae, as well as by looking for freshly emerged imagines (so called tenerals). In spring the densities of imagines were quantified by walking transects along the shore and by counting all dragonflies within short range of the observer. It was impossible to repeat these counts in autumn. The lowered water level had revealed broad marshy perimeters, through which walking was very difficult. The position of the shoreline had also greatly altered.

Number of species indentified
About 1200 larvae were collected, of which 62% could be attributed to 20 species. The remainder was too small to be identified. More than 440 exuviae were identified, also belonging to 20 species. In spring 6659 imagines of 15 species were counted along 4420 meters of transect. In total **43 species were recorded in the region**, of which 31 are known to reproduce. Eight additional species were so numerous that reproduction is almost certain. **34 species were found at or near the samples sites**. Table 11 provides the recorded status of each species at the sample sites, as well as in the river and bogs on either side of the studied gradient. Table 12 gives the data collected along the transects. Table 13 demonstrates that the species are distributed unevenly across the sample sites. These sites can be described as a gradient from the river to the bog. As we get farther from the river, the water bodies in the flood plain have

a progressively stronger influence of water that runs off the bogs and forest. Sample sites **A**, **B** and **C** are very close to the river, whilst **F** and **G** have a distinct run-off character. Sites **D** and **E** are somewhat intermediate and also differ by lying in a more forested landscape. Beyond the reach of the river is a zone of water bodies characterized by run-off water. This zone is represented by sites H, I and K. Beyond this zone lies the oligotrophic bog, which is dependent of rain water.
If the species-richness of the ten sample sites is compared, it appears that this is quite constant across them. An average of seventeen species was found associated with the water bodies at each site. The species-richness of five successive sites, **F** to **K**, lies just above that mean. Four sites, **D, E, I** and **K,** have adult densities above average for both Zygoptera and Anisoptera. **C, G** and **H** are runners-up, whilst numbers at **A, B** and **F** were relatively low. Thus sites with both high numbers of species as of individuals are **I** and **K,** with **G** and **H** as close followers. It can therefore be concluded that localities with the strongest run-off water influence are richest both in species as individuals.

Table 11
Status of the dragonfly species of the ten sample sites in the Pripyat itselfs (P) and the two sites south of Hvoenks, one in the center of the bog (B2) and one in the lagg-zone (B1)

The following symbols are used:
+ reproduction proved by larvae, exuviae or tenerals
o reproduction not proven
~ recorded in the vicinity, but not associated with water bodies in the sample site*

The number of symbols gives and indication of relative abundance:
1 recorded sporadically, not more than two or three individuals
2 present in numbers
3 relatively abundant, this estimate is based largely on the data from table 10
* not included in the species count

Locality	**P**	**A (4)**	**B (7)**	**C (2)**	**D (8)**	**E (9)**	**F (1)**	**G (3)**	**H (6)**	**I (10)**	**K (5)**	**B1**	**B2**
ZYGOPTERA													
Calopteryx splendens	++	O	O							O	~		
Lestes barbarus							~						
L. dryas										O	O		
L. sponsa	OO	++	++	++	+++	+++	++	++	++	++	++		
L. virens							OO		OO	O	OO		OO
Sympecma paedisca	O			O			O	OO					
Coenagrion armatum								OO	OO		OO		
C. hastulatum	~	~	~	O		++	++	++	+++	++	+++	++	OO
C. puella	OO	~	++	+	+++	+++	++	++	++	+++	++	++	OO
C. pulchellum	++	++	++	++	+++	++	++	++	+++	+++	+++	++	OO
Enallagma cyathigerum					OO								
Erythromma najas	++	+++	+++	++	++	++	++	+++		++	~	O	
Ischnura elegans	++	+++	OO	O	O	O	O	O	O				
ANISOPTERA													
Aeshna cyanea					~					O		++	++
A. grandis		+	+	O	++	++	++	++		++	++	+	
A. isosceles	~		~	O	++	++	++	O					
A. juncea							O		O		O	O	++
A. mixta	O	O	OO	OO	OO	OO	OO	OO	OO	OO	O	OO	~
A. subarctica													+
A. viridis						++	++	++	++		++		
Brachytron pratense	++	O	++	OO	++	++	O	++	O	O	OO	O	
Cordulia aenea	++	~	++	OO	++	++	++	++		++	++	~	
Epitheca bimaculata	OO	~	OO		++	+		O				~	

Somatochlora arctica												O	++
S. flavomaculata	+		+		++				++			++	+++
S. metallica			++		++								
Libellula depressa							~				~	~	~
L. quadrimaculata	++	OO	++	++	++	OO	++	++	++	++	++	++	++
Leucorrhinia pectoralis					+			++	O	++	++	OO	
L. rubicunda	~								OO	OO	++	++	++
Orthetrum cancellatum		~											
Sympetrum danae	O			O			OO	O	O		O		OOO
S. flaveolum	OO	~				O		O	OO	O			
S. sanguineum	OO	~	OO	OO	OO	OO	OO	OO	OO	OO	OO	OO	
S. vulgatum	OO	OO	OO	OO	OO	OO	++	OO	OO	O	OO		OO
Number of species	**19**	**10**	**16**	**16**	**17**	**17**	**19**	**21**	**19**	**18**	**19**	**15**	**13**

Table 12
Densities of imagines of Dragonflies at the ten sample sites

Densities indicated as zero refer to species present at the site as imago or exuviae during the count, but seen outside the transect.

Locality	**A (4)**	**B (7)**	**C (2)**	**D (8)**	**E (9)**	**F (1)**	**G (3)**	**H (6)**	**I (10)**	**K (5)**	**Total**
Length of transect (m)	**800**	**360**	**250**	**250**	**60**	**600**	**800**	**450**	**150**	**500**	**4420**
Date of count	**28 / 5**	**1 / 6**	**25 / 5**	**3 / 6**	**4 / 6**	**25 / 5**	**27 / 5**	**29 / 5**	**5 / 6**	**29 / 5**	
ZYGOPTERA											
Calopteryx splendens	0.13	0.56							2.00		**0.14**
Sympecma paedisca			1.20			0.33	0.38				**0.19**
Coenagrion armatum							0.25	0.89		1.00	**0.26**
C. hastulatum		0.00	0.40		33.33	3.50	2.13	62.22	33.33	70.00	**17.51**
C. puella		2.22	0.40	50.00	83.33	0.00	0.50	2.67	220.00	7.60	**13.46**
C. pulchellum	2.13	44.44	100.00	140.00	83.33	65.00	81.25	100.00	113.33	150.00	**76.71**
Erythromma najas	82.50	58.33	46.00	16.00	1.67	45.00	55.00		5.33		**41.33**
Ischnura elegans	0.13	0.83	0.40	0.80	1.67	0.33	0.13	0.00			**0.26**
ANISOPTERA											
Aeshna grandis				0.00	0.00				0.00		**0.00**
A. isosceles				1.20	0.00		0.00				**0.07**
Brachytron pratense	0.00	1.11	2.00	4.00	0.00	0.00	1.00	0.44	0.67	1.00	**0.83**
Cordulia aenea		0.00	1.60	1.20	0.00	0.00	0.50		5.33	0.00	**0.45**
Epitheca bimaculata		0.28		0.40			0.00				**0.05**
Somatochlora flavomaculata		0.00		0.00				0.00			**0.00**
S. metallica		0.00		0.00							**0.00**
Leucorrhinia pectoralis				0.00			0.88	0.44	0.67	2.80	**0.57**
L. rubicunda								2.89	0.00	4.60	**0.85**
Libellula quadrimaculata	5.00	0.56	4.40	4.80	16.67	4.17	5.63	4.22	13.33	6.40	**5.12**
Total Zygoptera	**84.88**	**106.39**	**148.40**	**206.80**	**203.33**	**114.17**	**139.63**	**165.78**	**374.00**	**228.60**	**149.86**
Total Anisoptera	**5.00**	**1.94**	**8.00**	**11.60**	**16.67**	**4.17**	**8.00**	**8.00**	**20.00**	**14.80**	**7.94**

Ecological groupings

Although the linear arrangement of the sample sites is an oversimplification of reality, the distribution of dragonfly species along the gradient can give clues about their ecological requirements and natural habitat preferences. By projecting the data from table 11 onto the described gradient a species grouping can be acquired (table 13). This is again an oversimplification of reality, but it can serve as a guideline for the discussion. The species at both ends of the gradient are typical of rivers and oligotrophic, acidic bogs respectively. It is the transition between these extremes that it is especially informative. Such transitions have almost vanished throughout the ranges of the species involved. These species now often occur under much more anthropogenic conditions and, having become rare, are of imminent conservation concern. *Sympecma paedisca*, *Coenagrion hastulatum*, *Aeshna viridis*, *Brachytron pratense*, *Epitheca bimaculata*, *Somatochlora flavomaculata*, *Leucorrhinia pectoralis* and *L. rubicunda* are examples of species that are red-listed in many (western) European countries (Dommanget 1987, De Knijf & Anselin 1996, Maibach & Meier 1987, Merritt et al 1996, Ott & Piper 1997, Wasscher 1999), but that are common in the transition between river and bog.

Table 13
Ecological species grouping of dragonflies recorded in study area

NN	Ecological groups	Property	Species	Number of species
1	**Wide-ranging species**	Species found along the entire range of sample sites and often in the river or bog as well.	*Lestes sponsa*, *Coenagrion puella*, *C. pulchellum*, *Aeshna grandis*, *A. mixta*, *Cordulia aenea*, *Somatochlora flavomaculata*, *Libellula quadrimaculata*, *Sympetrum danae*, *S. sanguineum*, *S. vulgatum*	11
2	**River species**	Species (largely) confined to the river.	*Calopteryx splendens*, *Platycnemis pennipes*, *Gomphus flavipes*	3
3	**Flood plain species**	Species with various ranges, but with their strongest representation in the flood plain.	*Erythromma najas*, *Ischnura elegans*, *Aeshna isosceles*, *Brachytron pratense*, *Epitheca bimaculata*, *Somatochlora metallica*	6
4	**Transition species**	Species found in the lagg-zone and the part of the flood plain with a strong run-off water influence.	*Coenagrion armatum*, *C. hastulatum*, *Aeshna viridis*, *Leucorrhinia pectoralis*	4
5	**Bog species**	Species found in the bog and, in part, the adjacent lagg-zone.	*Lestes virens*, *Aeshna cyanea*, *A. juncea*, *A. subarctica*, *Somatochlora arctica*, *Leucorrhinia rubicunda*	6
6	**Unassigned species**	Species with insufficient data or without a clear pattern.	*Lestes barbarus*, *L. dryas*, *Sympecma paedisca*, *Enallagma cyathigerum*, *Orthetrum cancellatum*, *Libellula depressa*, *Sympetrum flaveolum*	7

Wide-range species
These species were found throughout the transition from river to bog and some of them were found in the river and/or bog itself as well. The most wide ranging species is Libellula quadrimaculata, exuviae of which were found in both the river and the bog, as well as in all but two sample sites. It is the most

common anisopteran in the area in spring. The most abundant zygopteran in this season is *Coenagrion pulchellum*, which was very numerous at all studied sites and which only appears not to be reproducing in the bog. The most abundant species in autumn are *Lestes sponsa, Sympetrum sanguineum and S. vulgatum*. The most interesting species in this category is *Somatochlora flavomaculata*, which is among the rarest, most localized species in Western Europe (Schorr 1990). In Belarus larvae or exuviae were found in the river, oxbows, mesotrophic marshes and right up to the tiny depressions in Sphagnum bog. It was particularly abundant in the bog, where it swarmed with *Somatochlora arctica, Aeshna grandis, Cordulia aenea* and *Coenagrion pulchellum* are also species that appear to be ecologically more wide-ranging here than elsewhere in Europe.

River species
Of the pure river species, *only Calopteryx splendens* was observed during the fieldwork. Larvae of *Platycnemis pennipes* and *Gomphus flavipes* are mentioned from this part of the Pripyat by Moller Pillot (1997) and Buskens et al (1998). *Gomphus flavipes* is typical of large rivers (Suhling & MĴller 1996). *Platycnemis pennipes* is also found along small rivers and streams (Martens 1996). *Gomphus vulgatissimus* and *Ophiogomphus cecilia*, two other specialists of running water, are likely to be present too.

Floodplain species
The species in this category are most common in stagnant water bodies fed mainly by the river. Although *Coenagrion pulchellum* was the most abundant spring damselfly by far, *Erythromma najas* was dominant wherever the riparian vegetation was less well developed. Because the water was unusually high in the spring of 1999, many meadows were still flooded in early summer. Decaying vegetation in the shallows released a sudden burst of nutrients, allowing extensive mats of green algae to form. *Erythromma najas* was the only species that responded well to this wealth of available habitat. Fields of *Nuphar lutea* also harboured great densities of individuals. *Ischnura elegans* was present at the majority of localities, but always with only one or a few individuals. Only in the most eutrophic habitats, close to the river, were numbers higher and was reproduction proven. The only larvae were found in an oxbow that is permanently in contact with the river. It is interesting to note that the species is the dominant damselfly in the severely eutrophicated regions in Western Europe. Patrolling males of *Epitheca bimaculata* were seen exclusively above larger water bodies, such as oxbows and the river. In the study area, such habitats were only found in the flood plain. *Brachytron pratense* was common wherever the cover of trees, usually willows (*Salix*), was present. Two species occurring rather narrowly in the flood plain zone are *Aeshna isosceles* and *Somatochlora metallica*. The first appears to prefer larger water bodies with a well-developed marshy perimeter, while the second is often found in water bodies surrounded by woodland and with rather steep banks (Schorr 1990, Wildermuth & Knapp 1993). Within the study area, both habitats are more or less restricted to the sites where these species were found. Outside the flood plain, *Somatochlora metallica* was abundant along the Svinovod near Pererovskij Mlynok. The stream runs through forest here and is rather murky, with steep unvegetated banks.

Transition species
This category includes species that occur in the lagg-zone of the bog (i.e. in marshes fed principally by water that runs off the bog), but also in those water bodies that lie at the outer edge of the flood plain and have a strong influence of run-off water. This transitional zone is typified by the common occurrence of

Coenagrion hastulatum and *Leucorrhinia pectoralis*. Both species are known to require a varied, well-structured aquatic and riparian vegetation, a situation which is optimally present in this zone (Schorr 1990, Wildermuth 1993). The omnipresent *Coenagrion pulchellum* had its greatest abundance here. The presence of two very critical species in regard to vegetation-structure, illustrates the diverse nature of this section of the study area. *Coenagrion armatum* is one of the most severely endangered (and generally extirpated) species in Western Europe (Merritt et al 1996, Ott & Piper 1997, Wasscher 1999). This damselfly has a very specific habitat: half-open vegetation of helophytes standing in shallow water. The precise spacing of individual stems appears to be crucial. If this is too great then there is too little cover, whereas too dense stands inhibit the flight of the adults, which typically skim low above the surface, winding through the vegetation. At all seven Belarussian sites where the species was seen (two of which are outside the study area) these vegetation are formed by *Equisetum fluviatile* and *Carex rostrata*. Both plant species are restricted to the run-off zone. Similarly, the water plant *Stratiotes aloides* also appears to grow optimally in this zone, be it in the larger water bodies, such as oxbows. This correlates with the presence of *Aeshna viridis* in these waters, a species whose larvae are only found among the protective leaves of *Stratiotes aloides* (Schorr 1990). These plants also proved to be an important larval habitat for *Aeshna grandis*, *A. isosceles* and *Cordulia aenea*.

Bog species
This category includes species restricted to the bog such as *Aeshna juncea*, *A. subarctica* and *Somatochlora arctica*, as well as species that were also common in the adjoining lagg-zone, like *Lestes virens* and *Leucorrhinia rubicunda*. The larvae of *Aeshna subarctica* and *Somatochlora arctica* only live amongst *Sphagnum* moss (Schorr 1990), which explains this restriction. The latter species demonstrated mass-emergence at the end of May, with swarms of hundreds of individuals present in open areas in the forest. *Aeshna juncea* is generally only found in acidic waters, but several males were seen patrolling fields of *Stratiotes aloides* (sites **F, H** and **K**). The species is known to breed in this habitat sporadically in Germany (Schorr 1990). Perhaps this happens in Belarus as well. The presence of *Aeshna cyanea* in this group is strange, because it is known as a species occurring in a wide range of waters, often even those that attract no other dragonflies at all (Schorr 1990). All imagines observed in the study area were in a forested surrounding. Perhaps most other habitats are too open.

Unassigned species
These species were generally too rare to be fitted into a category, or the records of reproduction were few or lacking and providing no distinct pattern. *Sympecma paedisca* differs from all other species in the study area by overwintering not as egg or larvae, but as imagine (Jödicke 1997). The imagines seen in spring have ended their hibernation and are reproductively active. In this period low numbers were found at sites in the flood plain. In autumn imagines were seen more frequently and widespread, but none were associated with water. Instead they were found among bushes, tall herbs and grasses, apparently preparing for winter. No tenerals or exuviae were seen. A good population of *Enallagma cyathigerum* was found at site D and it is a mystery why this often abundant species was only seen here. A freshly emerged individual of *Orthetrum cancellatum* was found near site A. *Libellula depressa* was seen quite frequently, especially near habitation. This pioneer species probably inhabits the ponds in villages.

Missing data
Although the study area was visited twice, many details about the dragonfly fauna are still lacking. This is most obvious in the river species and the species that have the peak of their emergence late in summer. No species of the family Gomphidae, that includes the most typical rheophilous species, were recorded. The adults behave secretively and therefore exuviae are the best means to assess the presence of these species (Suhling & Müller 1996). Due to the high water level in spring most parts of the Pripyat were inaccessible. The small beaches that line the river and which are the most suitable emergence site were still largely under water. In autumn the flight season of these dragonflies had ended.
Two genera show a striking paucity of proof of reproduction, these being *Lestes* and *Sympetrum*. The species spend the winter as egg and have a one-year life-cycle: thus most larvae are still too small to be identified in spring, whilst in autumn all the adults have emerged and no larvae can be found at all. The most informative period for these species is the middle of summer, which was missed. Only the larvae of *Lestes sponsa* could easily be found in great numbers in spring. The autumn visit was also too late to find tenerals or exuviae of *Sympecma paedisca*, whilst identifiable larvae of that species can only be found shortly before emergence. *Coenagrion armatum* is a very early, low-density species, which explains why no proof of reproduction was found. This is a fairly immobile species with a high habitat-specificity. Therefore the gathered records are sufficient to understand the species' ecology in the area. As was explained earlier, no densities of adults were scored in autumn. Because the numbers were rather low and most species were widespread in this season and because the greatest diversity of interesting species is active in spring, it is not expected that this will seriously affect the conclusions of this study.

Conclusions
Dragonfly species were unevenly distributed along the studied gradient from river to bog. Eleven species were found in (almost) all sampled habitats. Seven species were insufficiently sampled to draw any conclusions. The remainder (nineteen species) could be attributed to four ecological groups: river species, flood plain species, bog species (some occurring in the adjacent lagg-zone) and transition species. The last category includes species occurring in the lagg-zone and the adjacent part of the flood plain. This part of the gradient is richest both in species and individual numbers. The four species restricted to this transitional zone are all particularly critical in respect to the vegetation structure of their habitat. The six species typical of the flood plain appear to be restricted to this zone because of the absence of large, eutrophic or open water bodies elsewhere in the gradient.

4.2.6 Coleoptera and Heteroptera

Number of species indentified
For the sampling both the scraper, hydrobiological net and plastic traps (in summer only) was used. By the way of five scything in every investigated localities multiplied on five it was possible to receive a representative data for comparable evaluation.
3207 individuals of water beetles (2140) and bugs (1067) were analyzed. It should be noted that the samples as a rule were collected during the whole period of field work (spring and summer seasons).
The **105 species of water beetles and bugs were found**. For the most part they were **Coleoptera - 82 species**: *Haliplidae* - 7, *Noteridae* - 2, *Dytiscidae* - 45,

Gyrinidae - 2, *Hydrophilidae* - 20, *Hydraenidae* - 4 and *Dryopoidae* - 2. The water bugs (**Heteroptera**) were represented by **23 species**: *Corixidae* - 9, *Notonectidae* - 2, *Pleidae* - 1, *Naucoridae* - 1, *Nepidae* - 2, *Gerridae* - 5, *Hydrometridae* - 1, *Mesoveliidae* - 1, *Veliidae* - 1.

Taxonomic and ecological groupings

In the tables are reckoned with imago from quantitative and qualitative samples:

+++ if the number of specimens of this taxon is more than 20 and higher than 20 % of the total number of water beetles and bugs,

++ if the number of specimens of this taxon is more than 5 and more than 5% of the total,

+ in other cases,

- absence.

For the evaluation of ecological preferences of investigated invertebrates the number-code was used by means of Limnofauna Europea (1978):

0 - freshwater in general, no specialization
1 - underground water, caves and psammon
2 - springs (krenon)
3 - brooks and small rivers (rhitron)
4 - rivers and large streams (potamon)
5 - lakes (standing water in general)
6 - temporary small waters, pools and ponds
8 - brackish water, estuaries
9 - inland salt water (salines, etc.)
10 - peat-bogs
13 - swamps, moist soil.

Results and discussion

COLEOPTERA

Analysing 2140 individuals of water beetles we were able to identify the 82 species.

Family Haliplidae (spring, summer)

Species	code	A	B	C	D	E	F	G	H	I	K
Haliplus fluviatilis	4,3	+++	++	++	+	+	-	-	-	-	-
Peltodytes caesus	5,6	+	+	+	+	++	+	-	-	+	-
Haliplus ruficollis	5,6	++	+	+++	+++	++	++	++	++	+	++
Haliplus fulvicollis	10	-	-	-	-	-	-	-	++	-	-
Haliplus furcatus	6,10	-	-	-	-	-	-	-	+	-	-

The 264 individuals of Haliplidae were collected belonging to 7 species. Among them the Haliplus ruficollis dominates – 65,5% (of the total number of Haliplidae), which prefers a stagnant water-bodies in a range from lakes to temporary pools. This species is recorded in all investigated localities. The second subdominant species was Haliplus fluviatilis (19,7%) preferring rivers and streams. The relative number of Haliplus fluviatilis decreased in gradient from localities **A** to **E**, that is quite in accordance with their ecological preference. The specific conditions of the locality **H** conditioned the occurrence of *Haliplus fulvicollis* and *Haliplus furcatus* usually found in the peat-bogs (Limnofauna Europea,1978). These species are rare in the countries of the former USSR (Zaitsev, 1953). *The Haliplus confinis* (□ and **I**) and *Haliplus flavicollis* (**I**) were found in a little number typical for stagnant brackish water

as well (Zaitsev, 1953). *Haliplus confinis* is more common for the glacial lakes in the north of Belarus.
It should be noted that at present 17 species of Haliplidae are known in Belarus, 11 of them were found in floodplain zones.

Family Notoridae (spring, summer)

Species	code	A	B	C	D	E	F	G	H	I	K
Noterus clavicornis	5,6	-	+	-	-	-	+	-	-	-	+
Noterus crassicornis	5,6	-	-	++	-	-	++	++	+++	+	+++

169 individuals were collected in spring and only 21 in summer. In spring samplings the Noterus crassicornis was a dominant species among all water beetles - 26,2%. It is one of the most common species practically in all types of reservoirs in Belarus. In fact the species of a genus Noterus were especially numerous in spring pools including a temporary reservoirs. It is difficult to explain why the given species in spring samplings were most numerous in the localities **H** and **K** and on the contrary they were absent practically in the pools from **A** up to **E**. Probably it is connected with the influence of a stability of the water level in these reservoirs. This statement can be proved by the fact that in the summer samplings 21 individuals of Noterus crassicornis were caught in the pool **F, H,** where the level of water in summer has changed very little.
Noterus clavicornis is rather rare species in Belarus and to the North from Polesye area practically is not found.

Family Dityscidae (spring, summer)

Species	code	A	B	C	D	E	F	G	H	I	K
Hygrotus versicolor	5,4	-	+++	+++	+	++	++	+	+	+	+
Ilybius fenestratus	5*	++	++	+++	++	+	+++	++	-	+	+
Cybister lateralimarginalis	5*	+	-	+	-	++	++	+++	-	+	+
Laccophilus minutus	5,6	+	+	++	-	-	++	-	+	-	+
Porhydrus lineatus	5,6	+	++	+++	+++	+++	+++	++	++	+	+++
Acilius canaliculatus	10	-	-	+	+	+	+	++	++	++	+++
Graptodytes bilineatus	10	-	-	-	-	-	+	-	-	+	-
Hydroporus tristis	5,10	-	-	-	-	-	-	-	+	-	-
Graptodytes granularis	10	-	-	-	-	-	-	-	+	-	+

* by the data Galewski and Tranda (1978), as in (Limnofauna Europea, 1978) information was absent.

