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ECOLOGICAL AND FAUNISTIC REVIEW OF GROUND BEETLES (COLEOPTERA, CARABIDAE) IN GOMEL URBOCENOSIS (THE REPUBLIC OF BELARUS)

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Ecological and Faunistic Review of Ground Beetles (Coleoptera, Carabidae) in Gomel Urbocenosis (Republic of Belarus). Halinouski, M. H., Krytskaya, A. M. — The results of our own investigations as well as the literary data about ground beetle fauna of Gomel' city are summarized in the article. The assessment of species composition and a wide range of carabidocomplexes ecological parameters have been examined. 131 ground beetles species have been detected for urbancenosis of Gomel' city (41 per cent of species registered on the territory of the Republic of Belarus). In general, ground beetles of Gomel' city are presented quite well in the Palearctic and their communitites are basically composed of field, meadow, and forest mesophilous and mesoxerophilous species but small in size populations in urbancenosis.

K e y w o r d s: ground beetles, Gomel' city, urbocenosis, hygropreferendum, biopreferendum, life-form of imago

Эколого-фаунистический обзор жужелиц (Coleoptera, Carabidae) урбоценозов города Гомель (Республика Беларусь). Галиновский Н. Г., Крицкая А. Н. — Обобщены результаты, как собственных исследований, так и литературные данные о фауне жужелиц города Гомель. Проанализирован видовой состав и рассмотрен ряд экологических параметров карабидокомплексов. Для урбоценозов города Гомель выявлен 131 вид жужелиц (41 % видов, зарегистрированных на территории Беларуси). Сообщества жужелиц в урбоценозах Гомеля представлены видами, широко распространёнными в Палеарктике, но состоят в основном из небольших по величине популяций полевых, луговых и лесных мезофильных и мезоксерофильных видов.

К л ю ч е в ы е с л о в а: жужелицы, город Гомель, урбоценоз, гигропреферендум, биопреферендум, жизненная форма имаго.

Introduction

The carabids is a big family of Coleoptera, which includes about 3000 species in Europe and c. 30000–50000 species in the world (Aleksandrovich, 2004). There are 314 species of this family fixed in Belarus (Aleksandrovitch et al., 1996; Tsinkevich, Aleksandrovich, 2002). Being a very important component of ground and soil ecosystems, ground beetles play a significant role in the process of regulation a number of various invertebrate herbivore species, including pests of agriculture and forestry. Besides that, ground beetles are considered a rather effective indicator of human influence on the environment (Avgin, Luft, 2010). Members of the family can also be used as a model in a range of ecological researches of urban habitats, for example, for assessment of changes which occur in carabidocomplexes while advancing along the urbanization gradient (Niemelä, Kotze, 2009). The special significance is given to the study of ground beetles inhabiting cities, the places of human compact residence, as one of the elements of urban ecosystem stability.

Gomel' is the second largest city in Belarus. Its population is 500,000 people. However, almost no works dedicated to the complex study of its Coleoptera fauna except some articles and abstracts of the conferences, have been published. The works by Molodova (1990, 1991, 1994; Molodova, Kovderko, 1997) significantly contributed to the study of Coleoptera in communities directly in the city of Gomel. These works allowed

making preliminary assessment of ground beetle composition in invertebrate communities in the city of Gomel. At the same time the suburban invertebrate communities, especially meadows studied in detail (Veremeev, 2009). The authors made several attempts partially to fill up the gap in the study of ground beetles species composition of Gomel' fauna (Halinouski, 2010, 2012; Samarchanka et al., 2010). The issue of the complex ecological and faunistic assessment of ground beetles fauna in the city remains important.

Material and methods

This study was carried out from 2006 to 2013 on 22 sites within the boundaries of the city of Gomel. The sites were united into 4 urbancenosis groups: urban lawns, parks and recreational forests, water bodies shores (Sozh River, water reservoir), and industrial zone (fig. 1). Ground beetles were collected in soil traps made of polystyrene cups 0.25 l (diameter 72 mm) with 9 % acetic acid solution. Besides the data received by Molodova (1990, 1991, 1994; Molodova, Kovderko, 1997), and the data previously published by the authors (Halinouski, 2010, 2012; Samarchanka et al., 2010) are used. Nomenclature follows the Catalogue of Palaearctic Coleoptera (Catalogue…, 2003).

Species composition, domination structure, hygropreferendum and biotopical distribution as well as imago ground beetles life forms characteristic for the ecological and faunistic assessment were studied. The following classes of ground beetles abundance are distinguished to assess the dominance: dominants — species with abundance more than 5 %, subdominants — from 2 to 5 %, recedents — from 1 to 2 %, subrecedents — species with abundance lower than 1 %. The range of imago ground beetles life forms is given in accordance with the system of I. Ch. Sharova (1981).

Results and discussion

As the result of study the ground beetles species composition in 4 urbocoenosis types in the city of Gomel as well as in the result of our own collecting and by the analysis of the existing publications, we record 131 species of 43 genera for the city fauna (table 1). It is 61 % from all ground beetles species found in the Polessko-Pridneprovskiy Geobotanical District (Aleksandrovitch et al., 1996; Tsinkevich, Aleksandrowich, 2002). It should be noted that 22 species from the list (table 1) are known only for the fauna of the city according to the literature. It is also necessary to say that in the result of the analyses made by V. A. Tsinkevich and O. R. Aleksandrowich the species *Agonum moestum* (Duftschmid, 1812), recorded by Molodova (1991; Molodova, Kovderko, 1997) for the city fauna, was a misidentification of *Agonum afrum* (Duftschmid, 1812) and we included the latter species on the list.

Genera *Amara* (18 species), *Bembidion* (13), *Harpalus* (14), *Pterostichus* (10), and *Carabus* (8) are the most widespread in terms of species in Gomel' fauna (table 1). It can be explained for lots of areas of open space in the studied city.

U r b a n l a w n s. On six studied city lawns the species richness varied from 9 ground beetles species at the well-kept regularly mown lawn in the microdistrict "Zapadniy" to 41 species on the lawn not fat from the technical university, which is not regularly mown. *A. aenea, B. bullatus, B. cephalotes, C. ambiguus, C. erratus, C. fuscipes, C. melanocephalus, H. affinis, H. latus, H. rubripes, H. rufipes, H. tardus, P. cupreus, P. lepidus, P. versicolor, Pt. melanarius* (table 1) dominated. It should be noted that species *H. rufipes* dominated on 5 from 6 studied lawns and it was a subdominant on one of them. *B. cephalotes, C. fuscipes, H. rubripes* and *P. Versicolor* dominated on 3 stationary sites from 6. All of these types tend to be at open space of meadows and fields and their dominance on the lawns is understandable. Besides, single specimens of species *C. cancellatus* were found on the lawn located on the territory of the kindergarten. This species is included in the Red Book of the Republic of Belarus.

