

ÚSTAV LESNICKÉ BOTANIKY, DENDROLOGIE A TYPOLOGIE, LDF MZLU V BRNĚ

NADAČNÍ FOND PROF. AUGUSTA BAYERA

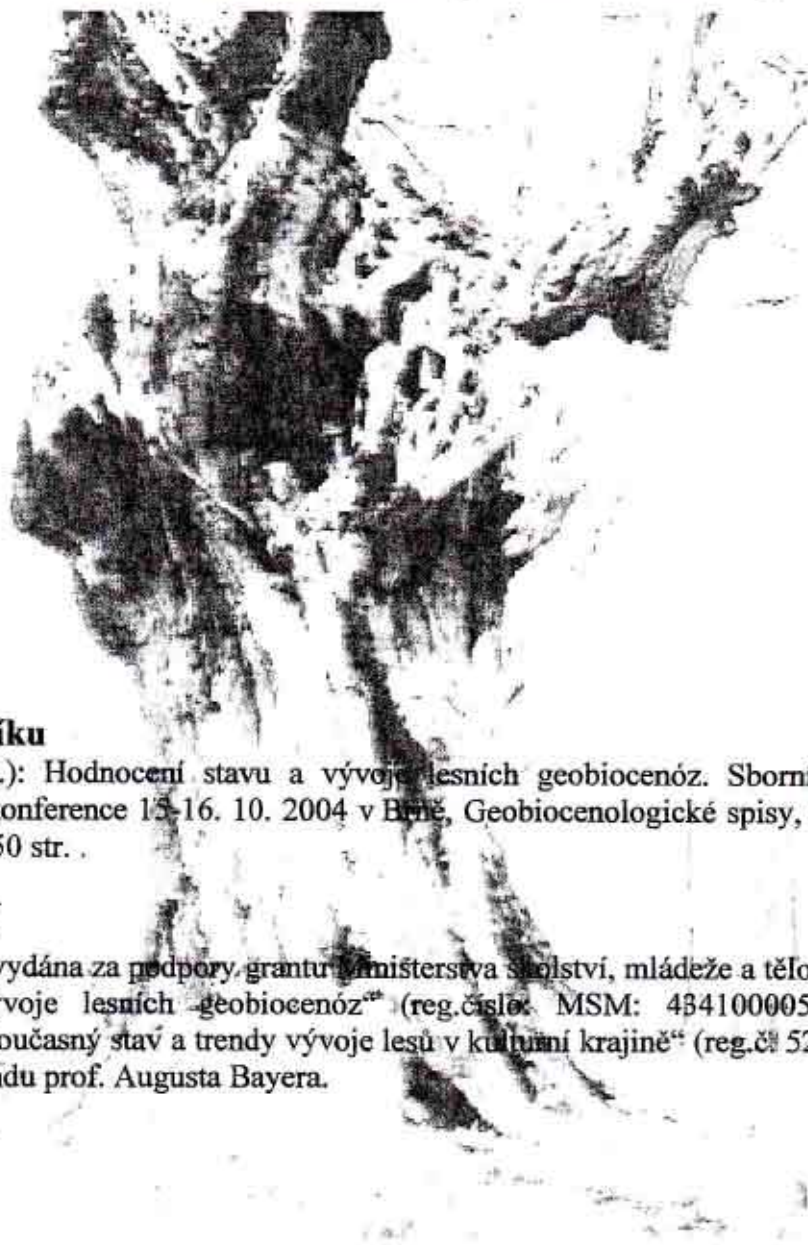
# HODNOCENÍ STAVU A VÝVOJE LESNÍCH GEOBIOCENÓZ

*Sborník příspěvků*  
*Mezinárodní konference konané 15-16. října 2004 v Brně*

k 85. výročí založení univerzity

a

při příležitosti 85. narozenin Doc. Ing. Jaroslava Horáka, CSc.



## **Citace sborníku**

Polehla, P. (ed.): Hodnocení stavu a vývoje lesních geobiocenóz. Sborník příspěvků z mezinárodní konference 15-16. 10. 2004 v Brně, Geobiocenologické spisy, sv.9, MZLU v Brně, 2004, 250 str. .