During the spring and summer season 1144 individuals of aquatic beetles were collected belonging to 45 species. The most of them, 34 species, prefer a wide range of stagnant waters - from lakes to temporary pools. Reobiontic species were not found. The only reophilic species found was Hygrotus versicolor. This species was subdominant - 19,5% (of the total number of Dytiscidae). In summer the relative number of H. versicolor decreased up to 6,4 % what means in fact a worsening of reophilic conditions in water-bodies. It is interesting to note the tendency of decreasing the relative amount of *Hygrotus versicolor* on a gradient from **B** to **K** that coincides with reduction of connection of the investigated reservoirs with the river.
A number of species preferring the peat-bogs (*Acilius canaliculatus, Hydroporus tristis*, *H. erythrocephalus, Graptodytes granularis and G. bilineatus*) were as a rule found in the localities **H** and **K**. Interestingly that the relative number of *A. canaliculatus* increased regularly from the **C** to **K** locality. The second species with regard to abundance (as subdominant) was *Porhydrus lineatus* - 27,6 % of the total number of Dytiscidae living in various stagnant waters from lakes to pools.
A number of species were not included in the table because they were caught in insignificant amount.

The species *Hygrotus quinquelineatus* (**B**) was of the great interest in respect of faunistic description. It is a rather rare species in the fauna of Belarus and it was only its second finding. Earlier one individual of this species also was found in the territory of National Park "Pripyatski" (Zacharenko, Moroz, 1988). H. quinquelineatus is distributed in the Northern, Eastern and Central Europe and Siberia (Zaitsev, 1953; Lafer, 1989). In Poland this species is not found out yet (Galewski, Tranda, 1978). It is necessary also to note that Graphoderes bilineatus is the species included in the European Red List of Plants and Animals. This species is not rare in the east part of Belarussian Polesye. It was found in the Poleski Radioecological Reservation (Choyniki, Narovlia) and reserve "Olmanskie bolota" too.
112 species of Dytiscidae are registered in Belarus, among them 58 are found in river floodplains.

Family Gyrinidae (spring, summer)

Species	code	A	B	C	D	E	F	G	H	I	K
Gyrinus marinus	0*,5,4	+	++	++	++	+++	++	+++	-	-	+
Gyrinus natator	0*	-	-	+	-	-	-	+	-	-	-

* by the data Zaitsev (1953).

During spring and summer sampling seasons 303 specimens *Gyrinus marinus* were collected. Only 2 specimens *G. natator* were caught. According to Zaitsev (1953) *G. marinus* prefers standing water-bodies with cool water and rivers. To our opinion only river floodplains are the most preferable type of a reservoir for this species.
Now in Belarus 8 species are registered, from which 6 are found in floodplains.

Family Hydrophilidae (spring, summer)

Species	code	A	B	C	D	E	F	G	H	I	K
Hydrophilus aterrimus	5,6	+	-	+	-	+	+	+	+	+	+
Helochares obscurus	5,6	+	-	+	+	-	++	-	++	+	+
Enochrus affinis	5,6	-	+	-	-	-	++	+	++	+	++
Hydrochus carinatus	5,6	-	-	-	-	-	+	+	+	+	+
Enochrus quadripunctatus	5,6,8	-	+	-	-	-	+	-	-	-	-
Hydrochus brevis	10	-	-	-	-	-	+	-	+	-	-
Enochrus coarctatus	10	-	-	-	-	-	-	-	+	-	+

155 specimens of Hydrophilidae were collected in spring and summer, 20 species are identified. All species prefer eutrophic stagnant waters (Hansen, 1987).
The dominant species were *Enochrus affinis* - 20,7% (of the total number of Hydrophilidae) and *Helochares obscurus* (20,0 %), subdominant - *Hydrophilus aterrimus* (13,6%). These species also prefer eutrophic stagnant waters with rich water vegetation. Two species (*Enochrus coarctatus* and *Hydrochus brevis*) preferring peat-bogs were found in localities **F, H** and **K**. In pools **E** and **G** no specimens of a given family were found in spring samplings. Some of the found species were not included in the table (*Helophorus granularis, H. griseus, Hydrochus carinatus, Hydrochus ignicollis*, *Spercheus emarginatus, Coelostoma orbiculare, Hydrochara caraboides, Hydrobius fuscipes, Anacaena lutescens, Laccobius biguttatus, L. minutus, Berosus luridis, B. signaticollis*,) as they were caught in insufficient number.
Hydrochus ignicollis (**D**) is enough rare species in the fauna of Belarus. A range of *H. ignicollis* is limited by Europe, but data available for its distribution are very scarce (Hansen, 1987).

Species structure and the distribution of Hydrophilidae in Belarus is still investigated insufficiently. Now 73 species are known, among them 13 only are found in floodplains.

Family Hydraenidae (summer)

Species	code	A	B	C	D	E	F	G	H	I	K
Ochthebius minimus	5,6,8	-	+	-	-	-	+	-	+	-	-
Hydraena palustris	5,6	-	-	-	-	-	+	+	++	-	-
Limnebius atomus	5,6	+	-	-	-	-	++	+	++	-	-
Limnebius truncatulus	5,6	-	-	-	-	-	+	+	++	-	-

62 specimens were collected in summer only. All of 4 species prefer various types of stagnant waters (Limnofauna Europea, 1978). Practically all beetles were found in floodplain **H** (station 1) and **F** (station 4). Probably, it can be connected with the hydrological regime in these places. Ochthebius minimus and Limnebius truncatulus are found frequently in springs (krenon) of Belarus. Limnebius atomus was a dominant species - 46,8 % (of the total number of Hydraenidae). Now it is known only from National Parks "Pripyatski" and "Belowezhskaya Pushcha" (in spring). The distribution of this species is ranged by southern and central Europe (Hansen, 1987), Siberia (Jäch, 1993).
4 species of Hydraenidae are registered now in Belarus, between them 3 only are found in floodplains.

Family Dryopidae (spring)

Species	code	A	B	C	D	E	F	G	H	I	K
Dryops auriculatus	4,13	+	+	+	-	-	+	+	+	-	+
Dryops griseus	4	-	-	-	-	-	+	+	-	-	-

The beetles of this family were collected only in spring sampling season - 20 specimens. *Dryops auriculatus* and *D. griseus* were met in banks of the large rivers and very common in spring brooks (Limnofauna Europea, 1978; Wiezlak, 1986). In Belarus we also frequently found them in spring temporary pools.
3 species of *Dryops* are known in Belarus now.

HETEROPTERA

In total 1067 specimens of the water bugs were collected and 23 species are identified.

Family Coroxidae (spring, summer)

Species	code	A	B	C	D	E	F	G	H	I	K
Callicorixa praeusta	3,4,5	+	-	-	-	+	+	-	-	-	-
Sigara falleni	3,5,6,8	-	-	++	+	++	+	+	-	-	
Ñymatia coleoptrata	0,6	++	++	++	++	+++	+++	++	-	+	-
Sigara striata	0	++	+	+++	+	++	+++	++	+	+	+
Hesperocorixa linnaei	5,6	-	-	+	+	-	+	-	-	-	++
Sigara semistriata	0,10	-	++	+	+	+	+	+	-	+	-
Corixa dentipes	5,6,10	-	-	-	-	-	-	+	-	+	-

330 specimens of Corixidae were collected and 9 species identified. All found species in more or less degree prefer various stagnant water-bodies (Wroblewski, 1980). A domination of two species were very typical - *Cymatia coleoptrata* (42,7 % of the total number of Corixidae) and *Sigara striata* (34,2 %).These species usually prefer waters with sandy bottom.
In pools **G** and **I** two species (*Sigara semistriata* and *Corixa dentipes*) were found which usually prefer peat-bogs. A low number of species belonging to

family Corixidae was revealed in the localities **H** and **K**. Probably, it was connected with a pressing of predatory species of a larvae of Coleoptera and Odonata. Two species (*Cymatia bonsdorfii* and *Sigara distincta*) were not included into the table as they were collected in a low number.
In of the total number of a finding of *Cymatia bonsdorfii* ("F") is of interest. This species is widespread in a forest zone of Europe, in Caucasus, Siberia and in the east up to Mongolia (Kerzner, Jaczewski,1964; Jaczewski, 1938; Jansson, 1986; Wroblewski, 1980).This species is very rare in Belarus. It prefers standing reservoirs with rather clean water with numerous water plants (*Chara* sp., *Fontinalis* sp., *Elodea* sp., *Potamogeton* sp.). That was the only a second finding in Belarus after 1938 (Jaczewski, 1938).
It is very surprising the absence in our samplings the species of a genus *Micronecta*, living in large stagnant water-bodies and rivers with sandy bottom. Now it is known 19 species of family Corixidae in Belarus (Lukashuk, 1997). The distribution of these species practically was not well studied.

Familiy Notonectidae, Naucoridae, Pleidae, Nepidae (spring, summer)

Species	code	A	B	C	D	E	F	G	H	I	K
Ilyocoris cimicoides	3,5,6	+	+	+++	++	++	+++	++	++	+++	+++
Nepa cinerea	3,5,6	+	+	+	++	+	-	-	+	-	+
Plea minutissima	0	+++	++	+++	++	+++	+++	+	+++	+	++
Notonecta glauca	0	+	-	++	++	++	+++	++	+	+	++
Ranatra linearis	0,10	++	++	+	+	+	++	++	-	++	+
Notonecta lutea	5,6,10	-	-	+	+	+	+	++	+	++	++

590 specimens were collected and 6 species identified belonging to families Notonectidae, Naucoridae, Pleidae and Nepidae. These are most common species among water bugs found in Belarus. It is connected probably with that the majority of them have not rigid specialization and inhabit practically all types of running and stagnant waters.
In investigated pools *Plea minutissima* (39,5 % of the total number of these families) and *Ilyocoris cimicoides* (30,5 %) were prevalent species. *Notonecta lutea* is of interest as species included in the Red Book of Belarus. This species preferring reservoirs with peat bottom was especially numerous in pools **G, I** and **K**.
6 species of these families are known in Belarus (Lukashuk, 1997).

Familiy Gerridae, Hydrometridae, Mesoveliidae, Veliidae (spring, summer)

Species	code	A	B	C	D	E	F	G	H	I	K
Gerris paludum	3,4,5	-	++	+	++	-	-	-	-	-	-
Microvelia reticulata	3,5,6	+	-	-	-	-	++	+	+	+	++
Gerris argentatus	(5),6	+	-	-	+	+	+	-	-	-	-
Mesovelia furcata	5,6	-	-	+	+	++	-	-	-	-	+
Gerris lacustris	5,6	-	-	+	+	+	+	-	-	-	-
Gerris odontogaster	5,6,10	+	+	+	+	++	+	++	-	+	++
Hydrometra gracilenta	13	-	-	-	-	-	-	-	+	-	+

147 specimens were collected and 8 species were identified during spring and summer sampling season. The most of species of these families preferred the various stagnant water-bodies (Limnofauna Europea, 1978). *Microvelia reticulata* inhabiting both running and stagnant waters is the prevalent species (26,5 % of a number of this group) and *Gerris odontogaster* - 25,9%. *G. odontogaster* was revealed in 9 of 10 investigated localities. This species is more common in various stagnant reservoirs including those with peat bottom (peat-bogs).

The subdominant species there was *Gerris paludum* (17,0%). *Gerris paludum* preferring running waters and lakes, was revealed only in localities **B, C** and **D**. In our opinion these pools have connected with the River Pripyat more closely. *Limnoporus rufoscutellatus* was not included to the table as it was caught in insufficient number and has no certain ecobiotic preference (Limnofauna Europea, 1978).
12 species of these families are known in Belarus (Lukashuk, 1997).

Spring-summer differences of Coleoptera, Heteroptera
In spring and summer 844 and 2363 specimens of water beetles and bugs were collected belonging to 85 and 66 species respectively. However a number of species decreased from spring summer only in localities **A** and **B**.

Species

Sampling	A	B	C	D	E	F	G	H	I	K
Spring	19	26	24	14	14	31	12	31	18	31
Summer	16	17	27	25	27	44	31	36	25	37
Total	**28**	**35**	**41**	**31**	**32**	**61**	**38**	**54**	**35**	**59**

Specimens

Sampling	A	B	C	D	E	F	G	H	I	K
Spring	52	97	136	43	27	117	42	138	47	145
Summer	109	88	388	170	299	424	306	245	84	250
Total	**161**	**185**	**524**	**213**	**326**	**541**	**348**	**383**	**131**	**395**

The oxbow **F** was characterized by the highest number of collected bugs and beetles and their species as well. Evidently this old bed seems to be intermediate in sense of ecological conditions among studied two groups ("reophilic" and "stagnophilic") of water-bodies.
In summer the absolute and relative amount of caught biggest and most active predators belonging to genera *Dytiscus*, *Cybister*, *Acilius*, *Graphoderes*, *Hydaticus*, *Ilybius*, *Colymbetes*, *Rhantus*, *Notonecta*, *Ilyocoris* increased significantly – 686 specimens (29,0% from Coleoptera and Heteroptera) if compare to spring – 60 specimens (7,1%).

Role of oxbows in the faunistic diversity.
Earlier we have done pilot studies of the fauna of aquatic beetles in the National Park «Pripyatsky» in the range: the Pripyat River- land-improvement channels – big stagnant water-bodies (old river beds, flood-plain lakes) – small stagnant water-bodies (ponds, temporal pools)- bogs and etc.
It was established that oxbows of the Pripyat River play an important role in forming of the beetle fauna of the National Park (Moroz, Ryndevich, 1999). The 51 species is registered what correspond to 59,3% of all aquatic Adephaga found there. Water-bodies of this type hold a second place by the water beetle species abundance in a given territory.
Also we have studied in a similar way upper reaches of the Neman River in surroundings of the town Stolbtsy (Moroz, 2000). In old beds 59 species of aquatic Adephaga were found what comprises 77,6% of a total number of species recorded there.
So results of our studies allow to conclude that in old river beds (Neman and Pripyat) of Belarus a main body of a faunistic complex of water beetles for adjoining territories is concentrated. Old river beds are important system-forming elements of the whole natural complex.
The fauna and ecological preferences of aquatic bugs in Belarus was not studied practically.

Conclusions
The 105 species of water beetles and bugs were found. For the most part they were Coleoptera - 82 species: Haliplidae - 7, Noteridae - 2, Dytiscidae - 45, Gyrinidae - 2, Hydrophilidae - 20, Hydraenidae - 4 and Dryopoidae - 2. The water bugs (Heteroptera) were represented by 23 species: Corixidae - 9, Notonectidae - 2, Pleidae - 1, Naucoridae - 1, Nepidae - 2, Gerridae - 5, Hydrometridae - 1, Mesoveliidae - 1, Veliidae - 1.
The tendency of decreasing of the relative number of reophilic species *Haliplus fluviatilis* (Haliplidae), *Hygrotus versicolor* (Dytiscidae)and *Gerris paludum* (Gerridae) is shown in gradient of investigated pools from **A** to **K**.
The species of water beetles: *Haliplus fulvicollis, Haliplus furcatus, Hydroporus tristis, H. erythrocephalus, Graptodytes granularis, G. bilineatus, Acilius canaliculatus, Enochrus coarctatus, Hydrochus brevis* and bugs: *Notonecta lutea, Gerris odontogaster* typical for peat-bog were found mainly in the localities **H** and **E**.
Hydraenidae - *Ochthebius minimus, Limnebius truncatulus* and *Limnebius atomus* were found in **H** (station 1) and **F** (station 4). Moreover these species are common in spring ecosystems of Belarus. It may be connected with the certain influence of ground water in this localities.
The wide variety of favourable habitats in investigated floodplains result in occurrence of a rich fauna of water beetles and bugs. Enough rare species in the fauna of Belarus were found among them such as *Hygrotus quinquelineatus, Hydrochus ignicollis Motschylsky, Cymatia bonsdorfii. Graphoderes bilineatus* and *Notonecta lutea* are under protection in some European countries (Red List).
It is assumed that the oxbow **F** is intermediate among studied water-bodies in sense of ecological conditions (an influence of the Pripyat River).
In summer a number of big predator water beetle and bug species belonging to genera Dytiscus, Cybister, Acilius, Graphoderes, Hydaticus, Ilybius, Colymbetes, Rhantus, Notonecta, Ilyocoris increases – 686 specimens (29,0% from Coleoptera, Heteroptera) if compare to spring – 60 specimens only (7,1%).
Former river-beds are important system-forming elements of a whole natural complex in a range: a river (Pripyat, Neman) – land-improvement channels – big stagnant waters (old river beds, flood plain lakes) – small stagnant waters (ponds, temporal pools) – bogs and etc. In them a main body of a water beetle fauna is concentrated.

4.2.7 Larvae of the Trichoptera and Ephemeroptera

Number of species indentified
For studying Trichoptera and Ephemeroptera no special methods have been used. In the tables mainly larvae from the quantitative samples are mentioned.

Taxanomic and ecological groupings
In these tables the real found numbers of larvae are given.
The sequence of taxa is according to alphabet.
L = larva
P = pupa
c = case
( ) = in qualitative sample

Spring

	A1	A2	A3	B1	B2	C1	C2	D	E1	E2	F1	F2	F3	F4	G1	G2	G3	H1	H2	H3	I	K1	K2	K3
Limnephilus flavicornis L										1														
Limnephilus ? flavicornis P		7	4	1c	1	6	7		1c	1		1c				4		1c						
Limnephilus other species				1	1			4				?1c												
Neureclipsis bimaculata	(1)																							
Oecetis furva											1	?1c									1			
Phryganeidae								1																
Triaenodes bicolor											5	6	1	1							5		11	2

	A1	A2	A3	B1	B2	C1	C2	D	E1	E2	F1	F2	F3	F4	G1	G2	G3	H1	H2	H3	I	K1	K2	K3
Caenis	2		1			1		1	1		1	7	1				1	1			1		1	
Cloeon dipterum	4		2			8			1		14	9	4	20		2	2			7	3	1	1	1

All species of Trichoptera and Ephemeroptera found in these samples are common species, which are able to live in very eutrophic water. All these species are characteristic for stagnant water except only one: *Neureclipsis bimaculata* is a typical rheophilic species, living in rivers. One specimen of this species was found in a qualitative sample on a place of point A, where the river water was flowing into the pojma.

Summer

	A1	A2	B1	B2	C1	C2	D1	D2	E1	E2	F1	F4	G1	G2	H1	H2	I	K1	K3
cf. Agrypnia picta											1								
Athripsodes aterrimus					1	1													
Holocentropus dubius							1		1										
Holocentropus picicornis															1				
Phryganea bipunctata									2										
Phryganea grandis											1								
Triaenodes bicolor					1	3		1	13	1	7	7	3					7	1
Tricholeiochiton fagesii																			1c

	A1	A2	B1	B2	C1	C2	D1	D2	E1	E2	F1	F4	G1	G2	H1	H2	I	K1	K3
Caenis		13	1				5	3	1	2	1		1	8		19	1	2	11
Cloeon dipterum		8	5	56	280	170	21	49	135	64	86	36	205	153	8	19	36	46	22

In August and September no larvae of rheophilic species have been found. *Cloeon dipterum* was much more common than in spring. This is a normal situation, because of the fact that in winter many larvae are lost. Most of the Trichoptera species are more common in mesotrophic conditions. This is especially the case for *Holocentropus dubius*, a species in the Netherlands nearly confined to acid or mesotrophic water bodies (Verdonschot e.a.,1992; Steenbergen, 1993). However the numbers met with in our samples are really low. If mesotrophic water bodies had been included more species and larger populations of Trichoptera would have been found.

4.2.8 Syphidae (Hoverflies)

Methods

At every samplesite, hoverflies were sampled in two different ways. The first method consisted of walking around at the site, while observing hoverflies by sight and catching them with a net. After a while, when no more additional species were found, the net was swept through the vegetation along the water. This method is especially suitable for collecting small or little mobile species.

The ‘sweeping’ was done after the ‘observing’ because sweeping is more or less disturbing for the habitat.
Collected specimens are preserved in the collection of M. Reemer (the Netherlands).

Number of species indentified
At the samplesites, **53 species of Syrphidae were observed** (Table 14). The species are divided into four groups, according to their larval feeding-habits: predacious species (PR) (most of which live on plants), phytophagous species (PH) (living in parts of plants), saprophagous (SA) (living in dead wood etc.) and aquatic or semi-aquatic (AQ). This division is clear for many species, but somewhat artificial for some. In particular, the distinction between saprophagous and aquatic species is not always straightforward. Strictly, every ‘aquatic’ species in this table should be considered as saprophagous, because the larvae filter micro-organisms from their surroundings. Some species, however, obtain these micro-organisms from muddy water (*Eristalis*-species), while others live under tree bark (*Xylota*-species). A relatively large proportion of the aquatic species spends the larval stages in decaying matter at the edge of marshes, pools etc.
23 species are predacious, 21 species have aquatic larvae, six species are saprophagous and two are phytophagous.

Table 14
Hoverfly species observed at the sample sites (total number of species = 53)

	4	**7**	**2**	**8**	**9**	**1**	**3**	**6**	**10**	**5**	**Larvae**
Xanthogramma pedissequum			1								PR
Episyrphus balteatus			1								PR
Syrphus ribesii	4								1	2	PR
S. vitripennis			1								PR
Epistrophe eligans										2	PR
E. nitidicollis								1			PR
Chrysotoxum festivum	1										PR
Eupeodes corollae	1		2			1		1	1		PR
E. latifasciatus			2			1			1		PR
E. nielseni										1	PR
S. scripta	3	3	1		2	20	1		x	2	PR
S. taeniata		2								1	PR
Platycheirus angustatus			1								PR
P. clypeatus	12	12		5	4	15	3	6		6	PR
*P. immarginatus / perpallidus **	1			3		x	3		x	4	PR
P. peltatus (?)				2		1			1		PR
Pyrophaena granditarsa							1				PR
Melanostoma mellinum	4								2	1	PR
Pipizella varipes									1	1	PR
P. spec.			1			1	1				PR
Trichopsomyia flavitarse											PR
Cheilosia mutabilis								1			PH
Chrysogaster aerosa								3		2	AQ
Neoascia tenur										4	AQ
Eumerus sogdianus / strigatus			1			1					PH
Microdon eggeri				1						1	PR
Xylota. florum					1						SA
X. sylvarum				2					1		SA
Chalcosyrphus nemorum					1	1		1	2	1	SA
Syritta pipiens			3			5			x	15	SA
Temnostoma apiforme									1		SA

T. vespiforme				1							SA
Helophilus hybridus	2			2				1	x	5	AQ
H. pendulus										1	AQ
H. trivittatus	2	1	2	1					x	15	AQ
Anasimyia contracta									1		AQ
A. interpuncta			1				1		1		AQ
A. lineata	1				15		2	x	1	80	AQ
A. lunulata										1	AQ
A. transfuga									1	1	AQ
Parhelophilus consimilis				1					1	1	AQ
P. versicolor										5	AQ
M. tricolor				2							SA
Eristalis abusiva	3	2	1			4	2			1	AQ
E. arbustorum									1	2	AQ
E. horticola										2	AQ
E. intricaria		3									AQ
E. nemorum			1								AQ
E. picea	1							1			AQ
E. vitripennis				1							AQ
Eristalinus sepulchralis	20	1	1	2	2	1	7		x	10	AQ
Myathropa florea			1					1		2	AQ
Tot. species	13	7	16	12	6	12	9	10	21	27	

*: The identity of these specimens is not clear yet. Possibly both species are collected.

Taxonomic and ecological groupings

Species associated with aquatic habitats

26 species associated with aquatic habitats are considered (Table 15). These species have been divided into two groups. Species group 1 contains the species with (semi-)aquatic larvae (21 species). These are the aquatic species in table 12. The larvae of most of these species live in mud or decaying matter at the margins of bodies of water.

Species group 2 contains predacious species which are associated with swamps and marshes, but do not have an aquatic larval habitat (5 species). The larvae of these species feed on aphids. Often these Syrphid-species are specialised on aphid-species which are specialised on certain plant-species. For instance, the larvae of *Platycheirus immarginatus* and *P. perpallidus* only feed on aphids of *Carex*-species in wetlands.