High information diversity (ranges from 1.71 on the lawn of microdistrict "Zapadniy" to 2.86 at the technical university campus) is not characteristic for most of the researches. Against the background of a low dominance concentration and relatively high uniformity (table 2) it can speak of a certain constancy and favourable habitat conditions for species that prefer open spaces. In our opinion, a range in ground beetles number is connected both with isolation of their territories and regular exposure on them by the city public utilities and residents.

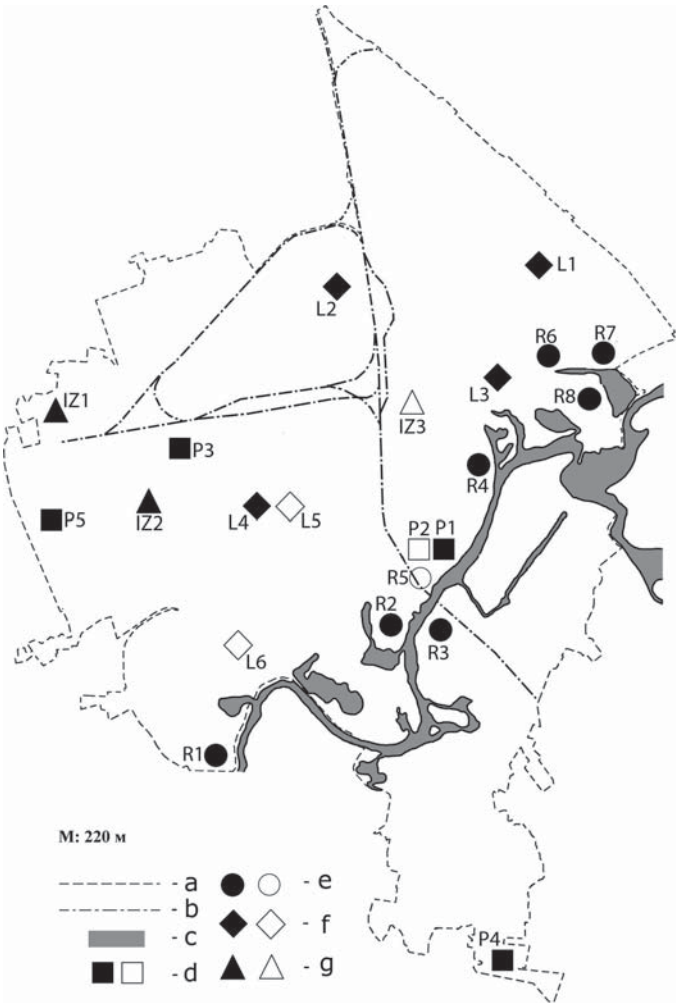

Fig. 1. The sites where ground beetles were collected: a — the city border; b — the railway; c — the river Sozh; d — parks (P1 — Central park, conservation zone; P2 — Central park, recreational zone; P3 — park "Festivalniy"; P4 — suburban recreational forest "Criystall"; P5 — suburban recreational forest "Solnechniy"); e — river bank (R1 — city border; R2 — Novobelitskiy bridge; R3 — city beach; R4 — recreation area "Proletarskiy lug"; R5 — highland in the neighbourhood of Central park; R6 — water body shore in Kamenschikov str.; R7 — water body shore in Makaenka str.; R8 — water body shore in Kozhara str.); f — city lawns (L1 — microdistrict "Melnikov lug" lawn; L2 — GSU named after F. Scorina campus lawn; L3 — lawn along motorway in Mazurova str.; L4 — a well-kept lawn of microdistrict "Zapadniy"; L5 — kindergarten lawn; L6 — lawn in front of GSTU named after Sukhoy); g — an industrial zone (IZ1 — Gomel Chemical Plant phosphogypsum dumps area; IZ2 — a site of the outside area of plant "Tsentrolit"; IZ3 — a site of the outside area of plant "Gomselmash"). The filled figures are the authors' collecting; the hollow ones are the literary data.

Рис. 1. Места сбора жужелиц: a — граница города; b — железная дорога; c — р. Сож; d — парки (P1 — Центральный парк, охранная зона; P2 — Центральный парк, зона рекреации; P3 —парк «Фестивальный»; P4 — пригородный лес реабилитационно-оздоровительного центра «Кристалл»; P5 — пригородный лес зоны отдыха «Солнечный»); e — берег реки (R1 — граница города; R2 — Новобелицкий мост; R3 — городской пляж; R4 — зона отдыха «Пролетарский луг»; R5 — возвышенность по соседству с Центральным парком; R6 — берег водоёма на ул. Каменщиков; R7 — берег водоёма на ул. Макаёнка; R8 берег водоёма на ул. Кожара); f — городские газоны (L1 — микрорайон «Мельников луг», газон; L2 — газон в кампусе ГГУ им. Ф. Скорины; L3 — газон вдоль трассы на ул. Мазурова; L4 — ухоженный газон в микрорайоне «Западный»; L5 — газон на территории детского сада; L6 — газон перед ГГТУ им. П. О. Сухого); g — индустриальная зона (IZ1 — Гомельсикй химический завод в зоне фосфогипсовых отвалов; IZ2 — площадка на территории завода «Центролит»; IZ3 — площадка на территории завода «Гомельмаш»). Заштрихованные области рисунка — места сборов авторов, незаштрихованные области — результаты из литературных источников).

Table 1. Ground beetles species composition and abundance (%) in Carabidocomplexes in Gomel' city