## **Poděkování**

Publikace byla vydána za podpory grantu Ministerstva školství, mládeže a tělovýchovy ČR „Hodnocení vývoje lesních geobiocenóz“ (reg. číslo: MSM: 434100005), Grantové agentury ČR „Současný stav a trendy vývoje lesů v kulturní krajině“ (reg. č. 526/03/H036) a Nadačního fondu prof. Augusta Bayera.

**CHARAKTERISTIKA VHLKOSTNÝCH NÁROKOV A VZTAHU K VEGETAČNÉMU KRYTU  
VYBRANÝCH DRUHOV STREDOEURÓPSKÝCH BYSTRUŠKOVITÝCH (COL., CARABIDAE)**

**CHARACTERISTICS OF HUMIDITY REQUIREMENTS AND RELATION TO VEGETATION COVER  
OF SELECTED CENTRAL-EUROPEAN CARABIDS (COL., CARABIDAE)**

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**Abstrakt**

Pre 224 druhov stredoeurópskych bystruškovitých (t.j. približne pre polovicu celkového druhového bohatstva) sú vypracované semikvantitatívne charakteristiky analogické tzv. Ellenbergovým číslam vo fytoocenológii vyjadrujúce vzťah bystruškovitých k dvom významným ekologickým faktorom – vlhkosti a vegetačnému krytu (zatienu). Vlhkostné preferendum je vyjadrené 8-člennou číselnou stupnicou (1 – silne xerofilný, ..., 4 mezofilný, ..., 8 – silne hydrofilný). Preferencia vegetačného krytu (zatienu) je vyjadrená 5-člennou stupnicou (1 – druhy bezlesia na stanovištiach s nesúvislým vegetačným krytom – 4 lesné druhy), doplnená o piatu kategóriu zahŕňajúcu niektoré ripikolné druhy, ktoré sa často vyskytujú aj na iných stanovištiach, najmä v lužných lesoch. Tieto stupnice upresňujú verbálne charakteristiky týchto nárokov v literatúre a sú využiteľné pre kvantitatívny opis stavu spoločenstiev a zmien, ktoré v nich prebiehajú.

**Abstract**

Semiquantitative characteristics analogous to the s.c. Ellenberg's numbers used in phytocoenology have been elaborated for 224 species of Central European Carabids (about half of total species richness). They express relationships of Carabids to two significant ecological factors – humidity and type of vegetation cover (shading). The humidity preference is characterized by a 8-degree numeric scale (1 – strongly xerophilous, ..., 4 - mezohygrophilous, ..., 8 – strongly hygrophilous). Preference of vegetation cover (shading) by a 5-degree scale (1 – species of open landscape with discontinuous vegetation cover – 4 forest species), completed by the fifth category including the river bank and shore species, which often occur in other habitats, especially in floodplain forests. These scales precise the verbal characteristics of the ecological requirements in literature and can be used for quantitative description of state of a communities and changes running in them.

Each species has a very complex set of ecological requirements, which often vary within its distributional area or in time. Beside this, one unsatisfied requirement can be compensated by surplus satisfying of an other. The general characterization of ecological requirements of species is difficult. Therefore many ecological characteristics of species in literature are ambiguous and not universally valid. In addition, many ecological characteristics, particularly in older literature (for example Burmeister 1939), are based on casuistic field observations, individual sampling and recording of all types of conditions in which a species has been found, without respect to optimum and naturalness of these conditions. Ambiguity of ecological characteristics of species also can result from working of some authors (Hůrka 1996) in a changed, intensively exploited and fragmented landscape, where some species survive in different ecotonal communities, in which their real habitat preference can be unclear. On the contrary, in some type of landscape structures with large distances between patches of individual types of habitats may suggest that some species are more stenotopic than they really are. It is the case of the South Slovakian or South Moravian lowland agrar landscape after collectivisation of agriculture, when some species disappeared from arable land. Only rarely attempts at experimental definition Carabid preference form some ecological factors were made (Lauterbach 1964, Lindroth 1949, Thiele 1967).

The quantitative evaluation of results of ecological investigations and monitoring of environmental changes however needs, to certain degree relatively simple ecological characteristics of species, which can be easily expressed or coded in a numeric form and used at calculation of different ecological indices or coordinates for direct ordination of communities. Such a type of characteristics was suggested by Ellenberg (1974) for Central European vascular plants know as the s.c. Ellenberg's numbers.