Table 15
Number of hoverfly species associated with aquatic habitats observed at the sample sites. X = present in unkmown numbers

a) Site	4	7	2	8	9	1	3	6	10	5	Eco
Species group 1											
Chrysogaster aerosa								3		2	**C**
N. tenur										4	**C**
S. silentis				1		1				1	**C**
Helophilus hybridus	2			3		1		3	x	5	**C**
H. pendulus					1	2				5	**E**
H. trivittatus	3	1	2	1		10			x	15	**E**
Anasimyia contracta									1		**C**
A. interpuncta			1				1		1		**C**
A. lineata	1				15		2	x	1	80	**E**
A. lunulata										1	**C**

A. transfuga			1						1	1	**C**
Parhelophilus consimilis				1					1	1	**C**
P. versicolor										5	**C**
Eristalis abusiva	3	2	1		2	1	2			1	**E**
E. arbustorum					4	1	1	1	1	2	**E**
E. horticola										2	**E**
E. intricaria		3		1	1						**E**
E. nemorum			1			2					**E**
E. picea	1							1			**C**
E. tenax					7	10		1		1	**E**
E. vitripennis				1				1			**C**
Species group 2											
Platycheirus angustatus			1								**E**
P. clypeatus	12	12		5	4	15	3	6		6	**E**
P. immarginatus / perpallidus	1			3		x	3		x	4	**C**
Pyrophaena granditarsa	4		5		2	4	5	1	3		**C**
P. rosarum			1			1		1	1	2	**C**
Tot. Species	**7**	**4**	**8**	**8**	**9**	**13**	**7**	**11**	**12**	**19**	

In the last column of table 15, a rough division is made between eurytopic and more or less critical species. The letter E indicates common species without a clear preference for a certain type of habitat, whereas the C indicates more critical species.
The samplesites have been grouped in four clusters, given in table 16. In table 17, the number of species per cluster of samplesites is given. For each cluster, this number is divided into eurytopic species and critical species.

Table 16
Clusters of sample sites from A to K

Cluster	*Samplesite*	*Description*
1	4, 7, 2	Inner flood plains near Hvoyensk and Pererov.
2	8, 9	Wooded flood plains near Hlupin.
3	1, 3	Outer flood plains near Hvoyensk and Pererov.
4	6, 10, 5	Sites out of the flood plains near Hvoyensk.

Table 17
Distributions of numbers of eurytopic and critical species over the clusters of sample sites

Cluster	*# aquatic spec.*	*# eurytopic aq.*	*# critical aq.*
1	14	7	7
2	15	8	6
3	15	8	6
4	24	8	15

Most of the species found near or in the flood plains are considered eurytopic and common, while a larger proportion of the species on sites further from the river is confined to particular habitats and (therefore) less common.

Species associated with non-aquatic habitats
In table 18 the numbers of Syrphid-species with non-aquatic larval habitats are given per sample site. A distinction is made between species with predacious larvae (feeding on aphids) and species associated with dead wood.

Table 18
Number of predacious and dead wood dwelling species per sample site

Site	4	7	2	8	9	1	3	6	10	5
Predators *	7	3	8	3	2	7	5	3	8	9
Dead. wood	0	0	1	2	3	3	0	2	5	3
Phytophagous	0	0	1	0	0	1	0	1	0	0

*: the five predacious species already considered in table 1 are excluded

In species with predacious larvae, no clear tendency is visible. The number of species associated with dead wood seems to increase with decreasing influence of the river. This would not seem to be surprising, considering the fact that the area covered by forest near the river is relatively small.
A surprisingly low number (two) of phytophagous species was found at the samplesites. Only single specimens were found.

Conclusions
The observed numbers of individual species are too low to draw any conclusions concerning particular species. However, the overall view is interesting. The data seem to suggest the following (very preliminary!) conclusions:

- The number of species associated with aquatic habitats increases with decreasing influence of the river;
- Most of the species associated with aquatic habitats found in or near the flood plains are eurytopic and common;
- A relatively large part of the species associated with aquatic habitats found out of the flood plains is confined to particular habitats and less common;
- The data do not reveal a relation between the number of predacious species and the influence of the river;
- Species-richness of species associated with dead wood seems to increase with decreasing influence of the river.

The number of eurytopic species is constant with changing influence of the river, while the number of critical species seems to be twice as high on sites out of the flood plains. Possible explanations for the larger number of critical species on sites out of the flood plain might - for instance - be found in the lower extent of hydro- and morphodynamics (higher stability), the less eutrophic character of the water, etc. The larvae or pupae of many Syrphid-species hibernate in soil or litter. Probably they are not capable of surviving long periods of flooding.
Very little is known about the preferences of Syrphidae in relation to hydrochemical properties of their larval habitats, so it is not yet possible to use the species as indicators for certain hydrochemical parameters.

General notes on the Syrphid-fauna of the Pripyat-plains
The Pripyat-plains and their surroundings form a very interesting habitat for Syrphid-flies. Some of the species found, are considered to be rare and threatened on a European level (Speight 1999). Examples of these species are Anasimyia lunulata, Mallota tricolor, M. megilliiformis and Eristalis cryptarum. (Some of these species were only recorded on sites not included in the research-project for RIZA.)
A very interesting and valuable type of habitat is the hardwood alluvial forest, as visited near Hlupin (site 8). This habitat has rapidly disappeared from large parts of Europe during the 20th century, which may explain the rarity of some of the species occurring here (i.e. *Mallota tricolor*).

4.2.9 Megaloptera
Only once a larva of *Sialis lutaria* has been found, in sample D2, 4th of September. It is not clear, why this species is so rare, though the specific habitat, muddy bottoms, are very common.

4.2.10 Hydrachnellae

There were 38 samples identified. 22 samples were sampled in spring and 16 ones in summer. In total 48 species was found for both seasons.

SPRING	A1	A2	A3	B1	B2	C1	C2	D1	E1	E2	F1	F2	F3	F4	G1	G2	G3	H1	H2	H3	I	K1	K2	K3
Hydrachnellae																								
Arrenurus bifidicodulus																1		1		6				
Arrenurus buccinator													2											
Arrenurus compactus							1																	
Arrenurus globator									1			1								2	3			
Arrenurus spec. 1	1									2		1			1						1			
Arrenurus spec?																				2				
Arrenurus spec.																					3			
Arrenurus maculator																					4			
Arrenurus stecki																					1			
Arrenurus 'near' truncatellus																				1				
Arrenurus truncatellus																1			1	3				
Eylais infundibulifera												1												
Eylais extendens																								
Eylais mutila						1																		
Eylais spec.				3							1	1									1			
Eylais spec.				1																				
Frontipoda musculus	1																							
Hydrachna conjecta												1												
Hydrochoreutes krameri				2							1	**1**				1								
Hydryphantes dispar						1																		
Hydryphantes ruber ruber																			1					
Hydryphantes spec.																				1				
Limnesia connata						1				8														
Limnesia fulgida						1				1														
Limnesia koenickei	3																							
Limnesia maculata				4		2		1				1												
Limnochares aquatica								1																
Neumania vernalis						1															2			
Piona alpicola	1								4											1				
Piona cf. litoralis				**1**																				
Piona cf. stjoerdalensis																		1		1				
Piona circularis										**2**														
Piona coccinea	4			4	2	6	2				3	4			2	6	6							
Piona nodata															1	5		1						
Piona pusilla	2				1															2				
Piona variabilis					5	1			4	1														
Pionidae	1			1	1		1		1	1										1	1	1	1	1
Pionopsis lutescens	3		1		5	1	3	1					1					3		2				
Tiphys ornatus				1						1			1		1	1				2				
Tiphys torris																		2						
Unionicola crassipes										1														

SUMMER	A1	A2	B1	B2	C1	C2	2	Da1	DA2	E1	E2	F1	F4	G1	G2	H1	H2	I qual	K1	K3
Hydrachnellae																				
Arrenurus bicuspidator		8			7	1	2	4				1	1							
Arrenurus bifidicodulus																	2			
Arrenurus bruzelii														1						
Arrenurus cuspidator					3							1								
Arrenurus globator					1							5		1		1				
Arrenurus spec. 1												1		**3**			1		1	
Arrenurus spec?							1													
Arrenurus tricuspidator		1			5															
Eylais infundibulifera														1						
Hydrodroma despiciens											1		1							
Limnesia fulgida														1		3		1	1	
Limnesia maculata		1	1		9															
Limnochares aquatica																		3		
Pionidae			4	1			3									3	9			
Unionicola crassipes				5							2									
Unionicola minor													1							
Unionicola spec.			1	1								2								

4.2.11 Oligochaeta

The identification of 38 samples was fulfilled (22 were spring samples and 16 were summer ones). In total 21 species of Oligochaeta was found.

SPRING	A1	A2	A3	B1	B2	C1	C2	D1	E1	E2	F1	F2	F3	F4	G1	G2	G3	H1	H2	H3	I	K1	K2	K3
Oligochaeta																								
Aulodrilus pluriseta					1	2																		
Chaetogaster diaphanus			3																					
Dero digitata										3														
Dero dorsalis	2																							
cf. Kincaidiana hexatheca				1	1																			
Limnodrilus hoffmeisteri																					1			
Lumbricidae																	1							
Lumbriculidae							5																	
Lumbriculus variegatus	1	30			5						1	3	2	15			1			1		1		
Nais variabilis																	1						4	
Ophidonais serpentina	10																							
Peloscolex ferox		1			2																			
Slavina appendiculata				4		5															3		3	
Stylaria lacustris	1	6	25	87	3	69	3		28	1			92	72	77	9	105				5			3
Tubifex tubifex					2			1																
Tubificidae met haarborstels			2		1			2														6	2	4
Tubificidae zonder haarborstels	11		13		1																1			

SUMMER	A1	A2	B1	B2	C1	C2	Da1	DA2	E1	E2	F1	F4	G1	G2	H1	H2	I qual	K1	K3
Oligochaeta																			
Aulophorus furcatus														1					
Dero digitata		68	13	4						3									
Dero dorsalis							1							24					
Dero spec.														2					
Limnodrilus hoffmeisteri	5																2		
Lumbriculidae						1											1		
Nais pardalis	1																		
Nais variabilis	1								9		7		4				13		
Ophidonais serpentina				1															
Peloscolex ferox		1																	
Peloscolex spec						1													
Slavina appendiculata													13						
Stylaria lacustris											17		24						
Tubificidae met haarborstels	2	29	19		2	26	37	28		4		1							1
Tubificidae zonder haarborstels	3	2	1				2										8		

4.2.12 Hydrozoa

To this group of rather small organisms little attention has been paid. In spring 1 specimen of Hydra was found in the sample of F2 and 1 specimen in H2; further about 100 specimens were seen at station F3.

4.2.13 Turbellaria

Tricladida were rather common in the quantitative samples. They were identified in the field (magnification 10 x). Only two species have been found: *Dendrocoelum lacteum* and *Dugesia lugubris*. Both were more common in spring.
The other species belong to the Rhabdocoela. As a rule small Rhabdocoela will have been overlooked and were not identified.
The known ecology of the species give no possibility for important conclusions.

Spring

	A1	A2	A3	B1	B2	C1	C2	D	E1	E2	F1	F2	F3	F4	G1	G2	G3	H1	H2	H3	I	K1	K2	K3
Dendrocoelum lacteum		4				1	3	2	3	3		1				1								
Dugesia lugubris		3								2			1			2								
Mesostoma									1															
small Rhabdocoela						4																		

Autumn

	A1	A2	A3	B1	B2	C1	C2	D	E1	E2	F1	F2	F3	F4	G1	G2	G3	H1	H2	H3	I	K1	K2	K3
Dendrocoelum lacteum											1													
Dugesia lugubris						(3)																		
Dalyellia viridis										1														

4.2.14 Lepidoptera

Only very few aquatic Lepidoptera larvae have been found. Because of the fact, that most larvae or living near the surface, most of them have been encountered in qualitative samples. All larvae have been found in summer samples as follows:

Cataclysta lemnata	2 larvae in H 1 (qualitative sample)
Elophila nymphaeata	1 larva in C 2
	2 larvae in E (qualitative sample)
Paraponyx statiotata	1 larva in E (qualitative sample).

All these species are rather indifferent to water quality.

4.2.15 Hirudinae

30 samples Hirudinea were used for the identification. 16 quantitive samples were from spring pools and 14 ones were from summer pools. In total **15** species were found in quantitive samples.
Additionally, we identified *Hirudo medicinalis* in qualititive samples

SPRING	A1	A2	A3	B1	B2	C1	C2	D1	E1	E2	F1	F2	F3	F4	G1	G2	G3	H1	H2	H3	I	K1	K2	K3
Hirudinea																								
Branchiobdella ?			1																					
Erpobdellidae		1	1				5		10	38			3			1		2	1		19	1		
Erpobdella spec. 1										1		1												
Erpobdella octoculata					1		1			2			1					1		1				
Erpobdella testacea										2														
Glossiphonia complanata					2																			
Glossiphonia concolor										**2**			1											
Glossiphonia cf paludosa			1	1	16		5		2	6											2			
Glossiphonia heteroclita		1			1								1			2		3		3	2			
Haemiclepsis marginata									2				2											
Haemopis sanguisuga						1											1							
Helobdella stagnalis		19	25		1				1				2											
Piscicola geometra					1	1			1															
Theromyzon tessulatum		1																						

SUMMER	A1	A2	B1	B2	C1	C2	2	Da1	DA2	E1	E2	F1	F4	G1	G2	H1	H2	I qual	K1	K3
Hirudinea																				
Erpobdellidae						1		2	1	2		6	4						1	
Erpobdella spec. 1												39	1							
Erpobdella octoculata				1										1				1		
Erpobdella testacea												25								
Glossiphonia complanata						1		1	1			3	1					2	1	
Glossiphonia concolor						1							2	1						
Glossiphonia cf paludosa					1	1						4	1	1						
Haemiclepsis marginata												1		4	1			2		
Helobdella stagnalis						8						9	2							

4.2.16 Amphibia

In area investigated live mostly **10 Amphibia species.** They *are Pleobates fuscus, Hyla arborea, Bombina bombina, Bufo bufo, Bufo viridis Runa terrestris (=arvalis), Rana remporaria, Runa esculenta-complex, Triturus vulgaris and T. cristatus.*

The dominant species are Runa esculenta-complex, *R. arvalis* and *B. bufo*. A little bit less population density (about 32 ind/ha) have *P. fuscus, H. arborea, B. bombina.*

In the water bodies investigated quantitative samples had *Rana arvalis* larvae (27 ind/m2) and *R. temporaria* (2 ind/m2) and in G3 water body (27/05/99). Beside that it was *B. bombina* larvae (9,5 ind/m2), *R. terrestris* (3.5 ind/m2) and *Triturus vulgaris* (0.5 ind/m2) in pool I (05/06/99).

5 General discussion

5.1 Species richness and rarity

5.1.1 Species number and ratio between taxa

The species list includes **797 species** from different groups **(287** were plankton and **510** benthos taxa) found in qualitative and quantitative samples from water bodies investigated (Tabl. 19).

The identified species had different faunistic representation. The most numerous taxa was Insecta, second place kept Rotifera and the next one was Crustacea (Fig. 41). In total it must be admitted that the fauna of the water bodies investigated was rich both in the species number and in the population density of some species. A faunistic complex was in 2-3 times richer than for analogic pools of more industrial zones of Belarus (for example 340 species for temporary pools at Minsk area) (Nagorskaya et all., 1998; 1999).

Table 19
The species number in different investigated groups

Phylum	Class	Order	Familie	Species number
Cnidaria	Hydrozoa		Hydridae	1
Plathelminthes	Turbellaria	Tricladida		2
		Rhabdocoela		2
Nemathelmintes	Rotatoria			204
Annelides	Oligochaeta			21
	Hirudinea			15
Mollusca	Gastropoda			29
	Bivalvia			14
Chelicerata	Arachnida	Acari	Hydrachnellae	48
Crustacea	Branchiopoda	Anostraca		1
		Notostraca		2
		Laevicudata		1
		Anomopoda	Bosminidae	1
			Daphniidae	10
			Eurycercidae	20
			Macrotrichidae	4
		Ctenopoda	Sididae	2
		Onichopoda	Polyphemidae	1
	Ostracoda			42
	Copepoda			25
	Malacostraca	Isopoda		1
		Amphipoda		2
Arthropoda	Insecta	Ephemeroptera		2
		Odonata		43
		Heteroptera		26
		Coleoptera		88
		Trichoptera		11
		Lepidoptera		3
		Diptera	Chironomidae	98
			Syrphidae	53

			Chaoboridae	1
			Culicidae	9
			Diptera	5
Chordata	Amphibia			10
			Total	**797 species**

The relationship between different groups of Crustacea, which were found in the region of investigations is presented at Figure 42. The most numerous were Ostracoda (37%), Cladocera (35%) and Copopoda (23%), while other taxa were presented by lesser species richness.

Figure 41
The relation between taxa of species inhabited the floodplain water bodies

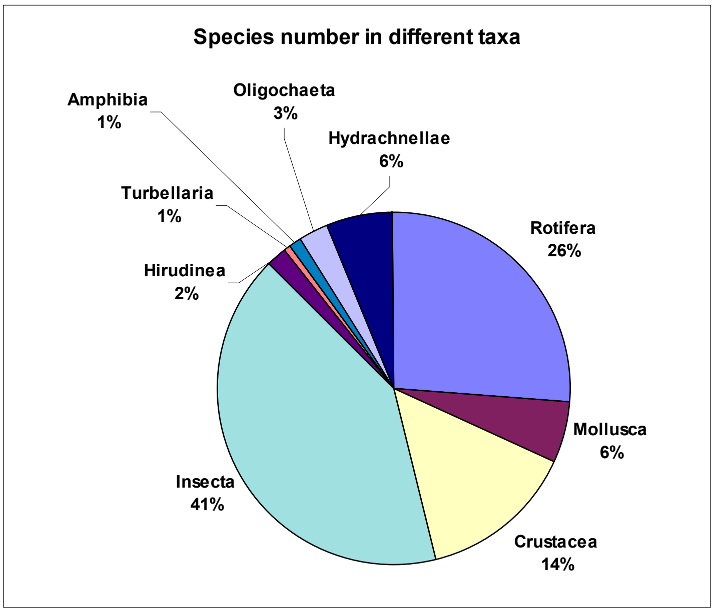
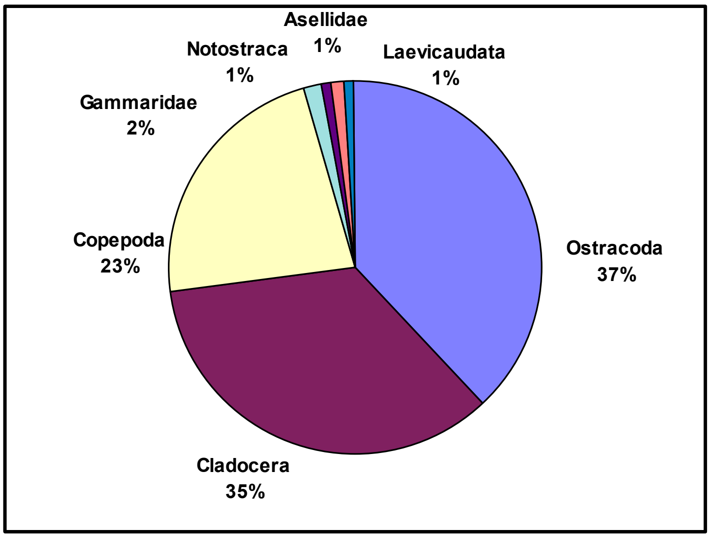


Figure 42
The percentage of different taxa of Crustacea (110 species) in total) from the Pripyat floodplain water bodies



The figure 43 presents the species number, which was in every pool in the quantitative samples. It is interesting that in spring a trend shows the species number increasing along the pools' gradient. And quite the reverse, in summer the trend is negative with the distance from the riverbed. The average value of the total species number per pool had significant differences (p<0,05) between spring and summer samplings and was equal 131 and 105 species, correspondingly. These differences were because of larger portion of the benthic species in spring.

Figure 43
The Ostracoda. The total species number along the waterbodies gradient

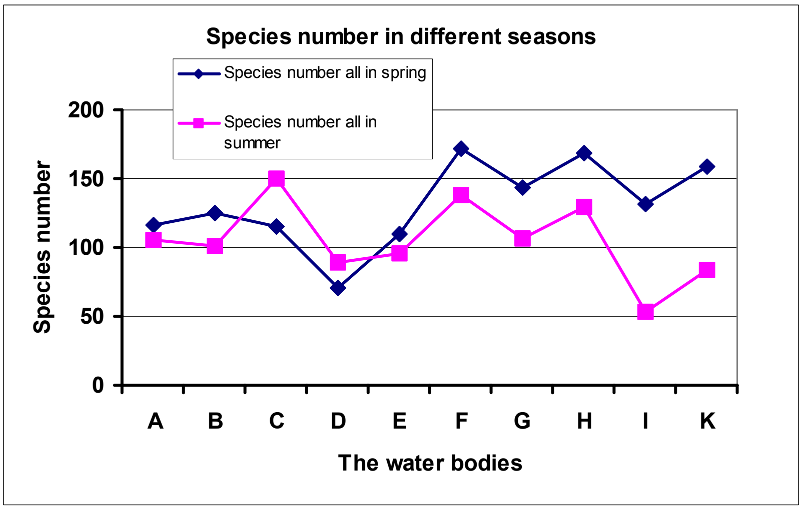
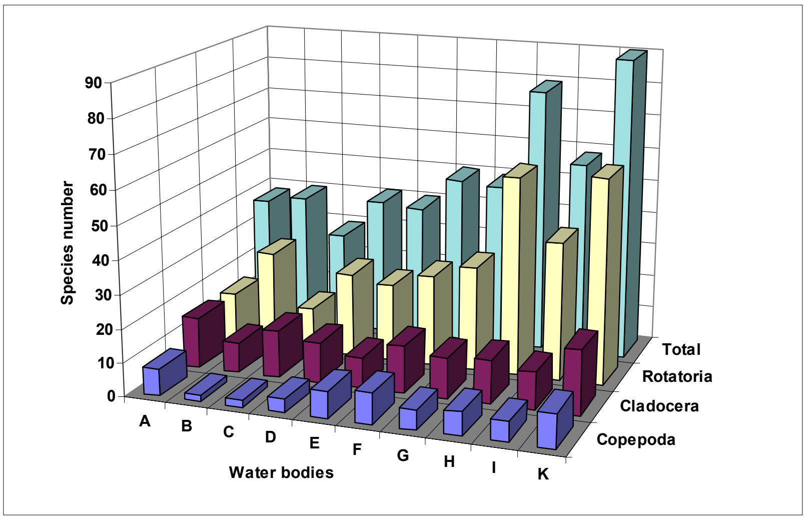
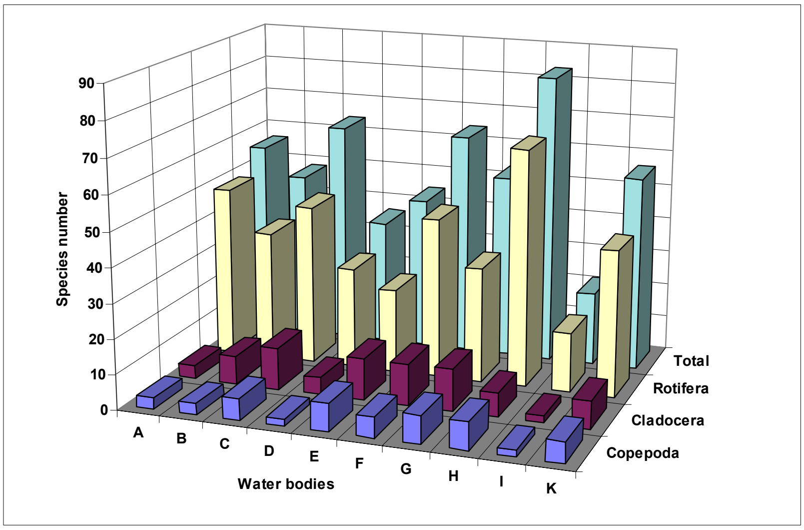


Figure 44
The Ostracoda. The species number of plankton groups along the water bodies gradient.
A = spring
B = summer



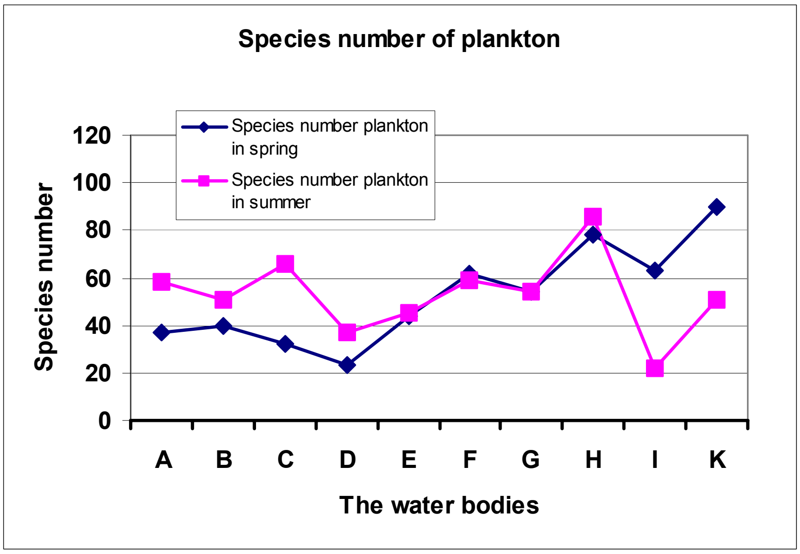
A



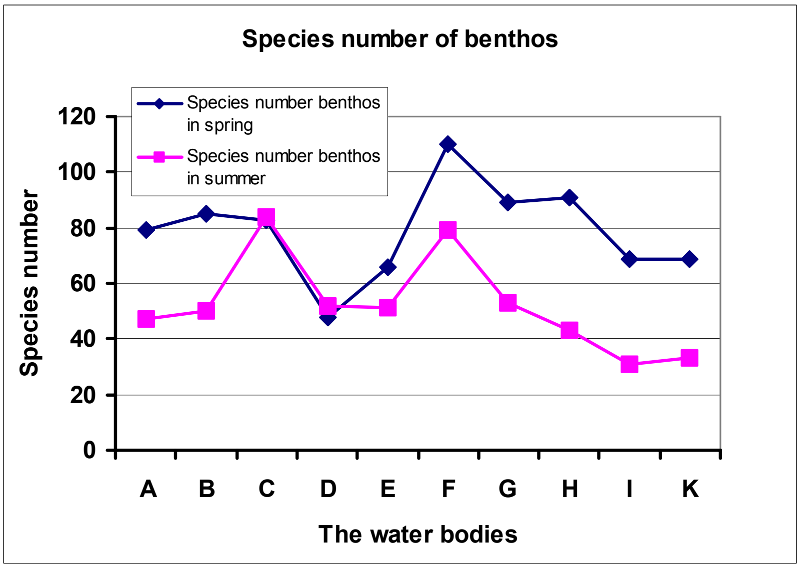
B

The plankton species number was changed mainly due to Rotifera species (Fig 43). The number of Rotifera species varied from 7 to 66 at that time as the Cladocera and Copepoda species range was equal 2 – 29 and 3 – 13, respectively. The total plankton species number's trend increased from the river-bed to inner pools in spring and demonstrated no regular fluctuations in summer (Fig. 45 A).