Таблица 1. Виды жужелиц и их численность (%) в карабидокомплексах г. Гомель

Species	L1	L2	L3	L4	L5	L6	P1	P2	P3	P4	P5	R1	R2	R3	R4	R5	R6	R7	R8	IZ1	IZ2	IZ3
Acupalpus flavicollis (Sturm, 1825)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acupalpus meridianus (Linnaeus, 1761)*	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0
Agonum afrum (Duftschmid, 1812)*	0	0	0	0	0	0.3	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0
Agonum fuliginosum (Panzer, 1809)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Agonum impressum (Panzer, 1796)	0	0	0	0	0	0.3	0	0	0.2	0	0	1.8	2.1	1.4	0	0.7	0	0	0	0	0	0
Agonum sexpunctatum (Linnaeus, 1758)	0	0	0	0	0	0	0	0	0.2	0	0	0.7	1	1.1	0	0	0	0	0	0	0	0
Agonum versutum Sturm, 1824	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0
Amara aenea (DeGeer, 1774)	6.9	0	0.5	0	0.3	7.5	1.6	0	2	0	1.7	0.3	5.3	0.8	1.9	1.1	0.3	0.4	6.9	0	0.5	0
Amara aulica (Panzer,1796)	0	0	0	0	0	0.2	0	0	1.2	0	1.7	0.2	0	1.1	1.9	0	0	0	0	0	0	0
Amara bifrons (Gyllenhal,1810)	0	0	0.2	0	0	0	0	0	0	0	0.8	0	0	0	0	0	0	0	0	0	0.2	0
Amara brunnea (Gyllenhal, 1810)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amara communis (Panzer, 1797)	0.5	0	0.9	0	0	2.1	0.4	0	2.2	0	0	0	0.5	0	1.2	0	0.3	0	0.5	0	0.9	0
Amara eurynota (Panzer, 1796)*	0	0	0.3	0	0	0.3	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0.3	0
Amara famelica C. Zimmermann, 1832*	0	0	0	0	0	0.3	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0
Amara familiaris (Duftschmid, 1812)*	0	0	2.8	0	0	2.1	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	2.8	0
Amara fulva (O.F. Müller, 1776)	0	0	0.2	0	0	0.2	0	0	0.1	0	0	0.1	0.8	0.5	8.8	0	0	1.1	0	0	0.2	0
Amara ingenua (Duftschmid, 1812)*	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0.8	0	0	0	0	0
Amara majuscula Chaudoir, 1850	0	0	0.8	0	0	0.3	0	0	0.2	0	0	0	0	0	0	0	1.3	0.4	0	0	0.8	0
Amara nitida Sturm, 1825*	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amara ovata (Fabricius, 1792)*	0	0	0	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amara plebeja (Gyllenhal, 1810)	0	0	0	0	0	0.3	0	0	0	5.4	1.7	0.1	0.1	0.3	0	0	0	0	0	0	0	0
Amara similata (Gyllenhal, 1810)*	0	0	0	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amara spreta Dejean, 1831*	0	0	0.3	0	0	2.1	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0.3	0
Amara tibialis (Paykull, 1798)	0	0	0.5	0	0	0.3	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0.5	0
Amara tricuspidata Dejean, 1831*	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anchomenus dorsalis (Pontoppidan, 1763)	0	4.3	0	0	0	0	0.1	16.8	0.1	0	0	0.1	0.1	0	0	0	0	0	0	4.3	0	0
Anisodactylus binotatus (Fabricius, 1787)	0	0	0.5	0	0	1.3	0	0	1.2	0	0	0	0	0	0	0	0	0	0	0	0.5	0
Anisodactylus signatus (Panzer, 1796)	0	0	0.8	0	0	0.1	0	0	2.0	0	0	0	0	0	0	0	0	0	0	0	0.8	0
Anthracus consputus (Duftschmid, 1812)	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0	0
Asaphidion flavipes (Linnaeus,1761)	0	0	0	0	0	0	0	0	0	0	0	0.6	0.3	0.9	1.2	0	0	0	0	0	0	0
Badister bullatus (Schrank, 1798)	0	6.4	0	0	0	0	0	0	0.2	0	0	0.1	0.1	0	0	0	0	0	0	6.4	0	0
Badister lacertosus (Sturm, 1815)	0	0	0	0	0	0	0	0	0	0	0	0.1	0.4	0.2	0	0	0	0	0	0	0	0
Badister peltatus peltatus (Panzer, 1796)	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0
Badister unipustulatus (Bonelli, 1813)	0	2.1	0	0	0	0	0	0	0.2	0	0	0	0	0.2	0	0	0	0	0	2.1	0	0
Bembidion andreae Fabricius, 1787	0	0	0	0	0	0	0.1	0	0	0	0	1	5.3	5.8	0	0	0	0	0	0	0	0
Bembidion articulatum (Panzer, 1796)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bembidion assimile Gyllenhal, 1810	0	0	0	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0
Bembidion azurescens azurescens (Dalla Torre, 1877)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bembidion biguttatum (Fabricius, 1779)	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0
Bembidion bipunctatum bipunctatum (Linnaeus, 1761)	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0
Bembidion doris (Panzer, 1796)	0	0	0	0	0	0	0	0	0	0	0	1.2	0.1	5.0	0	0	0	0	0	0	0	0
Bembidion femoratum femoratum Sturm, 1825	0	0	0	0	1.5	0	0.2	0	0	0	0	0	0	0	0	0.7	0	0	0	0	0	0
Bembidion lampros (Herbst, 1784)	0	0	0.8	0	0	2.1	0.7	0	0.2	0	0	3.8	5.9	3.6	0	0	0	0	0	0	0.8	0