The aim of this paper is an attempt at similar system of numeric characteristics of preference of Carabids for two significant ecological factors – humidity and vegetation cover (shading). For this purpose, 224 species were chosen. These species represent about half of the total species richness of Central European Carabids and most of them are abundant species regularly occurring and/or being characteristic of a type of natural geobiocoenosis and artificial geobiocenoids from the oak to the alpine vegetation tier.

Tab. 1. Ecological characteristics of selected Carabid species (PH - humidity preference, VC - vegetation cover preference)

| Species   | PH | VC | Species  | PH | VC |
|---|----|----|--|----|----|
| <i>Abax ater</i> (Villers, 1789)                  | 3  | 4  | <i>Bembidion varium</i> (Olivier, 1795)                | 8  | 5  |
| <i>Abax carinatus</i> (Duftschmidt, 1812)         | 5  | 4  | <i>Bembidion velox</i> (Linnaeus, 1761)                | 8  | 5  |
| <i>Abax paralellus</i> (Duftschmidt, 1812)        | 4  | 4  | <i>Blethisa multipunctata</i> (Linnaeus, 1758)         | 8  | 5  |
| <i>Abax schupelli rendschmidti</i> (Germar, 1839) | 5  | 4  | <i>Bradycellus caucasicus</i> (Caudoir, 1846)          | 3  | 1  |
| <i>Acupalpus brunnipes</i> (Sturm, 1825)          | 4  | 1  | <i>Bradycellus harpalinus</i> (Audinet-Serville, 1821) | 3  | 1  |
| <i>Acupalpus exiguus</i> Dejean, 1829             | 6  | 1  | <i>Brachinus gangelbaueri advena</i> Schaubergar, 1921 | 4  | 1  |
| <i>Acupalpus flavicollis</i> (Sturm, 1825)        | 6  | 1  | <i>Brachynus crepitans</i> (Linnaeus, 1758)            | 3  | 1  |
| <i>Acupalpus meridianus</i> (Linnaeus, 1761)      | 6  | 1  | <i>Brachynus explodes</i> (Duftschmidt, 1812)          | 3  | 1  |
| <i>Agonum marginatum</i> (Linnaeus 1758)          | 8  | 5  | <i>Brosicus cephalotes</i> (Linnaeus, 1758)            | 3  | 1  |
| <i>Agonum moestum</i> (Duftschmidt, 1812) *       | 8  | 4  | <i>Calathus ambiguus</i> (Paykull, 1790)               | 3  | 1  |
| <i>Agonum muelleri</i> (Herbst, 1784)             | 7  | 2  | <i>Calathus cinctus</i> Motschulsky, 1850              | 3  | 1  |
| <i>Agonum sexpunctatum</i> (Linnaeus, 1758)       | 5  | 1  | <i>Calathus erratus</i> (C. R. Sahlberg, 1827)         | 4  | 1  |
| <i>Agonum viduum</i> (Panzer, 1797)               | 8  | 5  | <i>Calathus fuscipes</i> (Goeze, 1777)                 | 4  | 1  |
| <i>Amara aenea</i> (De Geer, 1774)                | 3  | 1  | <i>Calathus melanocephalus</i> (Linnaeus, 1758)        | 3  | 1  |
| <i>Amara apricaria</i> (Paykull, 1790)            | 3  | 1  | <i>Calathus metallicus</i> Dejean, 1828                | 5  | 2  |
| <i>Amara aulica</i> (Panzer, 1797)                | 3  | 1  | <i>Calosoma auropunctatum</i> (Herbst, 1784)           | 3  | 1  |
| <i>Amara consularis</i> (Duftschmidt, 1812)       | 3  | 1  | <i>Calosoma inquisitor</i> (Linnaeus, 1758)            | 4  | 4  |
| <i>Amara convexiuscula</i> (Marsham, 1802)        | 3  | 1  | <i>Calosoma sycophantha</i> (Linnaeus, 1758)           | 4  | 4  |
| <i>Amara cursitans</i> Zimmermann, 1832           | 3  | 1  | <i>Carabus arvensis</i> Herbst, 1784                   | 4  | 2  |
| <i>Amara familiaris</i> (Duftschmidt, 1812)       | 3  | 1  | <i>Carabus auronitens</i> Fabricius, 1792              | 4  | 4  |
| <i>Amara majuscula</i> Caudoir, 1850              | 3  | 1  | <i>Carabus cancellatus</i> Illiger, 1798               | 4  | 2  |
| <i>Amara municipalis</i> (Duftschmidt, 1812)      | 3  | 1  | <i>Carabus clathratus</i> Linnaeus, 1761               | 8  | 2  |
| <i>Amara nitida</i> Sturm, 1825                   | 3  | 1  | <i>Carabus convexus</i> Fabricius, 1775                | 4  | 4  |
| <i>Amara ovata</i> (Fabricius, 1792)              | 3  | 1  | <i>Carabus coriaceus</i> Linnaeus, 1758                | 5  | 4  |