Figure 45
The total species number variation along the waterbodies gradient.
A = plankton
B = benthos



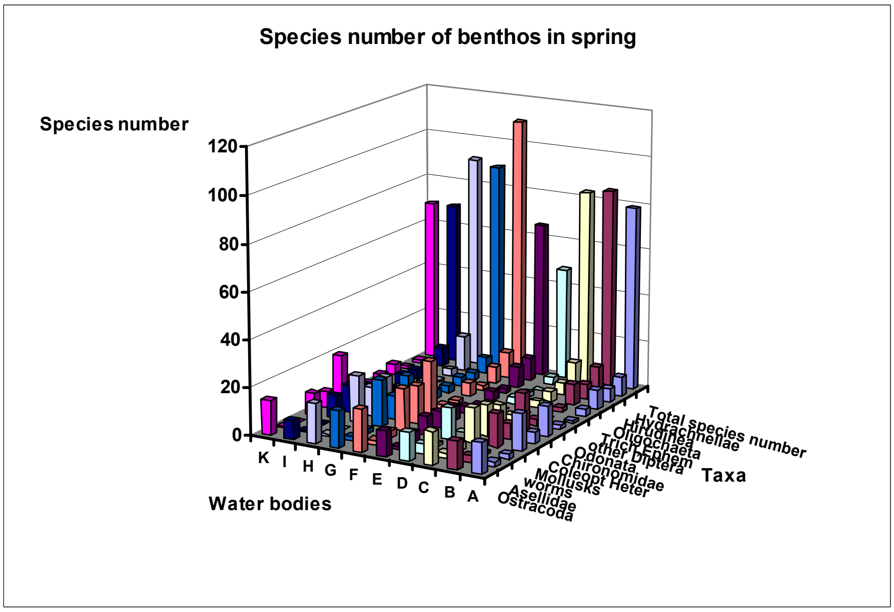
A



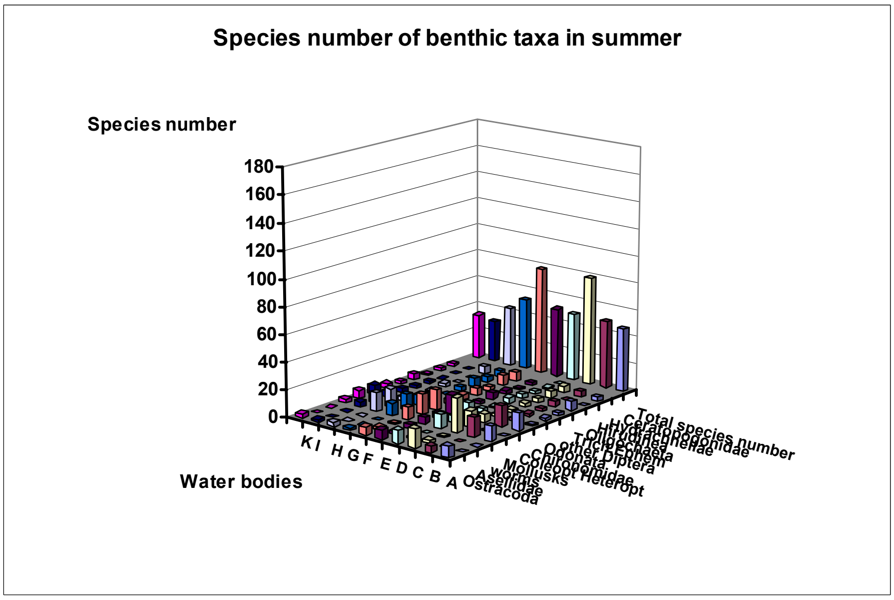
B

The total benthic species number's trend varied irregularly from the river-bed to inner pools in spring and decreased in summer (Fig. 45 B).
The benthic species number was mainly defined by Mollusca, Chironomidae, Ostracoda, Heteroptera and Coleoptera taxa (Fig. 46).
The total number of mollusks species was 43 (29 Gastropoda and 14 Bivalvia). Taxa richness per site ranged from 3 to 21 as a consequence of maintaining high levels of habitats diversity across the floodplain. The freshwater mollusks' fauna is composed mostly of common, ubiquitous species, which possess broad environmental tolerances. Mollusks' communities in floodplain zone are affected by such ecologically important factors as a sediment regime, substrate composition, riparian vegetation, water quality and differing degrees of outlying from the main river channel. Thereby there were some group of sites that could be distinguished on the basis of mollusks species richness: (1) sites with high mollusks diversity (**A, B, C**) which are relatively close situated with the main river channel; (2) sites with low species diversity of mollusks (**E, K**).
Taking into consideration our local sampling it is necessary to mention that Pripyat catchment is rich and diverse with Ostracoda species (42 in total*)*. At Volga and Dnestr river systems sampled annually during many years the Ostracoda species number was not more 70 and for Belarussian the Svislotch River it was 26 (Semyonova 1993; Keyser, Nagorskaya 1998).
In the same time such taxa as Chironomidae (99 species in total) are not so rich as at many European countries. For instance Caspers (1980) calls 71 species at one station in the Rhine near Bonn a species-poor remnant-community. De Jonge e.a., (1999) found 88 chironomid species in the river Pripyat and its old branches in 1998 and called it a poor macrofauna. Also in mesotrophic conditions the species numbers can be very high. In one exuviae sample in a ditch near Vlijmen (the Netherlands) were found 37 species, in other samples from more eutrophic ditches this number rarely exceeded 10 (Cuppen, 1993). Taking into account that in our investigations rheophilic species were scarce because of the fact that the river itself was not investigated, and that the meso-/ oligotrophic component was nearly lacking, the species number was high. For instance oxbow lakes of rivers in the Netherlands have mostly a much poorer chironomid fauna. In total we must admit that fauna of the water bodies investigated has high species richness.

Figure 46
The species number of benthos groups along the water bodies gradient.
A = spring
B = summer



A



B

5.1.2 Rare and new species

Moreover in nearly all groups of invertebrates we found species, which make special demands upon their environment and are relatively rare in Belarus and/or in Europe.

The common published list of zooplankton of Belarus included 294 species of Rotifera, 64 Cladocera and 37 Copepoda (Galkovskaya, Veznovets, Rosthin, 1992). We found 38 new species of Rotifera, which were not mentioned for Belarus fauna. The list of Rotifera we identified kept 10 species, which were not mentioned for that region (Limnofauna Europea, 1977). The majority of found zooplankton species are common. A rare species of Rotifera *Drilochaga delagei* is a parasite of Hirudinea, while *Eothinia elongata elongata* is a predator. New species in Copepoda and Cladocera groups were not founded.

About 30% of Ostracoda from water bodies investigated could be considered rare for Belarus as well as for some European countries (Limnofauna Europea, 1977, Meisch, 2000). Among them are *Candona hyalina, Candona caudata, Candona acuminata, Cypria curvifurcata, Cypria lata, Cypridopsis elongata, Cypridopsis obesa, Iliocypris decipens, Limnocythere relicta, and Physocypria craepelini. Pseudocandona semicognita, Trajancypris clavata.* Ostracoda rare species are spread through all water bodies but with a low abundance.
Three chironomid species are new for science: *Zavreliella spec. nov*. (pt**. H**), Paratanytarsus spec. nov. (pt. **K**) and genus nov. (exuviae pt**. I**). Some species are up to now not or hardly known from Europe: one on pt**. I** (*Cricotopus cf. elegans*) and at least one on pt**. K** (Acamptocladius).
The list of Coleoptera demonstrated many species, which are rare or lacking in the Netherlands. Some of them are also rare in Central Europe and Belarus for instance *Haliplus fulvicollis, Haliplus furcatus* (both on pt.**H**), *Hygrotus quinquelineatus (*pt. **B**), *Graphoderes bilineatus* and *Hydrochus ignicollis* (pt**. D**).
The Odonata *Sympecma paedisca*, *Coenagrion hastulatum*, *Aeshna viridis*, *Brachytron pratense*, *Epitheca bimaculata*, *Somatochlora flavomaculata*, *Leucorrhinia pectoralis* and *L. rubicunda* are examples of species that are red-listed in some western European countries (Dommanget 1987, De Knijf & Anselin 1996, Maibach & Meier 1987, Merritt et al 1996, Ott & Piper 1997, Wasscher 1999), while they where common in the transition zone between river and bog.
A few other Insects are rare for the fauna of Belarus as, for example, bug species *Cymatia bonsdorfii* and *Notonecta lutea*.
There were in total **21 rare and 3 new species** in the floodplain water bodies. The high number of species and the many rare species must be the result of the high spatial diversity and the diversity of water types. Probably, the great variation in habitats (numerous biotopes) in combination with a gradient of water feeding type can cause the presence of various conditions for inhabitants of oxbows.

5.1.3 The species richness in accordance with a theoretical possibility
A fullness of species coverage during sampling could be illustrated by the result of the theoretical curves construction. We used the analysis of species richness in the area of investigations by a building of plots number of new species accumulating against the number of pooled samples.

Figure 47
"Collector's curve" for the estimation of the species number in the area of sampling

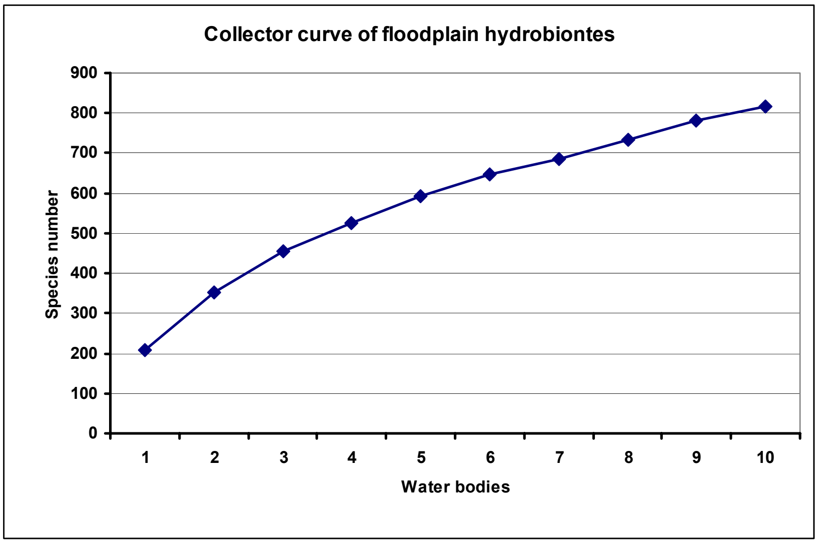


Figure 47 presents the shape of so called "collector's curve". When asymptote is reached all the species in a region have been collected and no further sampling is required.
As we can see at figure 46, the species richness was not reached "a plateau". In fact some additional species number would been found thanks new samplings. Nevertheless it seems that our two seasons sampling is the beginning of more thorough research of water bodies' inhabitants of Pripyat catchment..

5.1.4 Abundance of plankton and benthos and diversity indices
The population density (abundance) of plankton changed in different water bodies in 400 time in spring and more than in 1000 times in summer (Fig. 48A). In spring samples rotifers and Cladocera dominated in a number and in summer rotifers and different developmental stages of cyclops were more numerous. In summer the average abundance of zooplankton increased in 10 times more than in spring.
The population density (abundance) of benthos changed in different water pools in 10-15 times. (Fig, 48B). The average abundance of benthos decreased in summer in 4 times in comparison with spring. The most abundant groups of benthos in a majority floodplain water bodies wear Asellidae and Ostracoda. The population density of Ostracoda assemblages increased from the pools situated near the riverbed to more isolated ones in spring. Its maxim meaning was in the big and diverse oxbows **F, G** and **H**. In summer it was the opposite directed trend. The maximal population density of Ostracoda was fixed also in oxbows by the Pripyat bed (oxbow **C**). One should remind that **F, G**, **H** and **A, B, C** localities were characterized by relatively deep and cold waters, high values of the hydrochemical parameters of the mineralization (see 4.1).
The species richness and the abundance of hydrobiontes in separate patches/ localities as well as along a line of pools could be estimated by alpha- and beta-diversity indices. We used two diversity indices (alpha- and beta-diversity). Alpha-diversity defined by Whittaker as local diversity gives results for single samples. Diversity indices were used for the calculations of univariate diversity measure:

H' - index of Shannon: $H' = -\Sigma_i N_i \ln N_i$, (i = 1, 2, ... Q),

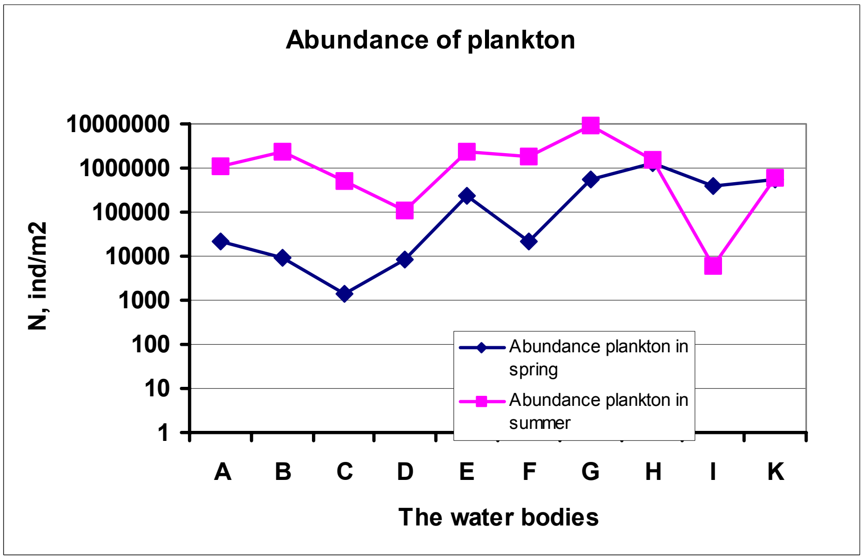
E_s - Pielou's equability (evenness) index: $E_s = H' (N_1, N_2, ..., N_Q) / \ln Q$,

Simpson's domination index D_s: $D_s = \Sigma_i (n_i/N)^2$, (i = 1, 2, ... Q), $(0 < I_s < 1,)$

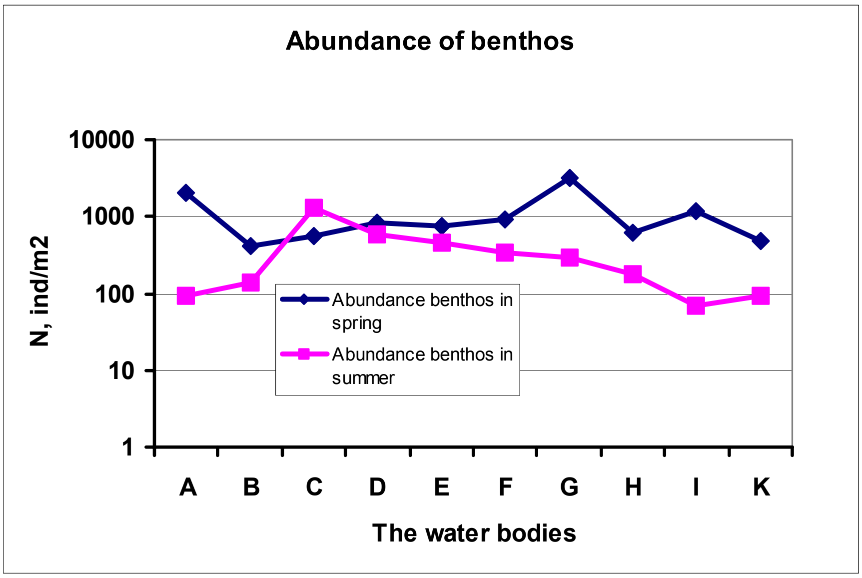
Beta-diversity defined by Whittaker as turnover of species between different localities. SHE analyses supported by BiodiversityPro computer program was been used for calculations.
SHE analysis examines the relationship between species richness (S), information (H) and evenness (E) in whole line of patches/samples from an area of investigations.
Diversity indices increased from «single biotopes/sample» – «area diversity» and changed within limits 0,6 - 1,4: 2,0 - 3,3, correspondingly (Fig.49). First group measured alpha-diversity whereas second one conveyed beta-diversity for whole series of investigates water bodies. It is evident that fluctuations of indices reflect both the number species and their abundance in every biotope/samplesite. It seems to be good for using the average indices value for comparing with other localities. In the same time its abrupt change showed some different situations for these patches. So, a dropping down index for **G1** in summer was a result of the population density flash of the only abundant species Rotifera *Anaeropsis fissa fissa.*

Basing on the alpha- and beta-diversity indices we could divide all line of the water bodies investigated in three groups. One group is **A - D** and these pools belong to adjacent to riverbed ones. Second group **E – G** are less connected with a main riverbed pools, which partially have patterns of temporary water bodies. At least group **H – K** are more inner water bodies and their fauna comprised both eurybiont and common widespread species and very specific and characteristic ones. Summarizing all written above it is need to not that in spite of the theoretical possibility to find a lot of new species the high level of species richness of the Pripyat floodplain water bodies is beyond any doubt. The abundance of plankton and benthos changed in a few ten thousand times in different season sampling in accordance with stages of species populations developing.

Figure 48
The abundance of hydrobiontes along the water bodies gradient.
A = plankton
B = benthos

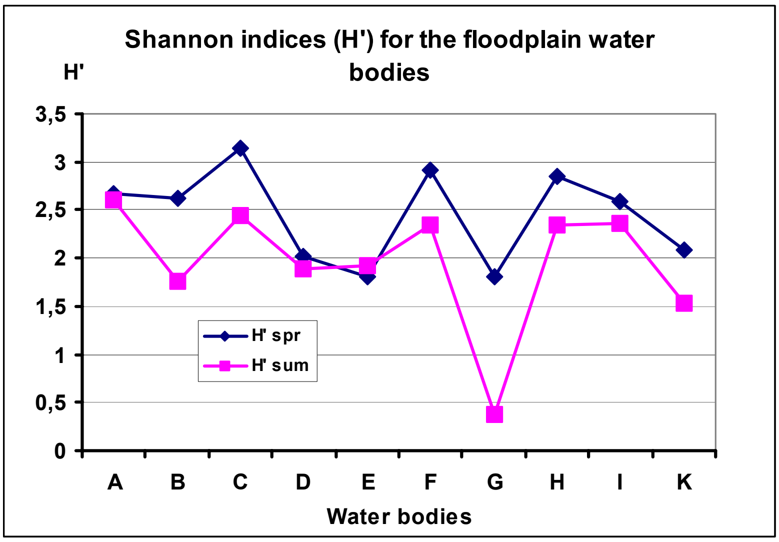


A

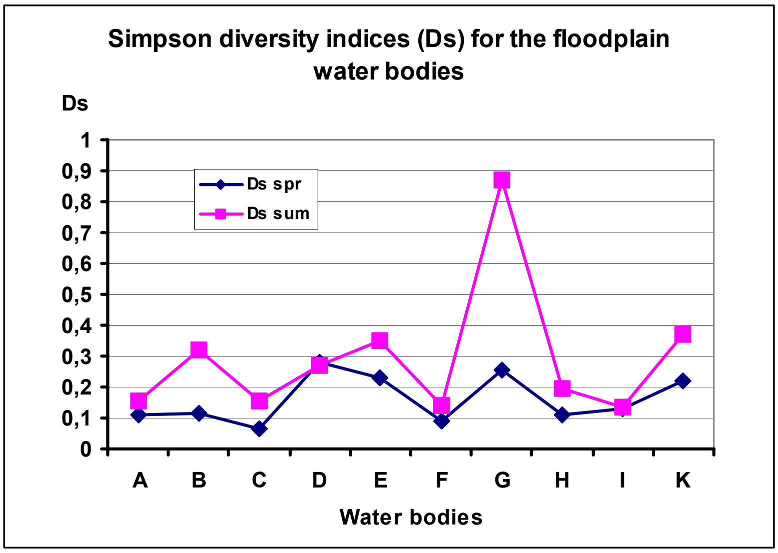


B

Figure 49
Diversity indices of the hydrobyonts'community along the water bodies gradient.
A = alpha diversity
B = Simpson's
C = Eveness
D = beta-diversity



A



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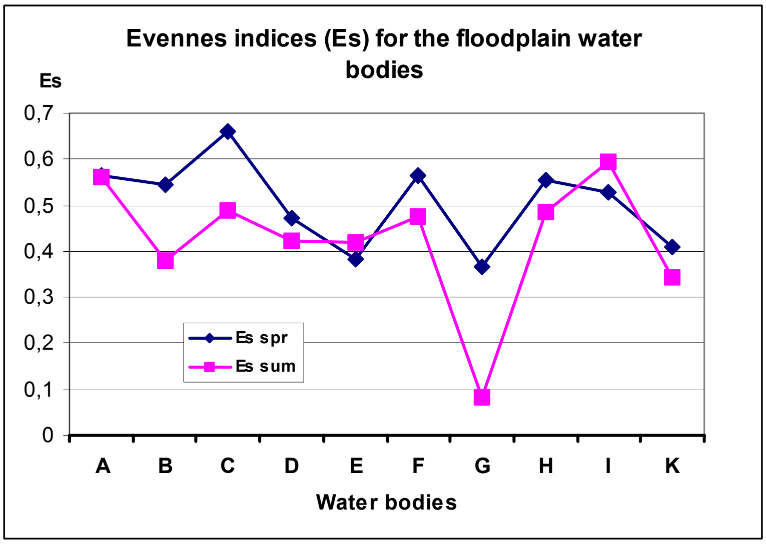