Bembidion properans (Stephens, 1828)	0	0	0	0	0.3	0.6	0.7	0	0	0	0	5.6	4.4	1.6	0	0	0	0	0	0	0.3	0.6
Bembidion quadrimaculatum quadrimaculatum (Linnaeus, 1761)	0	0	0	0	0	0.3	0	0	0.2	0	0	1.6	1.8	6.5	0	0	0	0	0	0	0	0.3
Bembidion varium (Olivier, 1795)	0	0	0.2	0	0	0	0	0	0.2	0	0	2.5	0.5	2.8	0	0	0	0	0.2	0	0	0
Bembidion velox (Linnaeus, 1761)	0	0	0	0	0	0	0	0	0	0	0	0.7	0.3	0.6	0	0	0	0	0	0	0	0
Blemus discus discus (Fabricius, 1792)*	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Blethisa multipunctata multipunctata (Linnaeus, 1758)	0	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	0	0
Broscus cephalotes (Linnaeus, 1758)	0.9	0	3.0	34.4	15.3	7.8	3.2	0.9	1.6	0	1.7	0	0.1	0	10.0	73.6	0.9	0	3.0	34.4	15.3	7.8
Calathus ambiguus ambiguus (Paykull, 1790)	0	0	13.9	0	0	8.2	0	0	1.2	0	0	0	0	1.2	0	0	0	0	13.9	0	0	8.2
Calathus erratus erratus (C.R. Sahlberg, 1827)	3.7	0	0	6.3	0	0	22.0	40.4	0	2.7	0	6	1.1	1.6	11.2	0	3.7	0	0	6.3	0	0
Calathus fuscipes fuscipes (Goeze, 1777)	17.1	0	4.7	25.0	0	9.5	19.4	0	10.9	2.7	5	18.8	3.4	9.8	1.9	0	17.1	0	4.7	25.0	0	9.5
Calathus melanocephalus melanocephalus (Linnaeus, 1758)	0	0	3.8	0	18.3	2.1	0	0	4.1	0	0.8	0.1	0.1	0.6	0.4	0.9	0	0	3.8	0	18.3	2.1
Calathus micropterus (Duftschmid, 1812)	2.3	0	0.3	0	0	0	1.1	0	0	0	0.8	0.7	2.1	1.2	0.4	0	2.3	0	0.3	0	0	0
Calosoma auropunctatum auropunctatum (Herbst, 1784)	0.9	0	0	0	0	0	0.1	0	0.2	0	0	0	0	0	0	0	0.9	0	0	0	0	0
Calosoma inquisitor inquisitor (Linnaeus, 1758)*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calosoma investigator investigator (Illiger, 1798)	0	0	0	0	0	0	0	0	0	5.4	0	0	0	0	0	0	0	0	0	0	0	0
Carabus arcensis arcensis Herbst, 1784	0.5	0	0	0	0	0	0	0	0	0	0.8	0	0	0	0	0	0.5	0	0	0	0	0
Carabus cancellatus cancellatus (Illiger, 1798)	0	0	0	0	0.5	0	0	0	0	0	1.7	0	0.1	0	0	0	0	0	0	0	0.5	0
Carabus coriaceus coriaceus Linnaeus, 1758	0	0	0	0	0	0	0	0	0	10.8	0	0	0	0	0	0	0	0	0	0	0	0
Carabus glabratus glabratus (Paykull, 1790)	0	0	0	0	0	0	0	0	0	0	2.5	0	0	0	0	0	0	0	0	0	0	0
Carabus granulatus granulatus Linnaeus, 1758	0.9	0	0	0	0	0.3	1.3	0.5	2.8	0	0	2.6	2.7	0.9	0.8	0	0.9	0	0	0	0	0.3
Carabus hortensis hortensis Linnaeus, 1758	0	0	0	0	0	0	0	0	0	0	6.7	0	0	0	0	0	0	0	0	0	0	0
Carabus nemoralis nemoralis O.F. Müller, 1764	0.5	0	0	0	0.5	0	3.7	0	0	37.9	27.7	0	0.3	0	0	0	0.5	0	0	0	0.5	0
Carabus violaceus violaceus Linnaeus, 1758	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0
Chlaenius nigricornis (Fabricius, 1787)*	0	0	0	0	0	0	0	0	0.9	0	0	0	0	0	0	0	0	0	0	0	0	0
Chlaenius nitidulus (Schrank, 1781)	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0
Chlaenius tibialis Dejean, 1826	0	0	0	0	0	0	0	0	0	0	0	0.4	0.3	0	0	0	0	0	0	0	0	0
Chlaenius tristis tristis (Schaller, 1783)	0	0	0	0	1.0	0	0.1	0	0	0	0	3.7	2.9	6.7	0.8	0	0	0	0	0	1.0	0
Chlaenius vestitus (Paykull, 1790)	0	0	0	0	0	0	0	0	0	0	0	0.1	0.7	0.5	0	0	0	0	0	0	0	0
Cicindela campestris campestris (Linnaeus, 1758)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cicindela hybrida hybrida Linnaeus, 1758	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clivina fossor fossor (Linnaeus, 1758)	0	0	0	0	0.3	0.3	0	0	0.3	0	0	0.8	1.8	0.9	0	0	0	0	0	0	0.3	0.3
Cychrus caraboides (Linnaeus,1758)	0	0	0.2	0	0	0	0	0	0	0	4.2	0	0	0	0	0	0	0	0.2	0	0	0
Cylindera germanica germanica Linnaeus, 1758	0	0	0.5	0	0	0.6	0	0	0	0	0	0	0	0	0	1.6	0	0	0.5	0	0	0.6
Dolichus halensis (Schaller, 1783)	0	0	0	0	0	0	2.4	0	1.2	0	0	0.1	0	0	0	0	0	0	0	0	0	0
Dyschirius arenosus (Stephens, 1827)	0	0	0	0	0	0	0.1	0	0.1	0	0	2	6.0	1.1	0	0	0	0	0	0	0	0
Dyschirius intermedius Putzeus, 1846	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0
Elaphrus riparius (Linnaeus, 1758)	0	0	0	0	0	0	0.1	0	0	0	0	0.1	0.4	0	0	0	0	0	0	0	0	0
Elaphrus uliginosus Fabricius, 1792	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0
Harpalus affinis (Schrank, 1781)	0.5	0	5.0	0	1.5	2.0	0	0	2.0	0	0	0	0.1	0.3	4.2	0	0.5	0	5.0	0	1.5	2.0
Harpalus anxius (Duftschmid, 1812)	0	2.1	0	1.6	0	0	0.8	0	0	0	0	0	0	0.9	1.2	0	0	2.1	0	1.6	0	0
Harpalus calceatus (Duftschmid, 1812)*	0	0	0	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
Harpalus distinguendus distinguendus (Duftschmid, 1812)	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0.8	0	0	0	0	0	0	0
Harpalus flavescens (Piller et Mitterpacher, 1783)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7.7	0	0	0	0	0	0	0
Harpalus griseus (Panzer, 1796)	0	0	0	1.6	3.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.6	3.6	0
Harpalus latus (Linnaeus, 1758)	0	0	2.0	6.3	0	0	1.8	0	0	0	0	0	0	0	11.2	2.8	0	0	2.0	6.3	0	0
Harpalus laevipes (Zetterstedt, 1828)	0	0	0	0	0	0	0	0	0	0	0	0.1	0.3	0	0.4	0	0	0	0	0	0	0