| <i>Amara saphyrea</i> Dejean, 1828                | 3  | 1  | <i>Carabus granulatus</i> Linnaeus, 1758               | 7  | 2  |
| <i>Amara similata</i> (Gyllenhal, 1810)           | 3  | 1  | <i>Carabus hortensis</i> Linnaeus, 1758                | 4  | 4  |
| <i>Anchomenus dorsalis</i> (Pontoppidan, 1763)    | 3  | 1  | <i>Carabus hungaricus</i> Fabricius, 1792              | 1  | 1  |
| <i>Anisodactylus binotatus</i> (Fabricius, 1787)  | 6  | 1  | <i>Carabus intricatus</i> Linnaeus 1761                | 4  | 4  |
| <i>Anisodactylus signatus</i> (Panzer, 1797)      | 5  | 1  | <i>Carabus irregularis</i> Fabricius, 1792             | 5  | 4  |
| <i>Aptinus bombardae</i> (Illiger, 1800)          | 3  | 4  | <i>Carabus montivagus</i> Palliardi, 1825              | 4  | 4  |
| <i>Asaphidion flavipes</i> (Linnaeus, 1761)       | 6  | 4  | <i>Carabus nemoralis</i> O. F. Müller, 1764            | 4  | 4  |
| <i>Badister bullatus</i> (Schrank, 1798)          | 5  | 2  | <i>Carabus problematicus</i> Herbst, 1786              | 4  | 1  |
| <i>Badister lacertosus</i> (Sturm, 1815)          | 6  | 2  | <i>Carabus scabriusculus</i> Olivier, 1795             | 2  | 1  |
| <i>Badister meridionalis</i> (Puel, 1925)         | 6  | 2  | <i>Carabus scheidleri</i> Panzer, 1799                 | 5  | 4  |
| <i>Badister peltatus</i> (Panzer, 1797)           | 8  | 2  | <i>Carabus sylvestris</i> Panzer, 1793                 | 5  | 2  |
| <i>Badister sodalis</i> (Duftschmidt, 1812)       | 7  | 2  | <i>Carabus ullrichi</i> Germar, 1824                   | 4  | 4  |
| <i>Badister unipustulatus</i> Bonelli, 1813)      | 7  | 2  | <i>Carabus variolosus</i> Fabricius, 1787              | 8  | 4  |
| <i>Bembidion articulatum</i> (Panzer, 1796)       | 8  | 5  | <i>Carabus violaceus</i> Linnaeus, 1758                | 5  | 4  |
| <i>Bembidion biguttatum</i> (Fabricius, 1779)     | 8  | 4  | <i>Cicindela campestris</i> Linnaeus, 1758             | 4  | 1  |
| <i>Bembidion dentellum</i> (Thunberg, 1787)       | 8  | 5  | <i>Cicindela germanica</i> Linnaeus, 1758              | 3  | 1  |
| <i>Bembidion femoratum</i> Sturm, 1825            | 7  | 5  | <i>Cicindela hybrida</i> Linnaeus, 1758                | 3  | 1  |
| <i>Bembidion gilvipes</i> Sturm, 1825             | 8  | 5  | <i>Cicindela silvatica</i> Linnaeus, 1758              | 3  | 4  |
| <i>Bembidion guttula</i> (Fabricius, 1792)        | 8  | 5  | <i>Cicindela silvicola</i> Dejean, 1822                | 4  | 2  |
| <i>Bembidion inoptatum</i> (Schaum, 1757)         | 8  | 1  | <i>Clivina collaris</i> (Herbst, 1784)                 | 6  | 2  |
| <i>Bembidion lampros</i> (Herbst, 1784)           | 3  | 1  | <i>Clivina fossor</i> (Linnaeus, 1758)                 | 6  | 4  |
| <i>Bembidion manneheimi</i> C. R. Sahlberg, 1827  | 8  | 4  | <i>Cychrus attenuatus</i> (Fabricius, 1792)            | 5  | 4  |
| <i>Bembidion minimum</i> (Fabricius, 1792)        | 8  | 5  | <i>Cychrus caraboides</i> (Linnaeus, 1758)             | 5  | 4  |
| <i>Bembidion octomaculatum</i> (Goeze, 1777)      | 8  | 5  | <i>Cymindis angularis</i> (Gyllenhal, 1810)            | 2  | 1  |
| <i>Bembidion properans</i> (Stephens, 1828)       | 3  | 1  | <i>Cymindis cingulata</i> Dejean, 1825)                | 2  | 1  |
| <i>Bembidion punctulatum</i> Drapiez, 1820        | 8  | 5  | <i>Cymindis humeralis</i> (Fourcroy, 1785)             | 3  | 4  |
| <i>Bembidion quadrimaculatum</i> (Linnaeus, 1761) | 3  | 1  | <i>Demetrius monostigma</i> Samouelle, 1818)           | 8  | 1  |
| <i>Bembidion semipunctatum</i> (Donovan, 1806)    | 8  | 5  | <i>Diachromus germanus</i> (Linnaeus, 1758)            | 7  | 1  |
| <i>Bembidion tetracollum</i> Say, 1823            | 8  | 5  | <i>Dolichus halensis</i> (Schaller, 1783)              | 4  | 1  |