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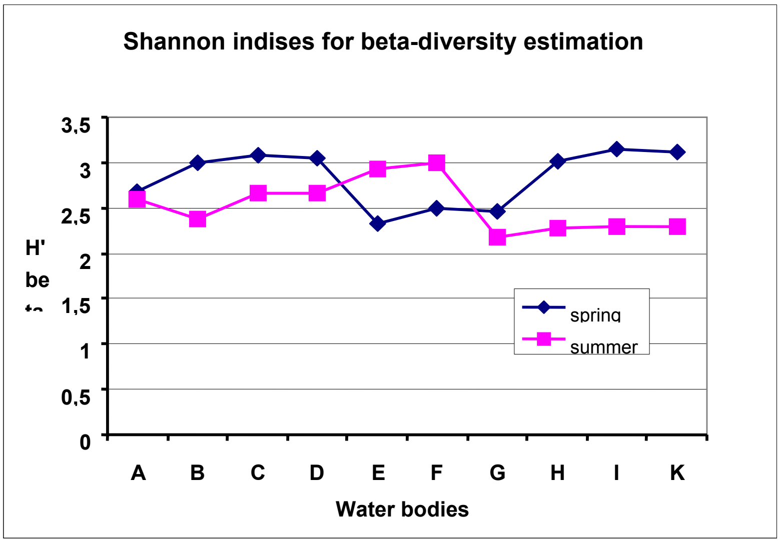
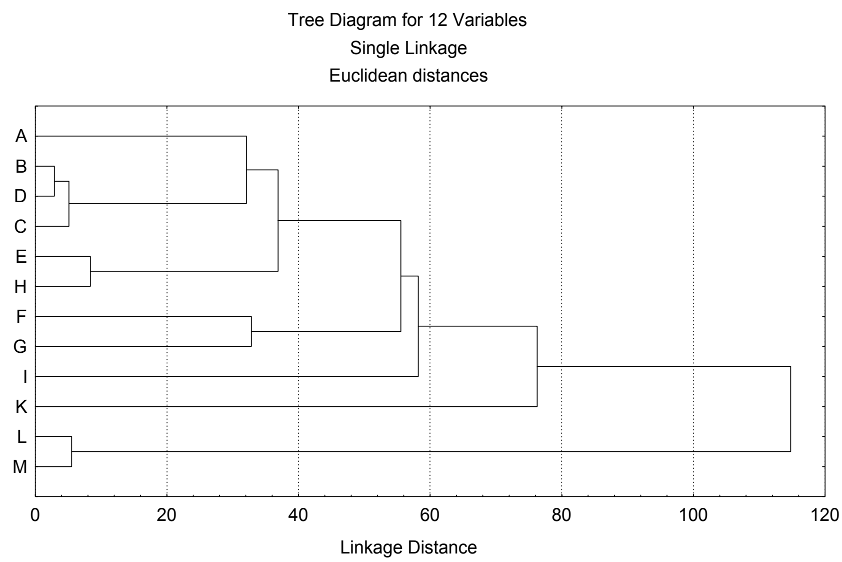
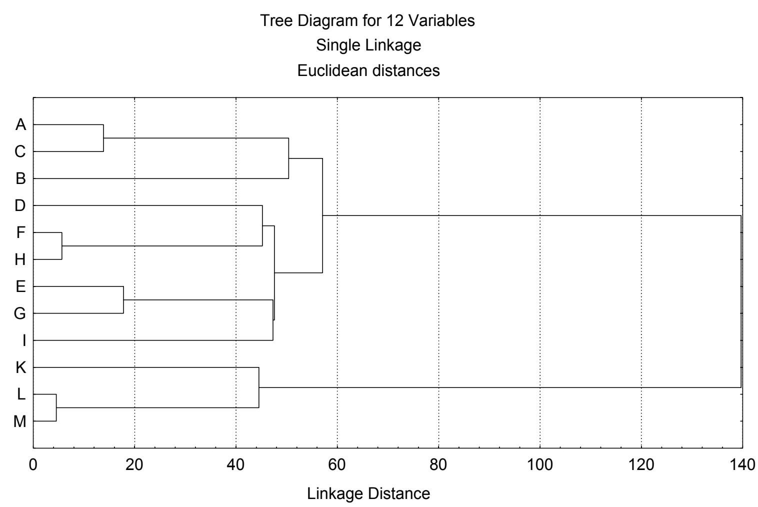


D

Figure 50
The hydrochemical parameters similarity of the floodplain waterbodies.
A = spring
B = summer



A



B

5.1.5 Dominant species complexes

The dominant species complexes were selected for future comparative analyses. Anticipating a calculation procedure we recounted the abundance of plankton from ind/m3 in ind/m2 taking into account the average depth of sampling localities (Tabl.1 - 2). Samples from every locality were ranged from species with maximal population density to its diminution. (See Appendix 11).
In the dominant complexes we included species formed to 75% of the total abundance. Than we ranged data for close localities, which were been selected on basis of the hydrochemical characteristics' clustering (Fig. 50). The first group included the water bodies by the main river-bed (**A, B, C, D** in spring and **A, B, C** in summer). The inner pool **K** had distinct differences in both seasons, while other water bodies belonged to one group in summer or to two various groups in spring.
The data of Table 20 reflect 4 groups of dominant species, which were found in the floodplain water bodies both in spring and in summer.

Table 20
The dominant species gathering in different waterbodies (groups are according the clustering of hydrochemical parameters) in two seasons

spring

1 group	2 group	3 group	4 group
A, B, C, D	E, H	F, G, I	K
Species from all groups of the water bodies:			
Chydorus sphaericus	*Chydorus sphaericus*	*Chydorus sphaericus*	*Chydorus sphaericus*
Cyclops copepodit	*Cyclops copepodit*	*Cyclops copepodit*	*Cyclops nauplii*
Cyclops nauplii	*Cyclops nauplii*	*Cyclops nauplii*	*Polyarthra dolichoptera*
Polyarthra dolichoptera	*Polyarthra dolichoptera*	*Simocephalus vetulus*	
Simocephalus vetulus	*Simocephalus vetulus*		
Species from 2 groups of the water bodies:			
1 group	2 group	3 group	4 group
A, B, C, D	E, H	F, G, I	K
Eurycercus lamellatus	*Anueropsis fissa fissa*	*Anueropsis fissa fissa*	*Polyarthra mayor*
	Colurella unsinata unsinata	*Colurella unsinata unsinata*	
	Conochilus hippocrepis	*Conochilus hippocrepis*	
	Polyarthra mayor	*Eurycercus lamellatus*	
Species from the only group of the water bodies:			
1 group	2 group	3 group	4 group
A, B, C, D	E, H	F, G, I	K
Alona guttata	*Euchlanis incisa*	*Ascomorpha saltans*	
Asellus aquaticus	*Polyarthra remata*	*Ceriodaphnia sp.(affinis)*	
Candona juv.	*Squatinella similis*	*Daphnia longispina*	
Euchlanis dilatata dilatata	*Trichotria posillum posillum*	*Lepadella patella patella*	
Harpacticoidae nauplii		*Polyarthra vulgaris*	
Lepadella ovalis		*Trichocerca rattus minor*	
Polyphemus pediculus			
Sida crystallina			
Synchaeta kitina			
Testudinella patina trilobata			

Testudinella sp.			
Trichocerca rattus rattus			
Trichocerca rattus carinata			

summer

1 group	2 group		3 group
A, B, C	D, E, H, F, G, I		K
Species from all groups of the water bodies:			
Anueropsis fissa fissa	*Anueropsis fissa fissa*		*Anueropsis fissa fissa*
Cyclops nauplii	*Cyclops nauplii*		*Cyclops nauplii*
Polyarthra dolichoptera	*Polyarthra dolichoptera*		*Polyarthra dolichoptera*
Species from 2 groups of the water bodies:			
1 group	2 group		3 group
A, B, C	D, E, H, F, G, I		K
Ascomorpha saltans	*Ascomorpha saltans*		
Cyclops copepodit	*Cyclops copepodit*		
Keratella cochlearis tecta	*Keratella cochlearis tecta*		
Pompholyx sulcata	*Pompholyx sulcata*		
Species from the only group of the water bodies:			
1 group	2 group		3 group
A, B, C	D, E, H, F, G, I		K
Asplanchna priodonta priodonta	*Bdelloida sp.*		
Filinia longiseta longiseta	*Cephalodella ventripes ventripes*		
Monommata actices	*Ceriodaphnia reticulata*		
Trichocerca cylindrica	*Harpacticoidae nauplii*		
Trichocerca pusilla	*Lecane bulla bulla*		
	Lepadella rhombopides rhomboides		
	Polyarthra longiremis		
	Polyarthra remata		
	Polyarthra vulgaris		
	Synchaeta longipes		

The total species number in dominant complex was 46 in spring and 41 in summer. Among them are 15 species/groups common for both seasons of sampling. 11 from them are Rotifera, 3 groups are nauplii and copepodit of Cyclops and nauplii of Harpacticoidae (Copepoda) and 1 species *Ceriodaphnia reticulata* presents Cladocera.
The ratio Rotifera : Copepoda : Cladocera was 29 : 4 : 10 in spring (plus 1 position of *Asellus aquaticus* and 2 ones of Ostracoda (*Pseudocandona compressa* and genus Candona juveniles). In summer this ratio was 37 : 3 : 1. So, the trophic conditions in spring are more favorable for prosperity of large filtraters from Cladocera whereas small Rotifera were numerous in dominant complex in summer.
We did not touch here the eudominants, subdominants and other divisions (Engelmann, 1978). In the same time it needs to remark absolutely other species for dominant complex under the lack of plankton species for an

examination. Benthic species have their proper group, which sometimes could be scrutinized as a dominant complex (Tabl.21).
The Pripyat floodplain water bodies have among dominants as widespread species as species from the only group of the water bodies. The first species were crustaceans *Asellus aquaticus*, *Cypris pubera*, *Cypria ophtalmica*, *Cypridopsis vidua*, *Cyclocypris ovum*, *C. laevis*, *etc*, Chironomidae *Ch. luridus agg*, which were dominant practically in all water bodies.
The dominant species from the only group of the water bodies were more numerous as crustaceans *Gammarus lacustris*, *Fabaeformiscandona fragilis*, *F. holzkampfi*, *Pseudocandona compressa*, *P. hartwigi*, *Candona weltneri*, *Cypria exculpta*, *Physocypria craepelini*, mollusks (*Pisidium casertanum*, *Planorbarius corneus*, *Valvata cristata*, *Lymnaea stagnalis*, *Viviparus viviparus*, *V. contectus)*, Chironomidae *(Polypedilum nubeculosum agg*, *Chironomus longipes*, *Cricotopus gr. Sylvestris*, *Cladopelma gr. lateralis)*, and other Insecta (Chaoborus, Caenis, *Cloeon dipterum*, Coenagrionidae, *Erythromma najas*, *Cymatia coleoptrata*, *Haliplus ruficollis*, *Hygrotus inaequalis)*.
It is obvious that eurybiont species had the wide range of a distribution and a high value of abundance, while more specialized species inhabited the narrow range of water bodies where they were abundant.

Tabel 21
The dominant benthic species gathering in different water bodies (groups are according clustering og hydrochemical parameters) in two seasons

spring

1 group	2 group	3 group	4 group
A, B, C, D	E, H	F, G, I	K
Species from all groups of the water bodies:			
Asellus aquaticus	*Asellus aquaticus*	*Asellus aquaticus*	Candona juv.
Candona juv.	Candona juv.	*Cypria ophtalmica*	*Cypria ophtalmica*
	Cypria ophtalmica		
Species from 2 groups of the water bodies:			
1 group	2 group	3 group	4 group
A, B, C, D	E, H	F, G, I	K
Cyclocypris laevis	*Cyclocypris laevis*	*Cypris pubera*	*Chironomus luridus agg*
Cyclocypris ovum	*Cyclocypris ovum*		Fabaeformiscandona juv.
Cypris pubera	*Chironomus luridus agg*		
Fabaeformiscandona juv.			
Species from the only group of the water bodies:			
1 group	2 group	3 group	4 group
A, B, C, D	E, H	F, G, I	K
Gammarus lacustris	*Pseudocandona hartwigi*	*Cricotopus gr. sylvestris*	*Chaoborus*
Viviparus viviparus jj	*Valvata cristata*	*Cypridopsis vidua*	*Chironomus longipes*
Chironomus annularis	Chasoborus	*Fabaeformiscandona holzkampfi*	*Fabaeformiscandona fragilis*
Stylaria lacustris	Planorbidae juv	*Pseudocandona compressa*	

summer

1 group	2 group	3 group	4 group
A, B, C	D, E, H, F, G, I		K
Species from all groups of the water bodies:			
Caenis	*Caenis*		*Caenis*
Cloeon dipterum	*Cloeon dipterum*		*Cloeon dipterum*
Coenagrionidae	*Coenagrionidae*		*Coenagrionidae*
Cypridopsis vidua	*Cypridopsis vidua*		*Cypridopsis vidua*
Species from 2 groups of the water bodies:			
1 group	2 group	3 group	4 group
A, B, C	D, E, H, F, G, I		K
Candona candida	*Candona candida*		*Fabaeformiscandona caudata*
Candona juv.	Candona juv.		*Triaenodes bicolor*
Candona neglecta	*Candona neglecta*		
Cypria ophtalmica	*Cypria ophtalmica*		
Erythromma najas	*Erythromma najas*		
Fabaeformiscandona caudata	*Triaenodes bicolor*		
Tubificidae met haarborstels	*Tubificidae met haarborstels*		
Species from the only group of the water bodies:			
1 group	2 group	3 group	4 group
A, B, C	D, E, H, F, G, I		K
Chaoborus	*Asellus aquaticus*		
	Candona weltneri		
Fabaeformiscandona jjj	*Cladopelma gr. lateralis*		
	Cymatia coleoptera		
Pisidium, jj	*Cypria exculpta*		
Polypedilum nubeculosum agg	*Haliplus ruficollis*		
Dero digitata	*Hygrotus inaequalis*		
	Lymnaea stagnalis		
Fabaeformiscandona fragilis	*Physocypria kraepelini*		
Laccophilus minutus	*Viviparus contectus*		
Cricotopus gr. sylvestris	*Fabaeformiscandona fragilis*		
	Planorbarius corneus		
	Erobdella spec. 1		
	Erobdella testacea		
	Stylaria lacustris		
	Porhydrus lineatus		
	Dero dorsalis		
	Pionidae		

5.2 Habitats requirements and a lateral zonation (the pools gradient)

5.2.1 Habitats requirements

All range of habitat requirements of invertebrates should be divided into two main categories: vegetation based and sediment based (The New River..., 1994).

The first category includes emergent, submersed vegetation, moss and algae. These different habitats type support the widest variety of taxa but there is a wide range of values the richest and poorest sites. Emergent vegetation is habitat for many insects (damselfly, dragonfly). Water areas associated with marginal vegetation offer pond like conditions and living space for water beetles and water boatmen. The plant stems themselves support a variety of water snails and caddisfly larvae. Large population of water fleas and Copepoda may develop in these areas. Such habitats are more prevalent at the margins of rivers, in sheltered backwaters, slacks and pounded sections more than in deep localities.

The second category (sediment based habitats) includes gravel, silt, sand, clay, etc. These habitats support much more less taxa (for example Diptera species and beetles, Ostracoda, Oligochaeta and Chironomidae). Comparison of the habitat requirements of zooplankton species, Ostracoda, Insects as well as other community groups illustrates the importance of lateral habitat diversity in river system. For example, the habitat requirements of fishes vary with age. Fry can tolerate only slow-flowing water, tending to occupy vegetation channel margins and side-channels. Adults prefer deeper areas with faster flows. Every age stages will prey most suitable and available for that biotopes group of hydrobiontes and as result the elimination of some species will be recorded. Many freshwater fishes are unselective, opportunist feeders, and some extent grayling, feed on aquatic invertebrates, particularly crustaceans and insects on/ or near the streambed. The same situation will be for prey Insecta larvae, Amphibia and other taxa.

5.2.2 Habitats diversity

The habitat diversity is the important prerequisite for species richness. The numerous floodplain water bodies demonstrated the wide range of habitats. Each of them supports species groups, which are good adapted to a habitat character. The most general habitats are:

- bottom sediments (sand, clay, silt, peat, coarse macrophyte fragments with associated microfauna and so on)
- open water column (with numerous algae, detritus particulars, bacteria)
- water vegetation (filamentous algae, mosses, submerged and emergent vegetation).

Every taxon should inhabit a lot of microhabitats. An example can be the ostracods and mollusks assemblages as well as plankton taxa.

Ostracoda species are represented both in bottom sediments and in vegetation zones while they are occasional in open water column. Ecological groups according their habitat requirements should represent them.

The majority of Ostracoda from the floodplain water bodies inhabit the bottom surface and 2-4 cm of sediments. Eurytopic wide spread species group includes *Candona candida, C. neglecta, Cypria ophtalmica, Cyclocypris ovum* and *Heterocypris incongruens.* These species have no any special habitat preferences and they occupied every biotope easy and enough quickly. They are high tolerant different factors species. Psammophilous species *Ilyocypris decipens, Limnocythere inopinata, Candonopsis kingslei, Pseudocandona* *hartwigi, Ilyocypris gibba, Candona linderi, Fabaeformiscandona caudata* were discovered in the water bodies **A, F** and **H**. These species are a component of river fauna in numerous rivers (Semyonova, 1980; 1993, Sywula, 1972, Meisch, 2000). Ostracoda species *Ilyocypris decipens, Physocypria craepelini, Cypridopsis obesa, Pseudocandona insculpta* were found in the water bodies **A, B, C, D** by the riverbed. These species inhabit stagnant water bodies and are often found at the lotic habitats (Meisch, 2000).

There are good swimmers as species of genus Cyclocypris, Cypridopsis, Cypria and some others. These species had the wide range of habitat using and they are often met in various type of the water vegetation. The specialist *Notodromas monacha* inhabits places, which are very close to the water surface film at places with the rich vegetation. The feeding of this species is based upon a filtration from the surface film.

The malacological structure in investigated water bodies associated with the peculiarities of habitats forming a spatial heterogeneous even within the same pools. It is likely that one of the most important changes affecting species distribution will be a change of the type and structure of vegetation and, correspondingly, a character of sediments.

For instance, the distribution of oxyphilous *Acroloxus lacustris* and *Physa fontinalis* in the pools with the water plants or floating leaves could be explained by its preference of helophytes-rich water conditions, which probably favorable for the oxygen accessibility. The colonization of water plants by numerous mollusks species may be associated also with a nutrient availability of periphyton developing on the plants. Bivalve mollusks occurred only in the water bodies with a suitable character of the bottom and a good conditions for feeding and breathing, as a relatively stationary organisms, forming "the near-bottom layer" of mollusks assemblages (sites **A - C**). Some reophilic mollusks (*Thedoxus fluviatilis* representatives of juvenile Dreissenidae and Unionidae) were mentioned sporadically in oxbows **A, B, C,** which were situated a very close to the river. As a result such species may colonize these habitats by passive dispersal effected by a number of factors.

Changes of the relative number of the true plankton species within zooplankton can characterized by the developing of separate taxa in the different habitats. The changing of the relative number of plankton species for the main groups of zooplankton demonstrated the different character in the gradient of investigated localities as well as season peculiarities (Fig 51).

The number of plankton rotifers had shown the tendency to decreasing by a moving off from the river to inner pools both in spring and summer seasons. However, in the water bodies **C** and **H** have been marked the exception from this phenomenon. Probably it was associated with an increasing of underground feeding in this pools expressed in constancy of numerous abiotic factors as mentioned above.

The increasing of a relative number of plankton copepods have been marked in summer for the water bodies **A - B** situated closely to river and temporary pool I as well. The water level in these sites decreased in more than 1m and available overgrowths of macrophytes disappeared as a result of the shoreline displacement.

The proportion of plankton species of Cladocera increased almost in all investigated water bodies except of the pool **K** in summer. This locality was characterized by a soft water and low amount of orthophosphates followed by changes for the worse vegetation developing.

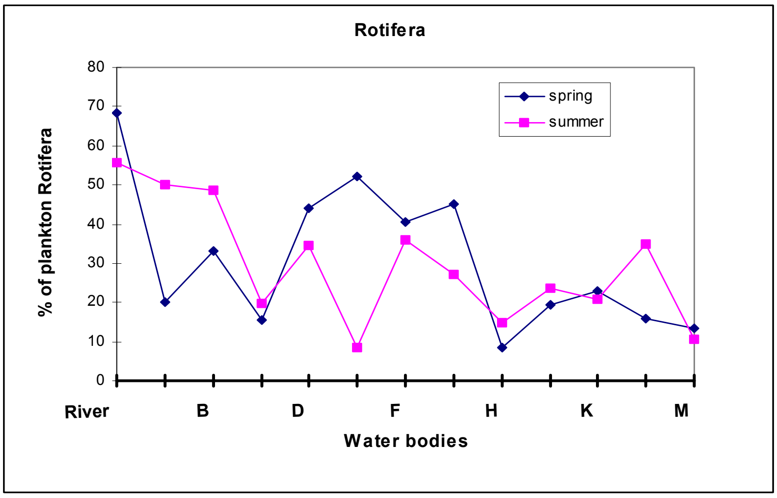
Species richness of Syrphidae species associated with dead wood seems to increase with decreasing influence of the river. The number of eurytopic species was constant with changing influence of the river, while the number of critical species seems to be twice as high on sites out of the Pripyat floodplain. Possible explanations for the larger number of critical species on sites out of the

floodplain might be found in the lower extent of hydro- and morphodynamics (higher stability), the less eutrophic character of the water, etc. The larvae or pupae of many Syrphid-species hibernate in soil or litter. Probably they are not capable of surviving long periods of a flooding.
It is obvious that the habitat requirement approach is perspective for the fauna composition allocation for various habitat types.

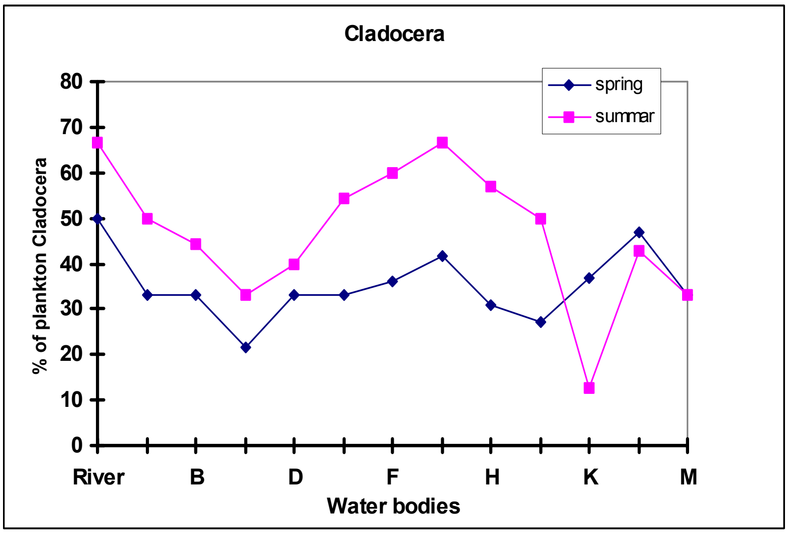
5.2.3 The waterbodies gradient

Hydrochemical data and both the species number and an abundance of taxa demonstrated the existence of some water bodies with the distinct underground waters' influence. The preliminary analyses of data let to present some groups in accordance with their habitat requirements and ecological preferences along the water bodies' gradient from oxbows situated by a riverbed and influenced by the river regularly to inland water bodies with a soft water.
The environmental gradient between adjacent river ecosystems provide a wide range landscape-, biotope- and biodiversities and is the necessary natural component of the river catchment.
In spring the species number and a density of plankton invertebrates increased regularly along a lateral gradient from the river-bed to inner pools. (Fig. 45A). In summer these fluctuations were irregular.
The analyses of a relative abundance and ecological peculiarities demonstrated distinct ecological groups of Ostracoda, which inhabited the gradient of different water bodies. They are cosmopolitan, species of the stagnant water bodies and species from soft inland water bodies. Only 4 species of Ostracoda were found in the oxbows, which have periodically/constant contacts with the Pripyat, which could be included in a river fauna composition. These species live both in running and stagnant water bodies.
As for Insects, then the typical riverine Nematocera species as found in the main channel of the Pripyat (AquaSense, 1999) are nearly totally lacking in our samples. The flooded pojma is inhabited by Chironomidae species hardly living in the river, but rather common in the oxbow lakes.
Interchange between these systems can play a special role in the years with a strong prolonged flooding.