Species	L1	L2	L3	L4	L5	L6	P1	P2	P3	P4	P5	R1	R2	R3	R4	R5	R6	R7	R8	IZ1	IZ2	IZ3
Harpalus rubripes (Duftschmid, 1812)	24.1	31.9	3.4	18.5	0	1.7	0.7	0	0.1	0	13.4	0.2	0.1	0	9.1	1.1	0.3	24.1	31.9	3.4	18.5	0
Harpalus rufipes (DeGeer, 1774)	33.3	23.5	13.9	4.7	30.5	7.3	4.8	0	12.6	5.4	0	1.7	2.9	6.5	6.1	3.4	13.1	33.3	23.5	13.9	4.7	30.5
Harpalus smaragdinus (Duftschmid, 1812)	0	0	0.5	0	0	0	0.1	0	0	0	0	0.4	0	0.2	1.2	0	0.3	0	0	0.5	0	0
Harpalus solitaris Dejean, 1829	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0
Harpalus tardus (Panzer, 1797)	0	10.6	2.0	1.6	0	2.7	2.2	0	0.2	0	0	0.2	0.1	0.5	15.2	0	1	0	10.6	2.0	1.6	0
Harpalus xanthopus winkleri Schauberger, 1923*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.4	0	0	0	0	0	0
Leistus ferrugineus (Linnaeus, 1758)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leistus terminatus Panzer, 1793	0	0	0	0	0	0	0	0	0	0	1.7	0	0.1	0	0	0	0	0	0	0	0	0
Loricera pilicornis pilicornis (Fabricius, 1775)	0	2.1	0	0	0	0	0.7	0	1.2	0	0	1.2	2.5	4.5	0	1.8	0	0	2.1	0	0	0
Microlestes maurus maurus (Sturm, 1827)	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0
Microlestes minutulus (Goeze, 1777)	0	0	0	0	0	0	0	0	0	0	0	0	0.8	0.8	0	0	0	0	0	0	0	0
Nebria brevicollis (Fabricius, 1792)	0	0	0	0	0	0	0.1	0	0.2	0	0	0.2	0	1.1	1.2	0	0	0	0	0	0	0
Nebria livida livida (Linnaeus, 1758)	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0	0	0	0	0	0	0	0	0
Notiophilus aquaticus (Linnaeus, 1758)	0	0	0	0	0	0.3	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0
Notiophilus palustris (Duftschmid, 1812)	0	0	0	0	0	0	0.1	0	0.3	2.7	2.5	0.1	0	0	0	0	0	0	0	0	0	0
Omophron limbatum (Fabricius, 1777)	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0
Oodes helopioides helopioides (Fabricius, 1792)	0	0	0.3	0	0	0	0.1	0	0.2	0	0	2.7	3.4	4.5	0	0	0	0	0	0.3	0	0
Ophonus puncticollis (Paykull, 1798)*	0	0	0	0	0	0.3	0	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0
Oxypselaphus obscurus (Herbst, 1784)	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0
Panagaeus bipustulatus (Fabricius, 1775)	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0
Panagaeus cruxmajor (Linnaeus, 1758)	0	0	0	0	0	0	0	0	0	0	0	0.6	0.5	1.2	0	0	0	0	0	0	0	0
Paradromius linearis linearis (Olivier, 1795)*	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0
Philorhizus sigma (R. Rossi, 1790)*	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0
Platynus assimilis (Paykull, 1790)	0	2.1	0	0	0.5	0	1.2	18.2	0	0	0	4.1	18.5	7.5	0	0	0	0	2.1	0	0	0.5
Poecilus cupreus cupreus (Linnaeus, 1758)	0	6.4	0.5	0	1.5	1.8	2.7	0	3.3	2.7	0	3.3	0.8	0.6	0	2.7	0	0	6.4	0.5	0	1.5
Poecilus lepidus lepidus (Leske, 1785)	0	0	31.6	0	0	15.2	0	6.6	0.3	0	0	0	0	0	0	0	0	0	0	31.6	0	0
Poecilus versicolor (Sturm, 1824)	7.9	8.5	4.2	0	0.5	15.4	15.6	1.3	14.2	13.5	0.8	17.6	2.6	6.1	0.8	0.9	0	7.9	8.5	4.2	0	0.5
Pterostichus anthracinus anthracinus (Illiger, 1798)*	0	0	0.2	0	0	0	0	0	1.2	0	0	0	0	0	0	0	0	0	0	0.2	0	0
Pterostichus aterrimus aterrimus (Herbst, 1784)	0	0	0	0	0	0	0	0	0	0	0	0.6	1.5	0.5	0	0	0	0	0	0	0	0
Pterostichus macer macer (Marsham, 1802)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0
Pterostichus melanarius (Illiger, 1798)	0	0	0.6	0	22.7	2.1	0	9.7	12.1	0	7.7	0.7	4.9	0.5	0	3.9	0	0	0	0.6	0	22.7
Pterostichus niger niger (Schaller, 1783)	0	0	0	0	0	0.3	6.4	1.2	9.8	10.8	7.7	6.8	5.9	5.1	0.4	3.4	0	0	0	0	0	0
Pterostichus nigrita (Paykull, 1790)	0	0	0	0	0	0	5.4	0	0.2	0	0	0	1.1	0.3	0	0	0	0	0	0	0	0
Pterostichus oblongopunctatus oblongopunctatus (Fabricius, 1787)	0	0	0	0	0.3	0	0	4.3	4.7	0	3.4	0.1	0.1	0	0	0	0	0	0	0	0	0.3
Pterostichus quadrifoveolatus Letzner, 1852	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pterostichus strenuus (Panzer, 1796)	0	0	0.3	0	0	0	0	0	0.5	0	0	1.6	0.3	1.4	0	0	0	0	0	0.3	0	0
Pterostichus vernalis (Panzer, 1796)	0	0	0	0	0	0.3	0	0	0.5	0	0	1.1	1	0.2	0	0	0	0	0	0	0	0
Stenolophus mixtus (Herbst, 1784)	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0.2	0	0	0	0	0	0	0	0
Stenolophus teutonus (Schrank, 1781)*	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0
Syntomus truncatellus (Linnaeus, 1761)*	0	0	0	0	0	0.2	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0
Synuchus vivalis vivalis (Illiger, 1798)	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0
Trechus secalis secalis Paykull, 1790	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total species number	14	11	34	9	20	41	33	11	59	11	22	55	61	47	25	15	18	12	19	55	13	38
Total speciments number	216	47	640	64	393	1658	1479	770	3290	37	119	984	729	643	260	436	400	261	222	1100	92	3041

* Species characteristic to Gomel' city fauna only after the literature data.

Mesophilous and mesoxerophilous species (table 2) dominated by species richness and relative abundance in city lawn carabidocomplexes. We found less xerophilous ground beetles. Hygrophilous and partially mesohygrophilous species are absent on the lawns which are regularly mown (the lawns of residential microdistricts in the city centre). In general, law abundance of the species which tend to moist habitats can be explained by the absence of necessary conditions on the city microdistrict lawns, except those which are situated not far from the water body (the lawn along the motorway) or near the shadowed habitats (GSU campus and kindergarten).

Meadow and largely field species dominated by species richness and number on the city lawns. The percentage of field species was around half of all the species found on the lawns and about 2/3 of all the collected individual ground beetles. The high percentage of meadow and field species is for the members of genera *Harpalus, Calathus* and *Broscus* — which are typical inhabitants of open spaces.

We found ground beetles imago of 11 life forms on the city lawns. Geohortobiontes garpaloid, stratohortobiontes and stratobionets inhabiting the soil-litter dominated in all city lawn carabidocomplexes. Fewer surface-litter stratobiontes and shifty-digging geobiontes were found. A very small amount of epigeobiontes and stratohortobiontes was collected.