Tab. 1. Continuation 1

| Species   | PH | VC | Species  | PH | VC |
|---|----|----|--|----|----|
| <i>Dromius quadrimaculatus</i> (Linnaeus, 1758)         | 4  | 1  | <i>Ophonus nitidulus</i> Stephens, 1828                | 3  | 4  |
| <i>Dyschirius aeneus</i> (Dejean, 1825)                 | 8  | 5  | <i>Ophonus puncticollis</i> (Aykull, 1796)             | 2  | 1  |
| <i>Dyschirius globosus</i> (Herbst, 1783)               | 8  | 5  | <i>Ophonus sabulicola</i> (Panzer, 1796)               | 1  | 1  |
| <i>Dyschirius nitidus</i> (Dejean, 1825)                | 8  | 5  | <i>Ophonus schaumerglerianus</i> Puel, 1937            | 3  | 1  |
| <i>Dyschirius rufipes</i> (Dejean, 1825)                | 1  | 1  | <i>Ophonus stictus</i> Stephens, 1828                  | 1  | 1  |
| <i>Elaphrus aureus</i> Ph. Müller, 1821                 | 8  | 5  | <i>Oxypselaphus obscurus</i> (Herbst, 1784)            | 7  | 4  |
| <i>Elaphrus cupreus</i> Duftschmidt, 1812               | 8  | 5  | <i>Panageus bipustulatus</i> (Fabricius, 1775)         | 4  | 1  |
| <i>Elaphrus riparius</i> (Linnaeus, 1758)               | 8  | 5  | <i>Panageus cruxmajor</i> (Linnaeus, 1758)             | 6  | 2  |
| <i>Elaphrus uliginosus</i> Fabricius, 1792              | 8  | 5  | <i>Paradromius linearis</i> (Olivier, 1795)            | 2  | 1  |
| <i>Epaphius secalis</i> (Paykull, 1790)                 | 6  | 4  | <i>Parachys bistriatus</i> (Duftschmidt, 1812)         | 8  | 5  |
| <i>Europhilus fuliginosus</i> (Panzer, 1809)            | 8  | 4  | <i>Paranchus albipes</i> (Fabricius, 1796)             | 8  | 5  |
| <i>Europhilus micans</i> (Nicolai, 1822)                | 7  | 4  | <i>Patrobus atrorufus</i> (Stroem, 1768)               | 7  | 4  |
| <i>Harpalus affinis</i> (Schrank, 1781)                 | 3  | 1  | <i>Phylorhizus notatus</i> (Stephens, 1828)            | 4  | 1  |
| <i>Harpalus atratus</i> Latreille, 1804                 | 4  | 4  | <i>Platyderus rufus</i> (Duftschmidt, 1812)            | 3  | 4  |
| <i>Harpalus distinguendus</i> (Duftschmidt, 1812)       | 3  | 1  | <i>Platynus assimilis</i> (Paykull, 1790)              | 7  | 4  |
| <i>Harpalus flavicomis</i> Dejean, 1829                 | 4  | 1  | <i>Platynus krynickyi</i> (Sperk, 1835)                | 8  | 4  |