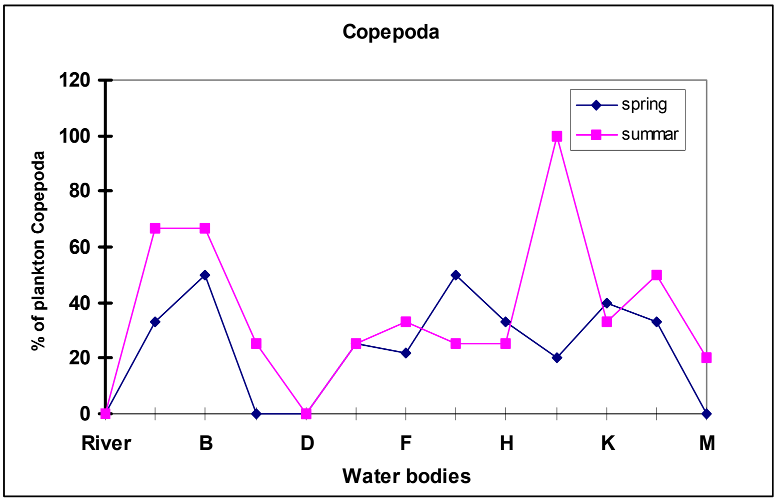
Figure 51
The relative number of the "true plankton" species in the floodplain bodies



A



B



C

The nineteen Odonata species could be attributed to four ecological groups: river species, floodplain species, bog species (some occurring in the adjacent lagg-zone) and transition species. The last category includes species occurring in the lagg-zone and the adjacent part of the flood plain. This part of the gradient is richest both in species and individual numbers. The four species restricted to this transitional zone are all particularly critical in respect to the vegetation structure of their habitat. The six species typical of the floodplain appear to be restricted to this zone because of the absence of large, eutrophic or open water bodies elsewhere in the gradient.
The tendency of decreasing of the relative number of reophilic beetles and bugs species Haliplus fluviatilis (Haliplidae), Hygrotus versicolor (Dytiscidae) and Gerris paludum (Gerridae) was shown in the gradient of investigated pools from **A** to **K**.
Typical for peat-bog species of water beetles: Haliplus fulvicollis, Haliplus furcatus, Hydroporus tristis, H. erythrocephalus, Graptodytes granularis, G. bilineatus, Acilius canaliculatus, Enochrus coarctatus, Hydrochus brevis and bugs: Notonecta lutea and Gerris odontogaster were found mainly in the localities **H** and **E**. Hydraenidae - Ochthebius minimus, Limnebius truncatulus

and Limnebius atomus were found in **H1** and **F4**. Moreover these species are common in spring ecosystems of Belarus. It may be connected with the certain influence of a ground water in these localities.
It is assumed that the oxbow **F** is intermediate among studied water bodies in sense of ecological conditions (an influence of the Pripyat River) for Coleoptera and Heteroptera as well as for some other Insects.
Oxbows are important system-forming elements of a whole natural complex in a range: a river (Pripyat, Neman) – soil-reclamation channels – big stagnant waters (old river beds, floodplain lakes) – small stagnant waters (oxbows, ponds, temporal pools) – bogs and etc. A main body of a water beetle fauna is concentrated in oxbows.
It is evident the floodplain water bodies fulfill various functions and support a high level of species richness in area. The lateral gradient of the floodplain water bodies is based on the morphologic and hydrochemical parameters modification, the river influence level. In accordance with the water bodies gradient the community composition and the ecological groups presence were varied in different seasons.

5.3 Biotope difference in species richness, composition and abundance

5.3.1 Biotopes similarity and distinction

As it is clear from Table 22, most of hydrochemical parameters have a very close correlation. The only exception was nutrients (orthophosphates) since their values reflected the trophic situation in the water bodies in various vegetation seasons (see Fig.25 - 27). These differences by implication reflect the trophic status of the ecosystem in spring and in summer but high values of orthophosphates are essential characteristics of region waters.
Basing on hydrochemical data, bottom characteristics and a vegetation similarity (Table 1, 2, 3 and Fig. 52), four groups of similar biotopes was selected (Table23, 24) both in spring and in summer.
In spring (Table 23) the first group (**A1, H2, E1, E2, F2**) embraced places with many organic deposits (silt and coarse) and high values of most hydrochemical parameters. **A1, E1** and **E2** had a lot of treated algae.

Table 22
Coefficients of correlation of hydrochemical values

Spring

Parameters	pH	Alkalinity	Hardness total	Hardness carbonate	Conduc-tivity	PO_4^{3-}
pH	0	0.71	0.69	0.74	0.72	0.30
Alkalinity	0.50	0	0.98	0.94	0.97	0.48
Hardness total	0.50	0.95	0	0.95	0.96	0.60
Hardness carbonate	0.56	0.98	0.95	0	0.96	0.62
Conductivity	0.64	0.95	0.98	0.94	0	0.53
PO_4^{3-}	0.12	0.16	0.26	0.29	0.14	0

Summer

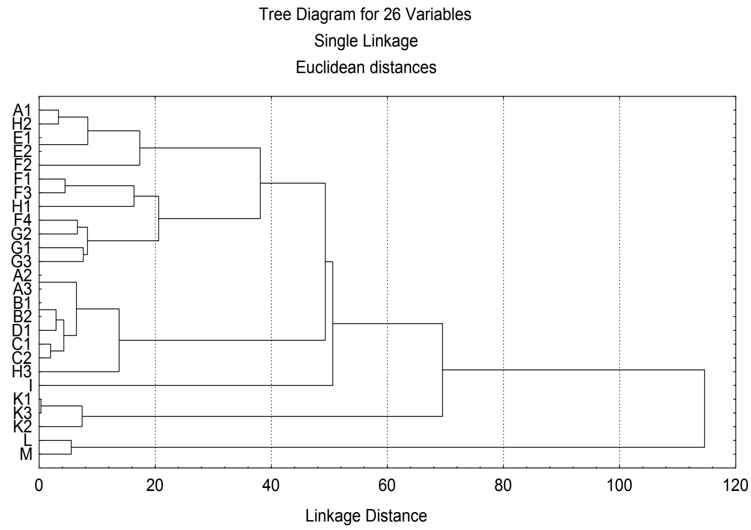
The second group (**F1, F3, F4, H1, G1, G2, G3**) embraced biotopes, which were typical for temporary water bodies. These locations had silt and organic coarse materials, helophytes, Stratiotes, floated leaves as well. Hydrochemical values were less than in the group mentioned above. Nutrients were higher than in other spots.

Third group consisted of the biotopes **A2, B1, B2, C1, C2, D1**, which were influenced by river and the inner pool I. They had a few organic deposits (silt and coarse) and high values of most hydrochemical parameters. Helophytes presented at these biotopes partially. Pool **I** had many "Elodea type" vegetation (Table 1).

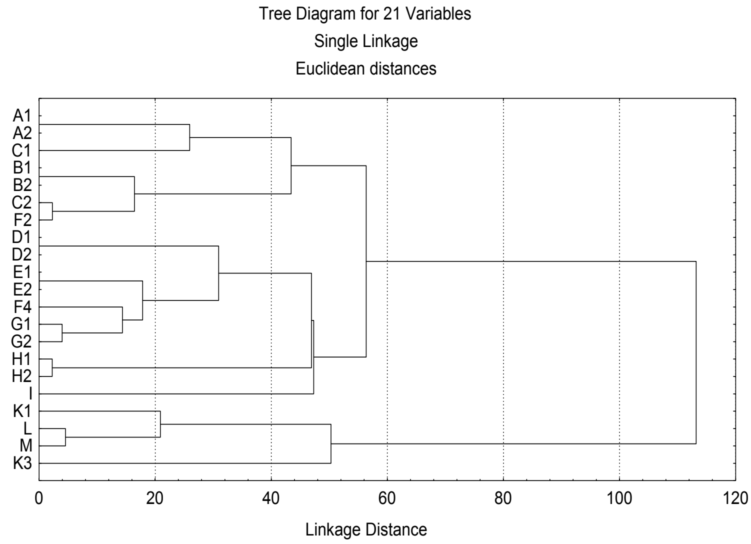
Forth group was from tree biotopes of the water bodies **K (K1, K2** and **K3**). It was inner pool with the very soft water (Table 3). K1 had the vegetation with floated leaves, **K2** had mosses, while both biotopes were rich with organic coarse on the bottom. **K3** had "Elodea type" vegetation and the bottom covered by a sick layer of the organic silt.

In summer the first group of biotopes (**A1, A2, B1, B2, C1, C2, F1**) embraced locations by the river-bed, annually influenced with the flooding. Besides, **C2** and **F1** were characterized by the underground water upwelling. This group had high values of most hydrochemical parameters. The bottom was a sand with a few silt (Table 2).

Figure 52
The biotpes similarity cluster tree based on morphological and hydrochemical characteristics.
A = spring
B = summer



A



B

Second group embraced biotopes **D1, E1, F4, G1** and **G2**. The bottom had a lot of organic silt. There was the rich vegetation as helophytes, floated leaves, Stratiotes at these biotopes.
Third group was **H1, H2** and **I** biotopes, which had a lot of bottom deposits and a rich vegetation. The water level of I water body decreased but it was practically invariable in **H** pool.
Forth group was biotopes **K1** and **K3** with the very soft water as in spring also.
In accordance with the biotopes grouping the dominant species (to 75% of the community's abundance) (see Appendix 11) were formed for every of four group selected basing on biotopes similarity.

5.3.2 Dominant species complexes in similar biotopes

The dominant complexes in different groups of biotopes were present in Table 23 (all species of the community) and Table 24 (benthos species). It was mentioned above, we included species formed to 75% of the total abundance in the dominant complexes.
The dominant complex' species were mainly the small rotifers (Tabl.23). They were 87% and 89% of total dominant species number in spring and in summer, correspondingly. At the same time there were 10 Cladocera species and *Asellus aquaticus* as well in spring. In summer *Ceriodaphnia reticulata* was the only Cladocera in the dominant species complex.
The very specific occurrence demonstrated 29 from 47 dominant species in spring and 27 from 38 dominant species in summer (species from the only group of biotopes). On the other hand the widespread dominant species were 6 from 47 in spring and 4 from 38 in summer.
It is necessary to note the more numerous groupment of the dominant species was in biotopes with the underground water upwelling **(C, F** and **H**) as well as localities **A1-A2** (connected with the river), while other patches had less dominant species.
9 dominant species were common for both seasons. They were 7 rotifers *(Polyarthra dolichoptera, Anaeropsis fissa fissa, Lepadella patella patella, Squatinella similis, Cephalobdella ventripes ventripes, Lecane closterica and Acromorpha saltans)* nauplii and copepodits of Cyclops and Cladocera *Ceriodaphnia reticulata.*
In spring Rotifera *Anueropsis fissa fissa* was dominant in biotopes **E1, E2, I** and eudominant in G2. This species was dominant in **C1, C2, H1**, and **K3** in summer. This common eurybiont species was presented at many other pools as less abundant one.
It is clear that widespread eurybiont species could not be used for the special biotope characteristics. Species from the only group of biotopes should be fitting for that purpose best of all.

Table 23
The dominant species gathering in different biotopes (groups are according the clustering of habitat factors) in tw o seasons.

SPRING			
Species from 3 or more groups of biotopes			
A1, H2, E1, E2, F2	**F1, F3, F4, H1, G1, G2, G3**	**A2, B1, C1, C2, D1, I**	**K1, K2, K3**
Species from 3 or more groups of biotopes:			
Asellus aquaticus	*Asellus aquaticus*	*Ascomorpha saltans*	*Chydorus sphaericus*
Chydorus sphaericus	*Cephalodella ventripes ventripes*	*Asellus aquaticus*	*Cyclops copepodit*
Cyclops copepodit	*Ceriodaphnia reticulata*	*Chydorus sphaericus*	*Cyclops nauplii*

Cyclops nauplii	*Chydorus sphaericus*	*Cyclops copepodit*	*Polyarthra dolichoptera*
Polyarthra dolichoptera	*Colurella unsinata unsinata*	*Cyclops nauplii*	
Polyarthra remata	*Cyclops copepodit*	*Polyarthra dolichoptera*	
Simocephalus vetulus	*Cyclops nauplii*	*Simocephalus vetulus*	
Squatinella similis	*Lecane arcuata*	*Synchaeta kitina*	
Squatinella similis	*Lecane closterocerca*	*Synchaeta kitina*	
	Polyarthra dolichoptera		
	Polyarthra vulgaris		
	Simocephalus vetulus		
	Squatinella similis		
	Synchaeta kitina		

Species from 2 groups of biotopes

1 group	2 group	3 group	4 group
A1, H2, E1, E2, F2	**F1, F3, F4, H1, G1, G2, G3**	**A2, B1, C1, C2, D1, I**	**K1, K2, K3**
Anueropsis fissa fissa	*Ceriodaphnia megops*	*Anueropsis fissa fissa*	*Polyarthra mayor*
Conochilus hippocrepis	*Conochilus hippocrepis*	*Eurycercus lamellatus*	
Eurycercus lamellatus	*Lepadella patella patella*	*Lepadella patella patella*	
Polyarthra mayor	*Mytilina mucronata spinigera*	*Mytilina mucronata spinigera*	
Squatinella similis	*Sida crystallina*	*Sida crystallina*	
Synchaeta pectinata	*Squatinella similis*	*Synchaeta kitina*	
Trichocerca rattus carinata	*Synchaeta kitina*	*Trichocerca rattus carinata*	
	Synchaeta pectinata		

Species from the only group of biotopes

1 group	2 group	3 group	4 group
A1, H2, E1, E2, F2	**F1, F3, F4, H1, G1, G2, G3**	**A2, B1, C1, C2, D1, I**	**K1, K2, K3**
Euchlanis contorta	*Ceriodaphnia megops*	*Ascomorpha saltans*	
Euchlanis incisa	*Cephalobdella ventripes ventripes*	Candona juv.	
Polyarthra remata	*Ceriodaphnia reticulata*	*Euchlanis dilatata dilatata*	
Synchaeta tremula	*Ceriodaphnia sp. (affinis)*	*Harpacticoidae copepodit*	
	Colurella unsinata unsinata	*Harpacticoidae nauplii*	
	Daphnia longispina	*Lepadella ovalis*	
	Disparalana rostrata	*Polyphemus pediculus*	
	Lecane arcuata	*Testudinella patina trilobata*	
	Lecane closterocerca	*Testudinella sp.*	
	Mytilina ventralis ventralis	*Trichocerca rattus minor*	
	Polyarthra vulgaris	*Trichocerca rattus rattus*	
	Pseudocandona compressa		
	Trichotria posillum bergi		

SUMMER			
Species from 3 or more groups of biotopes			
1 group	**2droup**	**3 group**	**4 group**
A1, A2, B1, B2, C1, C2, F1	**D1, E1, F4, G1, G2**	**H1, H2, I**	**K1, K3**
Anueropsis fissa fissa	*Anueropsis fissa fissa*	*Anueropsis fissa fissa*	*Anueropsis fissa fissa*
Cyclops copepodit	*Cyclops copepodit*	*Cyclops copepodit*	*Cyclops copepodit*
Cyclops nauplii	*Cyclops nauplii*	*Cyclops nauplii*	*Cyclops nauplii*
Polyarthra dolichoptera	*Polyarthra dolichoptera*	*Polyarthra dolichoptera*	*Polyarthra dolichoptera*
Species from 2 groups of biotopes			
1 group	**2droup**	**3 group**	**4 group**
A1, A2, B1, B2, C1, C2, F1	**D1, E1, F4, G1, G2**	**H1, H2, I**	**K1, K3**
Keratella cochlearis tecta	*Keratella cochlearis tecta*	*Bdelloida sp.*	*Bdelloida sp.*
Pompholyx sulcata	*Polyarthra longiremis*	*Lecane closterocerca*	*Lecane closterocerca*
	Pompholyx sulcata	*Polyarthra longiremis*	
Species from the only group of biotopes			
1 group	**2droup**	**3 group**	**4 group**
A1, A2, B1, B2, C1, C2, F1	**D1, E1, F4, G1, G2**	**H1, H2, I**	**K1, K3**
Asplanchna priodonta priodonta	*Ceriodaphnia reticulata*	*Ascomorpha saltans*	Brachionus quadridentatus melheni
Collotheca sp.	*Harpacticoidae nauplii*	*Cephalobdella ventripes ventripes*	*Brachionus quadridentatus quadridentatus*
Filinia longiseta longiseta	*Polyarthra vulgaris*	*Colurella unsinata unsinata*	*Cephalobdella gibba gibba*
Monommata actices	*Synchaeta longipes*	*Itura aurita intermedia*	*Euchlanis dilatata unisetata*
Postclausa hyptopus		*Lecane bulla bulla*	*Itura myersi*
Trichocerca cylindrica		*Lecane luna luna*	*Monommata caudatum*
Trichocerca pusilla		*Lepadella patella patella*	*Squatinella similis*
Polyarthra remata		*Lepadella rhombopides rhomboides*	
Synchaeta kitina		*Platyias patulus patulus*	

In spring dominant rotifers *Euchlanus contorta*, *E. incisa*, *Poliarthra remata* and *Synchaeta tremula* inhabited biotopes with rich organic deposits and high hardness' values (Table 23, group 1). Former river-bed pools had biotopes with a rich mineral feeding, which could be belonged to permanent presented points. These biotopes (Table 23, group 3) supported rotifers *Ascomorpha saltans*, *Euchlanus dilatata dilatata*, *Lepadella ovalis*, *Testudinella parina trilobata*, *T. sp.*, *Trichocera rattus minor*, *T.rattus rattus*, and Cladocera *Polyphemus pedieutus* as well as Harpacticoidae (nauplii and copepodit) and Ostracoda juvenile. The group 2 consolidated biotopes which had characteristic features of the temporary water bodies. These localities supported 4 Cladocera species (*Ceriodaphnia megops*, *C. reticulata*, *C. sp.*, *Daphnia longispina)*, Ostracoda *Pseudocandona compressa* and 8 rotifers (Cephalobdella *ventripes ventripes*, *Colurellaunsinata unsinata*, *Disparalana rostrata*, *Lecane arcuata*, *L.*

closterica, Mytilina ventralis ventralis, Poliarthra vulgaris and *Trichotria posillum bergi).*
In summer the flooding influence was diminished and the characteristic features of pools were expressed strikingly. In spite of 1, 3 and 4 biotopes' groups had features of the permanent points and supported to 7-9 rotifers species characteristic for only one type of biotopes, these groups were not similar. The group 1 united biotopes dependent definitely from the river influence (Fig. 51). Specific rotifers for them were *Asplanchna priodonta priodonta, Collotheca sp., Filinia longiseta longiseta, Monommata actices, Postclausa hyptopus, Trichocera cylindrica, T. pusilla, Polyarthra remata* and *Synchaeta kitina.*
The group 3 unified biotopes with a lot of silt, helophytes, Stratiotes, etc. If pool H has practically the constant water level, pool I dried up too much and its water level dropped down more than 1 meter. Two genus Lecane species, two genus Lepadella species, *Ascomorpha saltans, Cephalobdella ventripes ventripes, Colurella unsinata unsinata, Itura aurita intermedia, Platyias patulus patulus* were joined in group 3.
The very separate group 4 had biotopes with very soft waters. This group included two genus Brachionus species, *Cephalobdella gibba gibba, Euchlanus dilatata unisetata, Itura myersi, Monommata caudatum, Squatinella similis*.
Biotopes were combined into group 2 were rich in bottom deposits and macrophytes and enough soft waters. The group 2 included just 4 species (rotifers *Polyarthra vulgaris, Synchaeta longipes*, Cladocera *Ceriodaphnia reticulata* and nauplii of Harpacticoidae).
It is evident that the plankton species of the dominant complexes reflected the amount of an algae food and nutrients disengaged by the organic matter transformation by benthic species and microorganisms and bacteria as well.
At the same time the benthic dominant species reflected the quality and the quantity of organic deposits of the bottom. Their presence was connected with the food value of the bottom substances.
The dominant species of benthos are presented in table 24.
In spring 5 species (*Asellus aquaticus*, 3 ostracods and *Chironomus luridus* agg) were found at biotopes of most of groups. 4 species (2 chironomids and 2 ostracods) were found in two from four groups. Typical for the only group of biotopes were 14 species (3 chironomids, 5 mollusks, 5 ostracods and *Gammarus lacustris*). Most of chironomids dominant species inhabited biotopes of 2 and 4 groups, which had a lot of organic bottom deposits, soft waters as well. Mollusks dominant species were represented in biotopes of 2 and 3 groups. They were species from patches both typical for temporary water bodies (2 group) and situated by a river-bed.

Table 24
The dominant benthic species gathering in different biotopes (groups are according the clustering of habitat factors) in two seasons.

SPRING			
1 group	**2 group**	**3 group**	**4 group**
A1, H2, E1, E2, F2	**F1, F3, F4, H1, H3, G1, G2, G3**	**A2, A3, B1, C1, C2, D1, I**	**K1, K2, K3**
Species from 3 or more groups of biotopes:			
Asellus aquaticus	*Asellus aquaticus*	*Asellus aquaticus*	*Chironomus luridus agg*
Chironomus luridus agg	*Chironomus luridus agg*	*Cyclocypris laevis*	*Cypria ophtalmica*
Cyclocypris laevis	*Cyclocypris laevis*	*Cypris pubera*	*Candona juv*
Cypria ophtalmica	*Cypria ophtalmica*	*Candona juv*	
Cypris pubera	*Cypris pubera*	*Stylaria lacustris*	

Candona juv	*Candona juv*	*Cypridopsis vidua*	
Stylaria lacustris	*Stylaria lacustris*		
Cypridopsis vidua	*Cypridopsis vidua*		
1 group	**2 group**	**3 group**	**4 group**
A1, H2, E1, E2, F2	**F1, F3, F4, H1, H3, G1, G2, G3**	**A2, B1, C1, C2, D1, I**	**K1, K2, K3**
Species from 2 groups of biotopes:			
Ablabesmyia monilis agg	*Chironomus annularius*	*Ablabesmyia monilis agg*	*Chironomus annularius*
Cyclocypris ovum	*Gammarus lacustris*	*Cyclocypris ovum*	
		Gammarus lacustris	
1 group	**2 group**	**3 group**	**4 group**
A1, H2, E1, E2, F2	**F1, F3, F4, H1, H3, G1, G2, G3**	**A2, B1, C1, C2, D1, I**	**K1, K2, K3**
Species from the only group of biotopes:			
Notodromas monacha	*Gammarus lacustris*	*Sphaerium corneum*	Fabaeformiscandona juv
	Bathyomphalus contortus juv.	*Viviparus viviparus* juv.	*Parachironomus gr. arcuatus*
	Endochironomus albipennis	Corixidae	*Chironomus longipes*
	Pseudocandona hartwigi		Chaoborus
	Valvata cristata		*Tubificidae met haarborstels*
	Cricotopus gr. sylvestris		
	Planorbidae juv.		
	Pseudocandona compressa		
	Fabaeformiscandona holzkampfi		
SUMMER			
1 group	**2 group**	**3 group**	**4 group**
A1, A2, B1, B2, C1, C2, F1	**D1, E1, F4, G1, G2**	**H1, H2, I**	**K1, K3**
Species from 3 or more groups of biotopes:			
Caenis	Candona juv.	*Caenis*	*Caenis*
Candona juv.	*Chaoborus*	*Cloeon dipterum*	Candona juv.
Chaoborus	*Cloeon dipterum*	*Coenagrionidae*	*Chaoborus*
Cloeon dipterum	*Cypria ophtalmica*	*Cypria ophtalmica*	*Cloeon dipterum*
Coenagrionidae	*Cypridopsis vidua*	*Planorbarius corneus*	*Coenagrionidae*
Cypria ophtalmica	*Planorbarius corneus*		*Cypridopsis vidua*
Cypridopsis vidua			
Planorbarius corneus			
1 group	**2 group**	**3 group**	**4 group**
A1, A2, B1, B2, C1, C2, F1	**D1, E1, F4, G1, G2**	**H1, H2, I**	**K1, K3**
Species from 2 groups of biotopes:			
Candona candida	*Candona candida*	*Candona neglecta*	*Cladopelma gr. lateralis*
Candona neglecta	*Cladopelma gr. lateralis*	*Porhydrus lineatus*	*Fabaeformiscandona caudata*
Cymatia coleoptera	*Cymatia coleoptera*	*Cladopelma gr. lateralis*	*Triaenodes bicolor*
Fabaeformiscandona	*Procladius*		

caudata			
Porhydrus lineatus	*Triaenodes bicolor*		
Procladius	*Syilaria lacustris*		
Syilaria lacustris	*Tubificidae met haarborstels*		
Tubificidae met haarborstels			
1 group	**2droup**	**3 group**	**4 group**
A1, A2, B1, B2, C1, C2, F1	**D1, E1, F4, G1, G2**	**H1, H2, I**	**K1, K3**
Species from the only group of biotopes:			
Asellus aquaticus	*Candona weltneri*	*Anisus (Disculifer)* juv.	
Cypridopsis obesa	*Chironomus annularius*	*Anisus vorticulus*	
Hygrotus versicolor	*Chironomus luridus agg*	*Haliplus ruficollis*	
Pisidium casertanum	*Cypria exculpta*	*Hygrotus inaequalis*	
Pisidium henslowanum	*Fabaeformiscandona fragilis*	*Planorbis planorbis*	
Fabaeformiscandona juv.	*Physocypria kraepelini*	Planorbis juv.	
Sphaerium corneum	*Erobdellidae*	*Plea minutissima*	
Valvata piscinalis	*Dero dorialis*	*Viviparus contectus*	
Viviparus viviparus	*Dixella amphibia*	*Lymnaea stagnalis*	
Viviparus viviparus juv.		*Hygrotus inaequalis*	
Erythromma najas		*Limnesia fulgida*	
Pisidium juv		Pionidae	
Polypedilum nubeculosum agg			
Dero digitata			
Limnesia maculata			
Erobdella sp. 1			
Erobdella testacea			
Polypedilum nubeculosum agg			