Thus, it can be said that carabidocomplexes of the lawns located in Gomel microdistricts consist predominantly of small-sized and medium-sized meadow and field mesophilous and mesoxerophilous which prefer habitat conditions with a sufficiently developed grass cover and a mat of mown grass.

Parks and recreational forests. Ground beetles species richness was also unstable in five carabidocomplexes of city parks and recreational forests. It ranged from 11 ground beetles species in the recreational zone of the Central park and the recreational forest in the south suburb to 59 species in park "Festivalniy". A large number of species in park "Festivalniy" can be explained by the fact that the park is situated far away from densely populated city area, it is visited by a smaller number of citizens and it is less comfortable and there are a lot of sites favourable for ground beetles habitation.

The species such as *A. plebeja, A. dorsalis, C. erratus, C. fuscipes, H. rubripes, H. rufipes, P. lepidus, P. versicolor* strongly attracted to the meadow vegetation of the parks created by man as well as the species which prefer tree plantations (*C. investigator, C. coriaceus, C. hortensis, C. nemoralis, C. violaceus, P. assimilis, Pt. melanarius, Pt. niger, Pt. nigrita*) dominated in recreational forests carabidocomplexes of Gomel. Big ground beetles more often were found in the city suburb. It is here where the species (*C. investigator, C. violaceus*) included in the Red Book of the Republic of Belarus were found as well as the species (*C. coriaceus*) included in the Red Book of the Republic of Belarus and the Red Book of Lithuania. A low information variety is characteristic to most of the studied recreational forest plantations. It says on the background of dominance and uniformity concentration indicators (table 2) that the distribution of ground beetles species and individuals in carabidocomplexes in the parks of the city central part mostly corresponds to logarithmically normal distribution. It can be the evidence of mature enough and diverse complexes which are close to natural. The distribution of species and individuals in carabidocomplexes of recreational forests in the suburb of Gomel' corresponds more to the broken stick model by MacArthur. It can indicate that there is no ground beetles isolation from the forests surrounded the city, which leads to a high uniformity in the studied species communities.

The species richness and number of hygrophilous and mesohygrophilous ground beetles was much higher in park and recreational forest carabidocomplexes than in city lawns complexes and the relative abundance of the collected individuals in some cases was 3 times higher (table 2). There were no hygrophilous species only in the recreational forest of the south suburb. This recreational forest is a dry pine forest and its habitat conditions

Table 2. Ecological groups and some indexes of ground beetles diversity in Carabidocomplexes of Gomel' city

Таблица 2. Экологические группы и некоторые коэффициенты разнообразия жужелиц в карабидокомплексах г. Гомель