In summer 8 species were found in various biotopes' groups (mollusk *Planorbarius corneus*, ostracods *Cypria ophtalmica, Cypridopsis vidua* and juvenile *Candona*, four insects *Cloeon dipterum, Caenis, Chaoborus*, Coenagrionidae). In two from four groups 8 dominant species were sampled (2 chironomids *Cladopelma gr. lateralis* and *Procladius;* 3 insects *Porhydrus lineatus, Cymatia coleoptrata* and *Triaenodes bicolor*; 3 ostracods species *Candona candida*, *C. neglecta, Fabaeformiscandona caudata*). Finally, 27 species were found at the only group of biotopes. They were 12 species of mollusks, 6 ostracods species, 3 chironomids, 4 Coleoptera and Heteroptera species and Odonata *Erythromma najas*).
The biotopes with the only species group contained 10 dominant benthic species in spring and 21 ones in summer. As it was mentioned above, just these species should be characteristic for selected biotopes' groups.
In spring the first group was presented by ostracods *Notodromas monacha*, second group was presented by Gammaridae *Gammarus lacustris*, ostracods *Pseudocandona hartwigi* and *P. compressa*, chironomids *Endochironomus albipennis*, *Cricotopus gr. sylvestris* and mollusks *Valvata cristata, Bathyomphalus contortus juv., Planorbidae juv.*

Third group included mollusks *Viviparus viviparus* and *Sphaerium corneum* and ostracod *Candona juv*.
Fourth group was presented by ostracod *Fabaeformiscandona fragilis* and chironomid *Parachironomus gr. arcuatus*.
In summer the first group unified crustaceans *Asellus aquaticus*, *Cypridopsis obesa, Fabaeformiscandona juv., mollusks Pisidium casertanum, P. henslowanum, Sphaerium corneum, Valvata piscinalis, Viviparus viviparus, chironomids Polypedilum nubeculosum agg., bug Hygrotus versicolor*, dragonfly *Erythroma najas*.
Second group included 4 ostracods *Candona weltneri, Cypria exculpta, Fabaeformiscandona fragilis*, *Physocypria craepelini* and 2 chironomids *Chironomus annularius* and *Ch. luridus* agg.
Third group was presented by 5 mollusks *Anisus vorticulus, Anisus juv., Planorbis juv., Planorbis planorbis, Viviparus contectus, Lymnaea stagnalis, Coleoptera Haliplus ruficollis, Hygrotus inaequalis, Plea minutissima*.
7 species were common for both sampling seasons as *Asellus aquaticus*, 2 ostracods (*Cypria ophtalmica* and *Cypridopsis vidua*), 2 chironomids (*Chironomus luridus agg*. and *Ch. annularius*), 2 mollusks (*Sphaerium corneum* and *Viviparus viviparus*). These species are euribiont and have a few generations per year.
In such a way, the dominant complex' species of a plankton were mainly the small rotifers. They were 87% and 89% of total dominant species number in spring and in summer, correspondingly. At the same time there were 10 Cladocera species and *Asellus aquaticus* as well in spring. In summer *Ceriodaphnia reticulata* was the only Cladocera in the dominant species complex.
With an exception of plankton , the dominant complex' species of a benthos were mollusks, insects (chironomids, bugs and beetles), crustaceans (ostracods and *Gammarus lacustris*).
In accordance with the biotopes grouping the dominant species (to 75% of the community's abundance) were formed for every of four group selected basing on biotopes similarity.
The very specific occurrence demonstrated 29 from 47 dominant species in spring and 27 from 38 dominant species in summer (species from the only group of biotopes). On the other hand the widespread dominant species were 6 from 47 in spring and 4 from 38 in summer.

5.4 Seasonal differences in species richness, composition and abundance

In spite of the absence of significant differences in mean values of species number per pool between spring and summer (see above), there were great differences between the season fauna composition and the community abundance.
In spring the plankton species richness in the water bodies' gradient increased from **A** to **K** (see Fig.45). The lowest species richness was noticed in water body **C** (29 species), the highest one was in water body **K** (90 species). Low meanings of a species richness in the water body **C** could be explained by the fact that this water body in spring was a river branch having an inflow. Our additional samples from the Pripyat River (near the Pererov village) showed the same species richness of a plankton (29 species). A high value of a species richness in the water body **K** is caused by a large biotope diversity of this water body. An increase of a species richness with a distance from the main river-bed is caused by the development of Rotifera, while such fact was not observed in Copepoda and Cladocera. The average abundance of zooplankton was ten

times higher in summer than in spring (see Fig 48). This was especially striking for Rotifera and juvenile stages of Cyclops.

The greatest mollusks species diversity was mentioned in spring in the **G** and **H** water bodies. These sampling sites had the most favorable conditions for mollusks were provided due to high quality physic-chemical factors, rich macrophytes development and a high level of photosynthetic activity.

In summer the highest number of mollusk species were found in the locality **A, B, C**. These biotopes (sites **A, B, C**) were situated a very close to the river and as a result mollusks may colonize these habitats by passive dispersal effected by a number of factors. The advantageous life conditions in this habitats be related with combination high quality of habitats and hydrochemical propitious suitable for mollusks. In summer the probably influence of the considerable decreasing of the water area or even their drying up were the determining factor for malacofauna of the inner sites from **E** to **K**. In the context of these comments the relatively low alkalinity, pH, hardness were recorded in pools **F -- K**.

The effect of a season sampling on the mollusks species number has been studied. The variable domination of mollusks species is appeared one of the characteristic features of sampling seasons. In spring 12 species have been found in more than 5 sampling sites of which only 4 (*Lymnaea stagnalis, Planorbarius corneum, Viviparus contectus* and *Bithynia tentaculata)* occurred in 50% of our sampling habitats in summer.

The mollusk species assemblages demonstrated the increasing of stagnant mollusks species and lacking of reophilic ones in spring. In summer samplings the bivalve mollusks (f. Pisidiidae) increased in number species as well as some other reophilic species (in the sampling sites **A, B, C**).

In Mollusca the different situation was noted both for stations (biotopes) and for separate groups. The links between the mollusks species abundance and their life history peculiarities seem to be important. Mollusks with the one-year life cycle demonstrate mass appearance of young individuals in the reproduction period (late spring or summer) with simultaneous extinction of adults. So in this period the quota of juvenile mollusks in population could average up to 54% (Pisidiidae) and 80% (Viviparidae). Consequently the species structure and their changes in mollusk density were determined more by life histories than by water body persistence in particular season. Another important aspect for several species was the shifting of habitats. In summer season we noted the loss of the former spring habitats and disappearance of Pisidiidae species from pools **H, G**. In the same time Pisidiidae species appeared in the suitable for pill-clams pools (**A, B, C**). These biotopes were situated a very close to the river and as a result some rheophilous species may colonize these habitats by passive dispersal effected by a number of factors. Furthermore there were a sandy bottom with small organic particles silt, include such features as still water with large surface area with wide range of microhabitats suitable for mollusks species. All investigated chemical variables showed strict increase in these habitats. According to Saunders and Kling, (1990) there must be reasonable certainly that the primary mechanisms regulating the distribution of Pisidiidae species are probably abiotic due to sensitive to changes in alkalinity. Competition for food or competition for space is unlikely to regulate the distribution of Pisidiidae species (Way, 1988).

The share of occurrence branchiate and pulmonate species in the pools differed in both sampling seasons. The tendency for decreasing the share of occurrence branchiate species was appeared more noticeable in summer season and probably reflects the real situation repeated every year for water bodies in the river floodplain.

A lot of benthic groups were less numerous in summer samples, (for instance Asellus aquaticus, Oligochaeta, beetle larvae and most chironomids). For the majority cases an explanation cannot be used up by the life cycles only. Quite

probably, the decrease of the population density of these species came from trophic relationships and the habitat quality deterioration (oxygen and nutrients deficit).
In the water body the ground/rain water can cause locally great differences in chironomid fauna. There are great differences between the fauna of spring and summer. Probably more predation in summer and more decaying plant material in spring were the main causes. In spring such available food as thread algae and decaying vegetation was more abundant, in summer the bottom consisted only of fine silt at some stations.
In general in August/September the numbers of chironomids, larvae as well as exuviae and numbers of individuals and the species numbers were much lower than in spring. Especially striking are the differences in numbers for some common genera and species as Ablabesmyia, Acricotopus lucens, Chironomus, Cricotopus sylvestris and Psectrocladius. Also Chaoborus larvae were more or less scarce. More numerous were the numbers of exuviae of Polypedilum sordens and Endochironomus tendens and the numbers of larvae of the mosquito Anopheles maculipennis and the meniscus midge Dixella amphibia. The decline was especially striking in the water bodies **F, G, H** and **K**, whereas in **E** more chironomids have been found. At some localities the bottom was covered with a thick layer of organic silt, but the decline was the same where such layers were absent (for instance **A1, A2, B2, C1, G1** in summer)**.**
The number of Ostracoda species changed from 6 to 15 per one pool in spring samples and from 2 to 11 species per one pool in summer. The rich assemblages were the water bodies **C, F, G** and **H**, which were characterised by very diverse biotopes in spring and oxbow **C**, which had different habitats for investigated biotopes in summer. It is necessary to emphazise that all these water bodies had feeding with underground water upwelling. In summer it was a tendency to the decrease of the species number per pool in the water bodies' gradient from the riverbed to inner pools.
The most of other benthic Crustacea were not abundant and they inhabited a few localities at water bodies by the riverbed (**A - D**). Amphipoda *Synurella ambulans* was at summer sample solely, while *Gammarus lacustris* was met during both seasons. In spring the population of *G. lacustris* was represented by young individuals, while in summer its population density varied strongly. The spring complex' species *Lynceus brachiurus* probably finished its life cycle to the end of May, therefore its population density was not high. *L. brachiurus* (just as most of other filtraters sampled in spring) seems to have some trophic restrictions.
In contradistinction to that, *Asellus aquaticus* was very numerous in spring almost in all water bodies, especially in pool **A**, which was the backwater connected to main stream at downstream end only (more than 2500 ind.m $^{-2}$) and **G** and **F** (500-700 ind.m $^{-2}$). In summer *Asellus aquaticus* was met in a few localities with a low population density.
It is important to analyze the causes of the low species number in summer, because of the fact, that we need to know if there is much influence of the season of sampling and which factors are responsible for presence or absence of the greater part of the species. Especially it is important for good research of such kind of systems In literature a low species number in summer samples are mentioned regularly. Sokolova e.a.(1983) gave two causes for Chironomus larvae: a worsening of trophic conditions and a predation. In summer an organic material in the water layer decays more quickly and often less of the nutritious material will be deposited on the bottom. Wróbel (1972) states that a decay of the terrestrial vegetation in spring after a flooding of ponds causes a high production of *Chironomus thummi*. In August he found a decrease of number and biomass of the bottom fauna.

Very likely the better trophic conditions in spring, when grasses and algae were decaying on a large scale, will have contributed to the difference in chironomid numbers between spring and summer. Fine detritus, which formed the greater part of many soils in summer, is an extremely poor food source (Lamberti & Moore, 1984). Because of the fact that many valuable organic nutrients break down rapidly the seasonal variability of the nutritional content is even greater and can have been very low in summer months. From the higher density of plankton in summer we can conclude that in any case in the water layer there was no shortage of food. It can be that the cycle of nutrients in summer was more concentrated in the water layer as was stated by Sokolova.
Nevertheless a predation seems to be important as well. The artificial increasing of the fish stock by Kajak e.a. (1972) caused a decrease of the benthos' biomass and an increase of the biomass of the species associated with aquatic plants. Eriksson e.a. (1980) stated that a removing or a disappearance of fishes lead to increase of Corixidae, Chaoborus and Odonata.
It seems to be probable that in our case the species abundance was heavy influenced by a predation. Water beetles and fishes were concentrated in summer in much smaller water bodies than in spring. A strong indication in this direction is the fact, that some species of Diptera larvae where more common in summer samples as distinct from most of other species. It was most striking for Endochironomus albipennis, E. tendens and Polypedilum sordens, which are living in small tubes in or close to plant stems and leaves and therefore less sensible for predation (Walshe, 1951, Kalugina, 1961). The larvae of Anopheles and Dixella were also numerous. These larvae are living within a vegetation and also elsewhere appear to be much less predated than most chironomids. From our data it is not possible to decide if food or predation was more responsible for the decline of the different benthic invertebrates in summer.
In summer a number of big predator water beetle and bug species belonging to genera Dytiscus, Cybister, Acilius, Graphoderes, Hydaticus, Ilybius, Colymbetes, Rhantus, Notonecta, Ilyocoris increases – 686 specimens (29,0% from Coleoptera, Heteroptera) if compare to spring – 60 specimens only (7,1%).
Thus one might infer from saying above that the most probable reasons of season differences were the life cycles of separate species associate with habitat requirements, food conditions and predators' pressure level.

5.5 The species using for the trophic status of waterbody estimation and the role of macrofauna in the floodplain pools

5.5.1 Trophic status of the floodplain waterbodies

Since the parameters of environment define the macrofauna species composition and the abundance of populations, single taxa as well as the specific species complexes could be used as a tool of the indication of the trophic status of systems.
In the plankton a few species only are sufficiently characteristic for mesotrophic conditions. In many benthic groups the most represented species are adapted to live in very eutrophic water, for instance the Trichoptera, Ephemeroptera, Mollusca as well as some Crustacea. The most developed taxa probably was Chironomidae.
The list of Chironomidae gives possibilities to analyze the trophic situation along the whole investigated gradient. In all samples of the localities **A - G** the species of eu- to hypertrophic conditions dominated, such as Chironomus species, *Cricotopus sylvestris*, *Endochironomus albipennis* etc. Species of mesotrophic water bodies are lacking or very scarce. Most probably in all these localities the influence of less eutrophic water (from seepage or rain water) is not playing any important role. It seems impossible to estimate to what extent

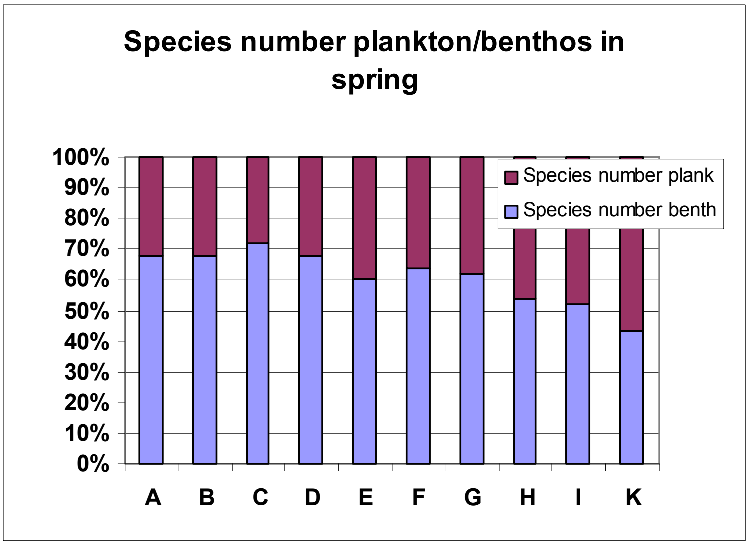
the special conditions in 1998/1999 can be the cause of this situation. Possibly the eutrophication will be relatively slight after some dry years.
Within this row of localities there are no striking differences. The stations **F** and **G** at the southern side of the dike appear to have hardly another water quality. However *Chironomus luridus* is more numerous here and in **G** some specimens of more mesotrophic conditions appear. Interesting is the distribution of *Acricotopus lucens* who inhabits more peaty water bodies, independent of water quality. Their presence in water bodies **F - K** suggests that the more developed succession plays a role in all localities south of the dike.
From this example appears that not only the trophic conditions are responsible for the differences between the three last and the former localities. The advanced succession finds expression in more dense vegetation and a thicker layer of organic material. This is more pronounced in the localities **H, I, K.** Moreover these three water bodies are much smaller than the others. Some species, which prefer to inhabit mesotrophic water bodies are met at these localities, proves that also the water quality is different. This is in agreement with the lower phosphate contents and the lower alkalinity.
However, the trophic status of the last three water bodies is not really mesotrophic: chironomid species characteristic for high production rate (*Cricotopus sylvestris* and *Parachironomus gr. arcuatus*) are still rather numerous and the alkalinity is not too low for rather rapid decay of organic material so that *Chironomus* species are far more numerous than for instance *Polypedilum uncinatum*. The rather high numbers of *Tanytarsus* exuviae in **I** locality can be an indication that this water is the least eutrophic, but the ecology of these species is unknown. In addition to the feeding circumstances also oxygen can play a role in determining the presence or absence of species living here.

5.5.2 The benthic/plantonic blocks' ratio

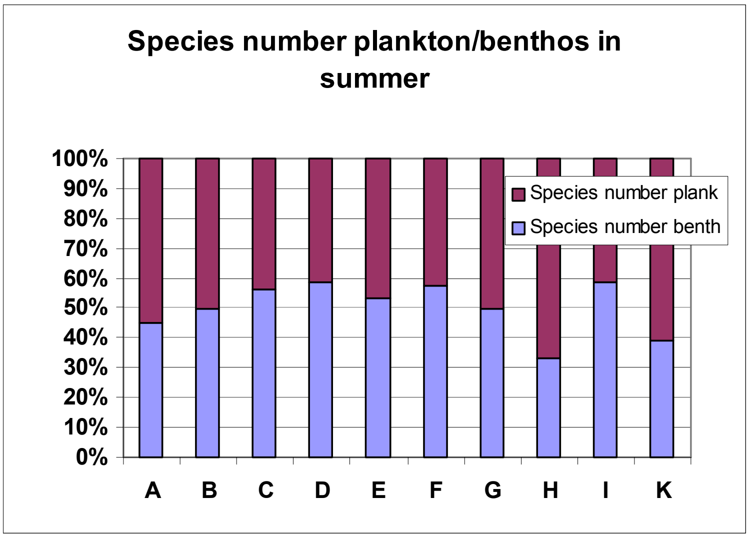
Variable water bodies adjoined to the river-bed fulfill the very powerful function such as a refuge and the place of feeding for juvenile fishes, amphibian, birds and many insects. In common it is the part of the organic matter transformation system and the nutrient supplies' regulation. These water bodies keep a water supply in the floodplain to the middle of summer. The river floodplain occupies a certain position along longitudinal gradient of the river system in total. Floodplains are themselves the large-scale complex gradient between river- channel and upland within, which are mosaic of vegetation types with a variety of lotic and lentic water bodies. The gradient zonation approach should be viewed only as a generalization, but it gave some useful idea about a river /floodplain system work.
A flooding as natural disturbance is a necessary element of the river system function. Thanks that, the system changes with nutrients, «cleaned» one zones and «fertilized» other. A flooding sustains a habitat type diversity, spatio-temporal heterogeneity and supports a high level of the biodiversity and the species richness.
Transition zones along the water bodies' gradient regulate fluxes of matter and energy both between adjacent ecosystems (bottom/water column; water/vegetation, etc.) and across the floodplain (Nagorskaya, Laenko, 1991).
A lot of processes in the water give in sum two main directions for the matter and energy exchange. There are a sedimentation provided with a plankton block and a flux from the bottom to the water column provides with benthic block's populations (matter transformation and bioturbation, destruction/resuspension).
For example, in spring (see Fig.53) the species number of zooplankters was less (35-45%) than zoobenthic species. In summer benthic species decreased in comparison with spring but plankton species increased in number. It could

mean that in spring the destruction processes on ecosystems investigated were prevalent but in summer nutrients in water column gave suitable situation for the algae and plankton production.

Figure 53
Teh relation (%) between plankton/benthos species number (N/m^2) in different biotopes of the floodplain waterbodies.
A = spring
B = summer



A



B

Undoubtedly, the data clause in biomass would demonstrate more realistic relations in terms of the matter and nutrients exchange but this should be a subject of a special analyses.
Benthic macroinvertebrates are important in structure and function of river system because of their role in the food web, productivity and decomposition, nutrient cycling (Nagorskaya, 1988; Zhukova, Nagorskaya, 1994).
The processes in the river floodplain demonstrate the relationship between different local patches across a landscape scale. The landscape diversity is one of the reason of the biotope diversity in water bodies and these in their term, the species richness/ or biodiversity. From this point of view the floodplain is a part of total river system and the essential powerful element of its normal function.

5.6 Conclusions

- 797 species from different groups were identified in total (287 were plankton and 510 benthos species). The most numerous taxa was Insecta (41%, second place kept Rotifera (26%) and the next one was Crustacea (14%).
- The average value of the total species number per pool had significant differences ($p<0,05$) between spring and summer samplings and was equal 131 and 105 species, correspondingly. These differences were because of larger portion of the benthic species in spring.
- It was found 21 rare and 3 new species into the fauna composition the Pripyat River floodplain water bodies.
- In spite of the theoretical possibility to find a lot of new species the high level of species richness of the Pripyat floodplain water bodies is beyond any doubt.
- The dominant species complex (to 75% of the community's abundance) was selected in accordance with the water bodies type/ biotope similarities. Basing on the water bodies' type similarities, the dominant complex included 46 and 41 species number in spring and in summer, correspondingly. Among them were 15 species/groups common for both seasons of sampling. 11 species were Rotifera, 3 groups were Copepods' nauplii and copepodit and 1 species *Ceriodaphnia reticulata* presented of Cladocera. Benthic species have their proper group, which sometimes could be scrutinized as a dominant complex. Along with 7 widespread eurytopic benthic species it was 26 species with specific whereabouts (8 crustaceans, 6 mollusks and 12 insects).
- The habitat requirement approach was used for analyses of our data. A lot of species demonstrated the specific ecotope needs. It is obvious that the habitat requirement approach is perspective for the fauna composition allocation for various habitat types.
- Hydrochemical data and both the species number and an abundance of taxa demonstrated the existence of some water bodies with the distinct underground waters' influence. The analyses of data on separate taxa let to present some groups in accordance with their habitat requirements and ecological preferences along the water bodies' gradient from oxbows situated by a riverbed and influenced by the river regularly to inland water bodies with a soft water.
- In accordance with the biotopes grouping the dominant species were formed for every of four group selected basing on biotopes similarity. The dominant complex' species of a plankton were mainly the small rotifers. They amount to 87% and 89% of total dominant species number in spring and in summer, correspondingly. At the same time there were 10 Cladocera species and *Asellus aquaticus* as well in spring. In summer *Ceriodaphnia reticulata* was the only Cladocera in the dominant species complex. The dominant complex' species of a benthos were mollusks, insects (chironomids, bugs and beetles), crustaceans (ostracods and *Gammarus lacustris).* The very specific occurrence demonstrated 29 from 47 dominant species in spring and 27 from 38 dominant species in summer (species from the only group of biotopes). On the other hand the widespread dominant species were 6 from 47 in spring and 4 from 38 in summer.
- It was great differences between the season fauna composition and the community abundance. The most probable reasons of season differences were the life cycles of separate species associate with habitat requirements, food conditions and predators' pressure level.

- Basing on the alpha- and beta-diversity indices we could divide all line of the water bodies investigated in three groups. One group is **A - D** and these pools belong to adjacent to riverbed ones. Second group **E – G** are less connected with a main riverbed pools, which partially have patterns of temporary water bodies. At least group **H – K** are more inner water bodies and their fauna comprised both eurybiont and common widespread species and very specific and characteristic ones.
- The species number of zooplankters in spring was less (35-45%) than zoobenthic species. In summer benthic species decreased in comparison with spring but plankton species increased in number. The population density (abundance) of plankton changed in different water pools in 40-70 times more than an analogous value of benthos. In summer the average abundance of zooplankton increased in 10 times more than in spring, whereas this value for benthos decreased in 4 times in comparison with a spring sampling. Taking into account an abundance of species, it could mean that in spring the destruction processes on ecosystems investigated were prevalent but in summer nutrients in water column gave suitable situation for the algae and plankton production.

6 General conclusions

1. Hydrological and ecological links between a riverbed and its floodplain different type water bodies are the central problem to have a knowledge and a comprehension of the way for a normal life and a function of the river.

2. The total area covered with water has been very large in spring 1999 as well as in late summer of 1998. This means that in this area an aquatic ecosystem can have developed during about a year before our sampling period at the end of May.