Ecological groups	L1		L2		L3		L4		L5		L6		P1		P2		P3		P4		P5		R1		R2		R3		R4		R5		R6		R7		R8		IZ1		IZ2		IZ3	
Hygropreferendum	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A
hygrophilous	0	0	3	6.4	4	0.9	0	0	2	1.5	2	0.6	7	7.6	1	18.2	13	5.3	0	0	1	1.7	17	20.6	22	41.2	14	40.9	1	0.8	2	2.5	0	0	0	0	0	0	11	3.3	0	0	3	0.8
mesohygrophilous	1	0.9	1	4.3	2	0.8	0	0	1	1.5	6	2.7	4	1.8	2	17.3	9	5.6	1	5.4	1	1.7	9	9.7	9	11.8	8	6.7	2	1.9	1	0.7	1	0.5	0	0	0	0	7	1.9	0	0	5	2.8
mesophilous	7	62.5	4	44.6	14	35.8	3	35.9	12	76.1	18	47.6	15	60.0	5	16.6	26	79.0	8	86.5	15	78.1	20	62.2	20	38.1	15	45.6	11	25.8	8	19.3	8	63.2	5	53.3	11	60.4	22	33.8	5	37.0	18	82.1
mesoxerophilous	4	28.7	2	42.6	9	25.9	3	26.6	1	1.5	10	18.3	3	24.9	1	40.4	8	3.7	2	8.1	3	15.1	7	6.8	8	3.4	6	4.8	6	56.5	2	2.8	4	34.3	4	45.6	4	36.5	11	56.2	4	18.4	5	1.3
xerophilous	2	7.9	1	2.1	5	36.6	3	37.5	4	19.4	5	30.8	4	5.7	2	7.5	7	6.4	0	0	2	3.4	2	0.7	2	5.5	4	2	5	15.0	2	74.7	5	2.0	3	1.1	4	3.1	5	4.8	4	44.6	7	13.0
Biopreferendum	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A
riparian	1	0.9	2	4.3	2	0.3	0	0	1	1	2	0.6	6	2.3	1	0.5	11	7.0	0	0	0	0	15	17.8	17	25.4	12	26.6	3	2.7	2	2.5	0	0	0	0	0	0	9	2.7	0	0	2	0.8
peat bog	0	0	0	0	3	0.9	0	0	0	0	2	0.6	2	5.4	0	0	7	2.1	0	0	0	0	7	7.5	9	7.8	7	12.0	0	0	0	0	1	0.5	0	0	0	0	5	0.8	0	0	2	0.7
forest	3	3.2	2	8.5	4	3.0	1	6.3	4	1.8	1	0.3	8	14.5	3	23.6	11	15.4	4	63.2	12	64.7	10	12.5	10	27.8	6	15.4	6	14.6	2	6.2	2	2.5	1	2.3	3	10.0	14	6.4	2	3.3	5	7.3
meadow	3	41.7	4	53.2	11	20.3	3	45.3	5	44.5	16	27.4	8	28.2	3	26.7	16	37.7	3	10.8	6	30.3	12	24.6	12	11.4	8	14.5	7	37.7	6	10.6	8	50.6	5	28.7	7	40.0	12	9.7	4	17.4	12	45.7
field	7	54.2	3	34.0	14	75.5	5	48.4	10	52.7	20	71.1	9	49.6	4	49.2	18	37.8	4	26.0	4	5.0	11	37.6	13	27.6	14	31.5	9	45.0	5	80.7	7	46.4	6	69.0	9	50.0	16	80.4	7	79.3	17	45.5
Life-form of imago	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A
WE	4	2.8	0	0	1	0.2	0	0	2	1.0	1	0.3	3	5.1	1	0.5	3	3.0	3	54.1	7	48.7	1	2.6	3	3.2	1	0.9	1	0.8	0	0	0	0	0	0	1	0.5	6	1.6	2	3.3	4	0.9
SE	0	0	0	0	1	0.3	0	0	0	0	0	0	1	0.1	0	0	1	0.1	0	0	0	0	2	0.7	3	0.8	1	0.9	1	1.2	0	0	0	0	0	0	0	0	1	0.5	0	0	0	0
S–SE	0	0	0	0	1	0.4	0	0	0	0	1	0.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1.7	1	0.3	0	0	0	0	3	2.3	0	0	1	0.1
S	1	33.3	1	23.4	1	14	2	6.3	3	34.4	1	7.3	1	4.8	0	0	1	12.7	1	5.4	0	0	1	1.7	1	2.8	1	6.5	1	6.2	1	3.4	1	13.3	1	28.7	1	18.5	1	20.2	1	28.3	3	26.4
S–CS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.1	0	0	0	0	1	0.1	1	0.1	1	0.2	0	0	0	0	0	0	0	0	0	0	1	0.2	0	0	0	0
S-S	0	0	0	0	1	0.4	0	0	0	0	1	0.3	0	0	0	0	1	0.2	0	0	0	0	1	0.1	1	0.3	0	0	0	0	0	0	0	0	0	0	0	0	2	1.0	0	0	0	0
SLS	0	0	4	14.9	3	1.2	0	0	3	2.8	6	3.9	10	3	1	16.8	20	4.7	1	2.7	1	2.6	21	28.5	21	32.5	16	47.0	2	1.9	3	3.2	1	0.5	0	0	2	2.7	13	6.3	1	1.1	6	1.9
ISLS	3	23.2	1	2.1	5	23.0	2	31.3	2	18.8	4	20.2	5	46.1	3	58.6	6	18.5	2	5.4	4	8.4	10	32.8	10	27.0	9	23.6	4	13.7	1	0.9	4	76.0	3	59.8	4	46.3	11	31.4	2	8.7	4	5.3
ILCS	0	0	0	0	0	0	0	0	0	0	1	0.2	0	0	0	0	2	0.2	0	0	0	0	0	0	2	1	1	0.8	0	0	0	0	0	0	0	0	0	0	1	22.6	0	0	0	0
ILBS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LSBS	1	7.9	2	14.9	5	37.3	0	0	4	25.2	5	34.7	4	30.0	5	23.1	8	46.1	3	27.0	4	19.3	6	28.8	7	16.8	7	13.4	2	1.2	4	10.8	0	0	0	0	1	1.4	7	5.7	2	33.6	6	50.4
S–DG	1	0.9	0	0	1	3	1	34.3	1	15.3	1	7.8	1	3.2	1	1	1	1.6	0	0	1	1.7	0	0	1	0.1	0	0	1	10	1	73.6	1	0.5	1	0.4	1	1.4	1	1.9	1	7.6	1	11.8
DG	0	0	0	0	0	0	0	0	1	0.3	1	0.3	1	0.1	0	0	2	0.4	0	0	0	0	2	2.8	3	7.9	2	2.2	0	0	0	0	0	0	0	0	0	0	1	0.2	0	0	0	0
RP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.1	0	0	0	0
GG	4	31.9	3	44.7	15	20.2	4	28.1	4	2.3	19	24.4	7	7.6	0	0	16	12.2	1	5.4	5	19.3	9	1.7	8	7.5	8	4.5	13	65.0	4	6.4	10	9.5	7	11.1	9	29.2	7	6.0	4	17.4	13	3.2
Total speciments number	216		47		640		64		393		1658		1479		770		3290		37		119		984		729		643		260		436		400		261		222		1100		92		3041	
Total species number	14		11		34		9		20		41		33		11		59		11		22		55		61		47		25		15		18		12		19		56		13		38	
Shannon's index, H'	1.84		1.97		2.44		1.71		1.87		2.86		2.51		1.70		2.93		1.98		2.54		2.99		3.27		3.3		2.67		1.23		1.54		1.57		2.20		2.43		1.94		2.05	
Simpson's index, C	0.21		0.17		0.15		0.21		0.21		0.08		0.13		0.24		0.08		0.17		0.12		0.09		0.06		0.05		0.09		0.55		0.30		0.26		0.15		0.17		0.20		0.20	
Uniformity by Pielou. e	0.7		0.82		0.69		0.78		0.78		0.77		0.72		0.71		0.72		0.83		0.82		0.75		0.80		0.86		0.83		0.45		0.53		0.63		0.75		0.60		0.76		0.56	

Note. S — number of species; A — species relative abundance, %; WE — walking epigeobiontes; SE — shifty epigeobiontes; S–SE — shifty-soaring epigeobiontes; S — stratohortobiontes.; S–CS — shifty-climbing stratobiontes; S–S — stratobiontes; SLS — surface–litter stratobiontes; ISLS — inhabiting soil-litter stratobiontes; ILCS — inhabiting litter and crack stratobiontes; ILBS — inhabiting litter and bark stratobiontes; LSBS — litter and soil burying stratobiontes; S–DG — shifty-digging geobiontes; DG — digging geobiontes; RP — riverside psammokolimbets; GG — geohorbiontes garpaloid.

are favourable for the habitation of species which prefer humid places. At the same time most of ground beetles species and individuals in carabidocomplexes of city parks and recreational forests were mesophilous and to a lesser extent mesoxerophilous. It can be explained by the fact that city tree plantations are landed sparsely.

We found ground beetles imago of 13 life forms in the carabidocomplexes of Gomel parks and recreational forests. Marked at all the studied sites stratobiontes inhabiting the soil-litter, litter and soil burying stratobiontes, surface-litter stratobiontes and walking epigeobiontes (table 2) dominated among them. We collected a smaller number of geohortobiontes garpaloid and stratohortobiontes which prefer grassy vegetation.

Thus, carabidocomplexes in Gomel parks and recreational forests mostly consist of big and medium-sized forest, meadow and field mesophilous and mesoxerophilous species inhabiting the natural cracks and holes of the upper soil horizons and preferring a well-developed litter of hardwood and litter fall softwood.

Riverside complexes. In 8 studied riverside complexes of the river Sozh the number of ground beetles ranged from 12 on the water body shore with a high recreational load to 61 near the bridge across the Sozh River in the city suburb, rarely visited by people. The species preferring open grassy habitats (*A. aenea, A. fulva, A. majuscula, B. lampros, B. properans, B. cephalotes, C. erratus, C. fuscipes, H. flavescens, H. latus, H. rubripes, H. rufipes, H. tardus, P. versicolor*), tree plantations (*P. assimilis, Pt. niger*) and river shores (*Ch. tristis, B. quadrimaculatum, B. andreae, D. arenosus*) dominated due to the fact that riverside vegetation was diverse both by species composition and life forms and projective cover. Besides, *C. erratus* and *H. rufipes* prevailed in 5 of 8 studied riverside communities. Moreover in the studied riverside complexes we collected *D. intermedius, H. solitaris, P. bipustulatus, Ch. tibialis* and *M. maurus*, which can rarely be found on the territory of Gomel' District (Tsinkevich et al., 2014).

Ground beetle information variety increases as the river moves to the city outskirts. But on the background of low dominance concentration and a very intense uniformity we can say that species and individual distribution in all studied complexes (except the suburban) corresponds to the broken stick model by MacArthur (Magurran, 1983). The ground beetle distribution in the riverside carabidocomplexes of the city suburb corresponds to the model of logarithmically normal distribution. It tells us about non-overlapping of ecological niches in almost all studied riverside carabidocomplexes of the River Sozh in the borders of the city of Gomel, except the outskirts, where the species and individuals' distribution is close to natural.

Ground beetles distribution by hygropreferendum in the riverside ecosystems of the River Sozh was irregular and varied. Thus, more than a half of ground beetles species and individuals were hygrophilous and mesohygrophilous in the communities located at riverside sites with running water. A considerable portion of the collected here beetles were also mesophilous (table 2). These peculiarities can be explained by the fact that shore communities here are covered with dense vegetation, the shore is marshy and wet. In contrast, a proportion of water-loving species catastrophically decreases in favour of mesophilous and mesoxerophilous due to intense trampleness and soil compaction on the water body shores and in the recreational zones of microdistricts.

A similar situation is seen, when the ground beetles species distribution in biotopical preference is analyzed. There is a high level of meadow and field species due to the grass growing densely on the shore in all studied carabidocomplexes, but if about one-third of all ground beetles species and individuals are typical inhabitants of riverside ecosystems in the carabidocomplexes adjacent to running water. They are also mixed with a significant portion of forest species thanks to thickets of shrubs and trees. Riparian species are entirely lacking in the area of water body with a high recreational load. The nucleus of such complexes is only meadow and field species.

We found ground beetles imago of 12 life forms in all studied shore carabidocomplexes.

Collected stratobiontes inhabiting the soil-litter, geohortobiontes garpaloid and stratohortobiontes prevailed among them in all sites of collecting (table 2). Surface-litter stratobiontes and shifty-digging geobiontes are slightly inferior to them. Walking and running epigeobiontes were found in the riverside carabidocomplexes of the city suburb where dense bushland with an admixture of trees grow.

Thus, riverside carabidocomplexes of the river Sozh within the city of Gomel consist of medium and small mesophilous, mesoxerophilous and hygrophilous meadow, field and shore ground beetles species, inhabiting a well-developed litter of hardwood and litter fall softwood in the upper soil horizons of the river shore.

Industrial zone. According to the results of the study, we found from 13 ("Tsentrolit" plant) to 55 (Gomel' Chemical Plant phosphogypsum dumps) ground beetles species on the outside territory of industrial enterprises (unmanaged lawns and waste dumps of phosphate fertilizer production) (table 1). Ground beetles which prefer open spaces *B. cephalotes, C. erratus, H. rubripes, H. rufipes, M. minutulus, P. cupreus, P. lepidus, P. versicolor*, *Pt. melanarius* dominated here as well as the inhabitant of forests and parks, but rarely found in meadows *Pt. niger*. At the same time *H. rufipes* prevailed in all studied sites. It should be noted that there is the species *O. limbatum* on phosphogypsum dumps on the territory of the plant. The occurrence of this species likely is due to the presence of the bypass channel which protects the dumps.

All carabidocomplexes of the industrial zone except the species on the territory of plant "Tsentrolit" have a higher index of information variety (table 2). On the background of rather low dominance concentration and uniformity it can say about correspondence of distribution model of logarithmic series (plant "Gomselmash") and logarithmically normal distribution (phosphogypsum dumps). In contrast to them, the species distribution in the carabidocomplex on the territory of plant "Tsentrolit" corresponds to the broken stick model by MacArthur. The detected peculiarities allow us to affirm that the established habitat conditions for ground beetles on the untidy transformed into wasteland lawn of plant "Gomselmash" and specific conditions in the phosphogypsum dumps led the carabidocomplexes of these sites to a stable state. In contrast to them, the lawn of the territory of plant "Tsentrolit" is mown but not regularly and is not isolated with broad asphalt areas; it promotes the availability of free ecological niches and the migration of ground beetles species.

Both the species richness and abundance were well represented by mesophilous in all studied sites of the industrial zone. Besides, we found about half of all recorded species on the lawn of plant "Gomselmash" and we collected more than 80 % of ground beetles individuals (table 2). The portion of xerophilous and mesoxerophilous species was also high on the lawns of plants. At the same time taking into account a high level of presence of mesoxerophilous on dumps of phosphate fertilizer production, the proportion of species which prefer dry habitats was inferior by species richness to hygrophilous and mesohygrophilous. It can also be explained by the presence of the bypass channel on this site. There were no ground beetles which prefer moist habitats on the open well-heated dry lawn of the outside territory of plant "Tsentrolit".It should also be noted that there was a significant dominance of field and to a lesser extent meadow ground beetles species in the carabidocomplexes located on the territory of industrial enterprises. It is explained by the fact that carabidocomplexes are located on open lawn sites transformed into wasteland and phosphogypsum dumps with a small amount of grassy vegetation and with a predominance of several kinds of cereals. The occurrence of forest species can be explained by the presence of a small amount of bushes growing on the studied sites.

We found ground beetles imago of 14 life forms in the carabidocomplexes of industrial zone (table 2). Burying litter and soil stratobiontes, stratohortobiontes, inhabiting the soil-litter stratobiontes, shifty-digging geobiontes, geochortobiontes garpaloid and walking epigeobiontes prevailed. These are mostly (except a small amount of big-sized epigeobiontes) medium and small size ground beetles inhabiting the cracks of the soil, litter and grassy

areas and sandy soils of open spaces.

Thus, carabidocomplexes of industrial enterprises territories of the city of Gomel consist mostly of small and medium size meadow and field mesophilous and mesoxerophilous inhabiting soil cracks and holes among grassy vegetation growing on the outside territory of plants and on the site of fertilizer production waste disposal.

Conclusion

Summarizing of both our own and literature data on Gomel fauna we recorded 131 ground beetles species of 43 genera; among them *Amara*, *Bembidion, Harpalus, Pterostichus* and *Carabus* are characterized by the highest species richness. They consist 41 % of all known ground beetles of Belarus fauna and 61 % of all ground beetles species recorded for Polesskiy and Pridneprovskiy eobotanical district.

In general, ground beetles complexes of the city of Gomel are characterized by large species variety. There are rare and protected species among them. They mostly consist of small and medium size field, meadow and forest mesophilous and mesoxerophilous, which prefer to inhabit a well-developed litter and natural soil cracks.

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