3. The pojma in May 1999 was very hypertrophic as appears from the thick layers of algae. Most probably the mass decaying of grasses in the flooded area has contributed as much or more to the trophic status of the oxbow lakes than external pollution of the Pripyat. Therefore the situation can change more or less after years with less summer flooding of the pojma than 1996 – 1999. Moreover in years with less high water levels the eutrophication will influence only the oxbow lakes, which have more direct contact with the river. More inland the flooding seem to stimulate the decay of plant material less strongly. The influence of ground and rainwater can be studied only in years with less high water levels. Even than it can be that their influence on oxbow lakes in the pojma is very low, even in the lakes very near to the higher land.

4. Most probably the differences between wet and dry years will enlarge or reduce the available habitat for many species of the oxbow lakes. Without doubt this will lead to great fluctuations in their numbers.

5. Hydrochemical data and both a species number and an abundance of taxa demonstrated the existence of some water bodies with distinct influence by underground waters. The preliminary analyses of data let to present some groups in accordance with their habitat requirements and ecological preferences along water bodies gradient from oxbows situated near a riverbed and influenced by the river regularly to inland water bodies with more soft water.

6. The great differences between the season fauna composition and the community abundance were found. The most probable reasons of season differences were the life cycles of separate species associate with habitat requirements, food conditions and predators' pressure level.

7. The investigation of biota in the floodplain water body's gradient gives a broad perspective to use macrofauna for water quality assessment and a framework for more effective management of river ecosystems. To provide reliable information on species richness is a major information block challenge, which must be met in order to assess priorities in conservation biology.

7 Recommemdations for further investigations

1. **How the results could be used?**
The data obtained could be used as referenced ones to estimate physic-chemical parameters (for example, with Mann-Whitney U Test) and for biotic parameters, which are used successful in many countries. In UK (BMWP) Biological Monitoring Working Party score system works and used of invertebrates data for water quality indication (The New River..., 1994). In USA the benthic macroinvertebtate analyses includes 11 metrics, which provided the assessment of structure (5), the community balance (4) and the function-feeding component (2). They used as percent of dominant taxon, species richness, standing crop (ind/m2), diversity indexes and a biotic indexes bases on percentage between suitable for that arm taxa (Ephemeroptera/ Plecoptera/ Trichoptera / Chironomidae), etc. (Jacobi et al., 1998).
The water quality assessment methods include as a rule diversity indexes (Shannon-Wiener (H'), Margalef, McIntosh (M), Evennes index (E) as well as about 10 biotic ones.
It is necessary to emphasize that every water body needs to select the adequate methods for the situation estimation. The application of some biotic indexes with work in the original situations is a big problem. The lack of some taxa in unsuitable for their life cycles season could be reason for conclusion about pollution because they have high indicator values for some indexes. For that aim it is necessary to have information about normal succession in the pool and life cycles of species from the community.
It seems to be lack the universal index for all type of water ecosystem (or even for one type of ecosystem.). Nevertheless, for concrete ecosystem investigated the significant correlation between species richness and environmental features for the site provide some general indicators (Wright et al., 1998)

2. **What it is necessary to do for the nearest future?**
It is important to carry out the minute and accurate investigations to estimate adequately the fauna diversity in flooding area as well as in the river itself. In this case the species richness should be described through the numerous localities distinguished in habitat quality along the river.
It should be necessary to investigate a fauna of the river and its floodplain water bodies by a monitoring manner (at least one time per month). It should be chosen few number series of water bodies with a substantial exchange of an allochthonic matter from the river, and backwards, from the river floodplain.
The community succession in these few pools during all vegetation season should give more clear idea about both the species richness dynamic and their correlation with environmental parameters.
This sort of data could be helpful for a realization of practical measures to improvement of the environmental quality of European rivers and their floodplains.

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8 Summary

- **Materials**
  The macrofauna of **12 water bodies** in Pripyat river floodplain was investigated in two seasons (spring and summer 1999) in the gradient from oxbows by river to inner pools. It was sampled 45 different biotopes both with both benthos and plankton quantitative samples. Additionally the some number qualitative samples were samples with special methods for separate taxa. Besides, two pools at the bog area were used to compare with floodplain fauna. The morphology, hydrochemy of the water bodies and vegetation were investigated.
  The pool gradient approach was evaluated on the relation between various water fed souses (flooding/ precipitation/ underground waters).
  Extraordinary flooding 1998-99 was a reason of **untypical situation on pojma** and completely different situation in pools in two periods of sampling. The influence of underground water was not very big and flooding and precipitation was prevalent, especially in spring. The area sampled at each of water bodies was very localized but the range of taxa considered was very wide.

- **Hydrochemy**
  Hydrochemy of water bodies investigated was studied in respect of following parameters: temperature, oxygen, pH, conductivity and hardness both total and carbonate, alkalinity, nutrients (PO_4^{3-}, NO_2^-, NO_3^-), and ammonium (NH_4^+).
  Pripyat flood plain waters are characterized by a big amount of organic (humic) matter as well as Fe content from bogs of the river catchment especially after a flooding. The typical feature of waters from the middle part of Pripyat catchment as well as river itself is a deficit of oxygen saturation (40-85%).
  The **decreasing** of pH, conductivity and hardness both total and carbonate were mentioned **along water bodies gradient from river to inner water bodies**. There were a few **exceptions** from that tendency for a few pools, which were differed by the increasing of these parameters. It seems to be the **underground/run-off waters contribution** in water souses feeding at these points.
  pH of water bodies investigated let to characterize them as mild alkaline (6,5-7,5 in spring and 6,2—8,5 in summer) and only bog pools are really acidic waters.
  Pripyat lowland waters are mild mineralized. They belonged to hydrocarbonate-calcium II type. Conductivity of water bodies investigated decreased from oxbows by river to inner pools. It varied in 1,6 time in spring (400-250 uS/cm) and in 10 times in summer (460-54 uS/cm). These values lied in the middle part of the scale for fresh waters.
  The alkalinity decreased from oxbows by river to inner pools within 2,0-3,0 (2,55-3,4 for stations **C2, F2, H**) in spring and 2,0-3,3 (4,6-3,3 for ones) in summer. These increasings probably were provided for run-off waters in the pool patches. In total alkalinity was not changed in a great measure from 60th years.
  The carbonate hardness decreased along the water bodies gradient

mentioned above from 12 to 4 °dH in spring and from 10 to 2 °dH in summer, in the same time localities **B** and **C** had values 11-13 °dH.
The total hardness demonstrated distinct decrease trend from a river to inner pools - bog, changing from 13-15 to 4 ° dH in spring and from 11-18 to 3 ° dH in summer. An excess of values demonstrated again the localities **C1, F2 and H**. So, oxbows by riverbed as well as pools with underground water feeding should be characterised as «medium hard», (in spring especially), while inner pools are «soft» (and even «very soft» for pool **K, L and M**).
The nutrients amount of water bodies investigated confirmed their euthrofic type. Orthophosphates were characterised by considerable high eutrophic value in oxbows situated by a main river channel (**A - D**) and regularly flooded by river waters, especially in spring after flooding (>0,43 - 1,0 mg P/l), while in summer these value dropped down to 0,15-0,25 mgP/l. The inner pools had 0,05-0,25 mg P/l. Phosphorus loading of a system enhanced more than 5 time since 60^{th} years, as result of a meliorate activity in up-river tributaries of Pripyat.
Nitrite and nitrate ions content was high for the points (**E and F**), which were situated in the area with visible anthropogenic impact (water bodies **B, C, E, F** were used as watering-places by herds from villages, and pool E was situated by the ploughed fertilized field).
Ammonium was **missing totally** in all water bodies investigates both in spring and in summer.
The line pools (**C, F, H**), which had the anthropogenic alteration in the past, showed the values, which are close to oxbows by the Pripyat River. It seems to be a reason in the increase of underground water feeding.

- **Vegetation**
  In spring we had to take our samples mostly on places, which were dry in summer. Nearly everywhere coarse organic material was present. The vegetation consisted mainly of helophytes.
  In summer the water had retired into the deeper places, the real oxbow lakes. Coarse organic material was scarce, organic silt present nearly everywhere, often in a layer of more than 5 cm, sometimes more than 30 cm thick. At the stations **A, B** and **C1**, which had been more or less under influence of the river, sand was dominant. The vegetation consisted of regular water plants as Stratiotes, Elodea and Nymphaea. Sometimes there was no vegetation at all and the water level stood lower than the sedges at the banks of the pool.

- **Trophic status of floodplain water bodies**
  Since the parameters of environment define the macrofauna species composition and the abundance of populations, single taxa as well as the specific species complexes could be used as a tool of the indication of the trophic status of systems.
  The pojma in May 1999 was very hypertrophic as appears from the thick layers of algae. Most probably the mass decaying of grasses in the flooded area has contributed as much or more to the trophic status of the oxbow lakes than external pollution of the Pripyat. Therefore the situation can change more or less after years with less summer flooding of the pojma than 1996 – 1999. Moreover in years with less high water levels the eutrophication will influence only the oxbow lakes, which have more direct contact with the river. More inland the flooding seem to stimulate the decay of plant material less strongly. The influence of ground and rainwater can be studied only in years with less high water levels. Even than it can be that their influence on oxbow lakes in the pojma is very low,

even in the lakes very near to the higher land.
The water in nearly all localities at the northern side of the dike and also in the water bodies **F** and **G** directly along the dike at the southern side was in spring and summer **very eutrophic**. The more inland lying water bodies **H, I** and **K** show more advanced succession and are smaller, but appear to be also a little more mesotrophic. However they have still no true mesotrophic community. Also in these systems decaying of organic material is at least as important as production.
The origin of the water seems to play hardly a role in the investigated water bodies: river and deep ground water had nearly the same composition (apart from phosphate); only pool **K** had more or less soft water, but no characteristic chironomid fauna.
Influence of the river seemed to be important in this sense that it caused higher trophy (through decaying material from pojma), sandy instead of organic silt bottom and other vegetation.
Taking into account that true river habitats and true mesotrophic water bodies were not included in the investigations the total diversity of the area is high.
The Chironomidae species numbers were found in Pripyat river main channel and its old ones (De Jonge e.a. 1999) however refer this flowing water with relatively mesotrophic conditions. Taking into account that in our investigations rheophilic species were scarce because of the fact that the river itself was not investigated, and that the meso-/oligotrophic component was nearly lacking, the species number was high. For instance oxbow lakes of rivers in the Netherlands have mostly a much poorer chironomid fauna.

- **Species number total**
  797 species were identified in total **(287** were plankton and **510** benthic species).
  A **zooplankton** of studied water bodies was characterised by a high number of species. A total number of species and specific forms of plankton organisms found us in all research period was **267**, among them **204** species of rotifers, the **25** of copepods, and the **38** of Cladocera.
  It was revealed **43 species of Mollusca** (**29 Gastropoda** and **14 Bivalvia**) during both spring and summer field works season. In spring we found the almost the same species number as in summer: **33** and **37** species respectively. The species list of mollusks according to quantitative samplings consists of near 84% from that of qualitative once. It is concluded that the method of quantitative sampling is capable of producing underestimation species richness and population density values of mollusk inhabiting water bodies in reality without taking into consideration the environmental Mollusca preferences.
  In the water bodies of the Pripyat flood plain **42 Ostracoda** species were identified. That testifies the plenty rich Ostracoda fauna composition. Moreover, *Lepidurus apus* (**Notostraca**), *Gammarus lacustris* and *Synurella ambulans* (**Gammaridae**), *Lynceus brachiurus* (**Laevicaudata)** -as well as numerous *Asellus aquaticus* (**Asellidae**) inhabited the oxbows investigated. So **in total there are 49 species of Crustacea** (without plankton Crustacea).
  1 species of **Hydrozoa** and **4** species of **Turbellaria** were found in the samples.
  Hydrachnella were presented by **48** species. In the water bodies investigated **15** species of **Hirudinea** were found. The total species number of **Oligochaeta** was **21**.
  Chironomidae were presented by **99** species in total. In the same time Chironomidae species are not so rich as at many European countries.

Dragonfly species were unevenly distributed along the studied gradient from river to bog. Eleven species were found in (almost) all sampled habitats. Seven species were insufficiently sampled to draw any conclusions.
The **105** species of water beetles and bugs were found. For the most part they were **Coleoptera** - **82** species: Haliplidae - 7, Noteridae - 2, Dytiscidae - 45, Gyrinidae - 2, Hydrophilidae - 20, Hydraenidae - 4 and Dryopoidae - 2. The water bugs (**Heteroptera**) were represented by **23** species: Corixidae - 9, Notonectidae - 2, Pleidae - 1, Naucoridae - 1, Nepidae - 2, Gerridae - 5, Hydrometridae - 1, Mesoveliidae - 1, Veliidae - 1.
Other Insects taxa were presented by **Ephemeroptera (2), Lepidoptera (3), Syrphidae (53), Chaoboridae (1), Culicidae (9)** and other **Diptera (5** species**).**
Larvae of **10** species of **Amphibia** were found in the floodplain water bodies as well.

- **Rare and new species**
It was found a big enough number of **rare** species in the fauna composition.
The wide variety of favourable habitats in investigated floodplains result in occurrence of a rich fauna of water beetles and bugs. Enough **rare** species in the fauna of Belarus were found among them such as *Hygrotus quinquelineatus*, *Hydrochus ignicollis Motschylsky, Cymatia bonsdorfii*. *Graphoderes bilineatus* and *Notonecta lutea* are under protection in some European countries (Red List).
12 species **(31%)** Ostracoda from water bodies investigated are **rare** for Belarus as well as for some European countries.
The Pripyat-plains and their surroundings form a very interesting habitat for Syrphid-flies. Some of the species found, are considered to be **rare and threatened** on a European level. Examples of these species are *Anasimyia lunulata, Mallota tricolor, M. megilliiformis* and *Eristalis cryptarum*. (Some of these species were only records on sites not included in the research-project for RIZA.)
A very interesting and valuable type of habitat is **the hardwood alluvial forest**, as visited near Hlupin **(D).** This habitat has rapidly disappeared from large parts of Europe during the 20th century, which may explain the **rarity** of some of the species occurring here (i.e. *Mallota tricolor*).
Three Chironomid species are new for science: *Zavreliella spec. nov.*, *Paratanytarsus* spec. nov. and genus nov. (exuviae pt. I). Some others are up to now not or hardly known from Europe*: Cricotopus cf. elegans* and Acamptocladius.
The list of Coleoptera shows many species, which are rare or lacking in the Netherlands. Some of them are also rare in Central Europe and Belarus for instance *Haliplus fulvicollis, Haliplus furcatus*, *Hygrotus quinquelineatus*, *Graphoderes bilineatus* and *Hydrochus ignicollis*.
The Odonata *Sympecma paedisca, Coenagrion hastulatum, Aeshna viridis, Brachytron pratense, Epitheca bimaculata, Somatochlora flavomaculata, Leucorrhinia pectoralis* and *L. rubicunda* are examples of species that are red-listed in some western European countries, while they where common in the transition zone between river and bog.
A few other Insects are rare for the fauna of Belarus as, for example, bug species *Cymatia bonsdorfii* and *Notonecta lutea.*
In a list of plankton invertebrate's 38 species are **new** in the fauna of Belarus. The 84 species of rotifers, the 14 of copepods and the 15 of Cladocera are registered firstly in the water fauna of the National Park

"Pripyatsky".

- **Pools gradient**

  Hydrochemical data and both species number and abundance of taxa demonstrated existence some water bodies with distinct influence by underground waters The preliminary analyses of data let to present some groups in accordance with their habitat requirements and ecological preferences along water bodies gradient from oxbows situated near river bed and influenced by river regularly to inland water bodies with soft water.

  The dominant species complexes (see Appendix 2) were selected for future comparative analyses. The environment gradient between adjacent river ecosystems provide wide range landscape, biotope and biodiversity and are the necessary natural component of the river catchment.

  In a gradient of investigated water-bodies a species number and a density of plankton invertebrates increased regularly along with a distance from the main river –bed in spring. In summer these fluctuations were irregular.

  In the **mollusks** assemblages the bivalve mollusks (f.Pisidiidae) increased in number species in the adjacent part of flood plain zone with the river. We also mentioned there some reophilic mollusks (sporadically). These biotopes (sites **A, B, C**) were situated a very close to the river and as a result such species may colonize these habitats by passive dispersal effected by a number of factors.

  The share of occurrence in the pools branchiate and pulmonate species differs in spring and summer samplings season. The tendency for decreasing the share of occurrence branchiate species was appeared more noticeable in summer season and probably reflects the real situation repeated every year for water bodies in floodplain of the river.

  The total benthos Crustacea species number per pool increased along water bodies gradient **A** □ **K** in spring after flooding. In summer the trend to decrease of species number per pool from riverbed to swampy areas was fixed distinctly. In the same time there are the tendency to increasing of species number with diversity of biotopes per pool.

  4 species of Ostracoda which are **the component of river fauna** were found in the oxbows which have periodically / constant contacts with the Pripyat.

  The typical **river Nematocera** species as found in the main channel of the Pripyat (AquaSense, 1999) are nearly totally **lacking in our samples**. The (last year often and prolonged) flooded pojma is inhabited by Chironomidae species hardly living in the river, but rather common in the oxbow lakes. Interchange between these systems can play a special role in this year.

  The tendency of decreasing of the relative number of reophilic species *Haliplus fluviatilis (Haliplidae), Hygrotus versicolor (Dytiscidae)* and *Gerris paludum (Gerridae)* is shown in gradient of investigated pools from **A** to **K**.

  The species of water beetles: *Haliplus fulvicollis*, *Haliplus furcatus*, *Hydroporus tristis, H. erythrocephalus*, *Graptodytes granularis*, *G. bilineatus*, *Acilius canaliculatus, Enochrus coarctatus*, *Hydrochus brevis* and bugs: *Notonecta lutea* and *Gerris odontogaster* typical for peat-bog were found mainly in the localities **H** and **E**.

  Hydraenidae - *Ochthebius minimus*, *Limnebius truncatulus* and *Limnebius atomus* were found in **H1**) and **F4**. Moreover these species are common in spring ecosystems of Belarus. It may be connected with the certain influence of ground water in these localities.

  It is assumed that the old bed **F** is intermediate among studied water-bodies in sense of ecological conditions (an influence of the Pripyat River) for Coleoptera and Heteroptera as well as for some other Insects.

In summer a number of big predator water beetle and bug species belonging to genera *Dytiscus, Cybister, Acilius, Graphoderes, Hydaticus, Ilybius, Colymbetes, Rhantus, Notonecta, Ilyocoris* increases – 686 specimens (29,0% from Coleoptera, Heteroptera) if compare to spring – 60 specimens only (7,1%).
Oxbows are important **system-forming elements** of a whole natural complex in a range: a river (Pripyat, Neman) – meliorate channels – big stagnant waters (old river beds, flood plain lakes) – small stagnant waters (ponds, temporal pools) – bogs and etc. In them a main body of a water beetle fauna is concentrated.
The analyses of a relative abundance and ecological peculiarities demonstrated distinct **ecological groups** of Ostracoda, which inhabited different water bodied in gradient. They are ubiquist, stagnant waters complexes and species were attracted by more inland soft water bodies.
The nineteen Odonata species could be attributed to **four ecological groups**: river species, flood plain species, bog species (some occurring in the adjacent lagg-zone) and transition species. The last category includes species occurring in the lagg-zone and the adjacent part of the flood plain. This part of the gradient is richest both in species and individual numbers. The four species restricted to this transitional zone are all particularly critical in respect to the vegetation structure of their habitat. The six species typical of the flood plain appear to be restricted to this zone because of the absence of large, eutrophic or open water bodies elsewhere in the gradient.

- **Abundance**
  The population density (abundance) of plankton changed in different water pools in 400 times in spring and more than in 1000 times in summer. These values changed in 10-15 times for benthos. In summer average abundance of zooplankton increased in 10 times more than in spring, but the same value decrease in 4 times for benthos. It could mean that in spring the destruction processes on ecosystems investigated were prevalent but in summer nutrient in water column gave suitable situation foe algae and plankton production.
  Average density values of zooplankton populations were in 10 times higher in summer than in spring. In spring samples rotifers and Cladocera dominated in a number and in summer rotifers and different developmental stages of cyclops were more numerous.
  It was revealed the important links between the species abundance **of mollusks** and their life history pecularities. Mollusks with the one-year life cycle demonstrate mass appearance of young individual in reproduction period (late spring or summer) with simultaneous extinction of adults. . So in this period the quota of juvenile molluscs in population could average up to 54% (for pisidiidae) and 80% (for viviparidae). Consequently the species structure and their changes in mollusk density were determined more by life histories than by water body persistence in particular season. The developing of malacological structure in investigated water bodies also associated with the peculiarities of habitats forming a spatial heterogeneous even within the same pools.
  The population density of Ostracoda assemblages increased from the pools situated near the riverbed to more isolated ones in spring. Its maxim meaning was in the big and diverse oxbows **F, G** and **H**. In summer it was back-directed trend. The maximal population density of Ostracoda was fixed in oxbows by the Pripyat bed.

- **Habitat requirements**
The number of **Syrphidae** species associated with aquatic habitats increases with decreasing influence of the river. Most of the species associated with aquatic habitats found in or near the flood plains are eurytopic and common. A relatively large part of the species associated with aquatic habitats found out of the flood plains is confined to particular habitats and less common.
The data do not reveal a relation between the number of predacious species and the influence of the river.
Species-richness of species associated with dead wood seems to increase with decreasing influence of the river.
The number of eurytopic species is constant with changing influence of the river, while the number of critical species seems to be twice as high on sites out of the flood plains. Possible explanations for the larger number of critical species on sites out of the floodplain might - for instance - be found in the lower extent of hydro- and morphodynamics (higher stability), the less eutrophic character of the water, etc. The larvae or pupae of many Syrphid-species hibernate in soil or litter. Probably they are not capable of surviving long periods of flooding.

- **Season**
In spring the trend shows the species number increasing along pools gradient. And quite the reverse, trend is negative with the distance from the river bed in summer. The total species number per pool had significant differences ($p < 0,05$) between spring and summer samplings.
The greatest species diversity was mentioned in **spring** in water bodies **G** and **H**. It was the sampling sites where the most favorable conditions for mollusks were provided due to high quality physic-chemical factors, which are responsible for species diversity, rich macrophytes development and a high level of photosynthetic activity.
In summer the highest number of species were found in the locality **A, B, C**. These biotopes (sites **A, B, C**) were situated a very close to the river and as a result mollusks may colonize these habitats by passive dispersal effected by a number of factors. The advantageous life conditions in these habitats are related with combination high quality of habitats and hydrochemical properties suitable for mollusks. In summer in the sites from **E** to **K** the probably influence of the considerable decreasing water area or even drying up were the determining factor for malacofauna of these water bodies. In the context of these comments in pools F, K were recorded the relatively low alkalinity, pH, hardness.
The share of occurrence in the pools branchiate and pulmonate **Mollusks** species differs in spring and summer samplings season. The tendency for decreasing the quota of occurrence branchiate species was appeared more noticeable in summer season and probably reflects the real situation repeated every year for water bodies in floodplain of the river.
The greatest species diversity of mollusks was mentioned in **spring** in water bodies **G** and **H**. The mollusk species assemblages demonstrated the increasing of stagnant mollusks species and lacking of reophilic ounces in spring.
In summer the highest number of species were found in the locality **A, B, C**. In summer samplings the bivalve mollusks (f.Pisidiidae) increased in number species as well as some other reophilic species. At the same time both in qualitative and quatitative samples the sites from **E** to **K** demonstrated a relatively low species diversity of mollusks. The probably plausible reason were the combination of the considerable decreasing water area or even drying up and influence of their life history pecularities.

However this general pattern is probably much more complex.
The effect of season sampling on mollusk species number has been studied. The variable domination of mollusks species is appeared one of the characteristic features of sampling seasons. In spring 12 species have been found in more than 5 sampling sites of which only 4 (*Lymnaea stagnalis, Planorbarius corneum, Viviparus contectus* and *Bithynia tentaculata*) occurred in 50% of our sampling habitats in summer.
The mollusk species assemblages demonstrated the increasing of stagnant mollusks species and lacking of reophilic ounces in spring. In summer samplings the bivalve mollusks (f.Pisidiidae) increased in number species as well as some other reophilic species (in the sampling sites **A, B, C**).
There are great differences between the fauna chironomid of spring and summer. Probably more predation in summer and more decaying plant material in spring are the main causes. Within one water body more or less ground or rainwater can cause locally great differences in chironomid fauna.
Summarizing, we could emphasize the importance of seasons for the community composition, the total species number and their abundance in the floodplain water bodies.

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