| <i>Harpalus froelichi</i> Sturm 1818                    | 5  | 2  | <i>Platynus livens</i> (Gyllenhal, 1810)               | 8  | 4  |
| <i>Harpalus honestus</i> (Duftschmidt, 1812)            | 4  | 1  | <i>Poecilus cupreus</i> (Linnaeus, 1758)               | 4  | 1  |
| <i>Harpalus latus</i> (Linnaeus, 1758)                  | 4  | 1  | <i>Poecilus lepidus</i> (Leske, 1787)                  | 3  | 1  |
| <i>Harpalus luteicomis</i> (Duftschmidt, 1812)          | 5  | 2  | <i>Poecilus punctatulus</i> (Schaller, 1783)           | 2  | 1  |
| <i>Harpalus progrediens</i> Schaubberger, 1922          | 5  | 2  | <i>Poecilus sericeus</i> Fischer von Waldheim, 1823    | 2  | 1  |
| <i>Harpalus pumilus</i> Sturm, 1818                     | 1  | 1  | <i>Poecilus versicolor</i> (Sturm, 1824)               | 2  | 1  |
| <i>Harpalus signaticomis</i> (Duftschmidt, 1812)        | 2  | 1  | <i>Pseudophonus calceatus</i> (Duftschmidt, 1812)      | 3  | 1  |
| <i>Harpalus tardus</i> (Panzer, 1797)                   | 2  | 1  | <i>Pseudophonus griseus</i> (Panzer, 1797)             | 3  | 1  |
| <i>Harpalus tenebrosus centralis</i> Schaubberger, 1929 | 1  | 1  | <i>Pseudophonus rufipes</i> (Panzer, 1797)             | 4  | 1  |
| <i>Harpalus zabroides</i> Dejean, 1829                  | 2  | 1  | <i>Pterostichus foveolatus</i> (Duftschmidt, 1812)     | 5  | 4  |
| <i>Harpalus picipennis</i> (Duftschmidt, 1812)          | 1  | 1  | <i>Pterostichus anthracinus</i> (Illiger, 1798)        | 8  | 4  |
| <i>Chlaenius nigricomis</i> (Fabricius, 1787)           | 8  | 5  | <i>Pterostichus blandulus</i> L. Müller, 1859          | 5  | 1  |
| <i>Chlaenius nitidulus</i> (Schrank, 1781)              | 8  | 5  | <i>Pterostichus cylindricus</i> (Herbst, 1784)         | 4  | 1  |
| <i>Chlaenius tristis</i> (Schaller, 1783)               | 8  | 5  | <i>Pterostichus diligens</i> (Sturm, 1824)             | 7  | 2  |
| <i>Laemostenus terricola</i> (Herbst, 1784)             | 4  | 2  | <i>Pterostichus gracilis</i> (Dejean, 1828)            | 8  | 2  |
| <i>Lasiotrechus discus</i> (Fabricius, 1792)            | 6  | 5  | <i>Pterostichus macer</i> (Marsham, 1802)              | 4  | 1  |
| <i>Labia chlorocephala</i> Hoffman 1803                 | 4  | 4  | <i>Pterostichus melananius</i> (Illiger, 1798)         | 5  | 2  |
| <i>Leistus ferrugineus</i> (Linnaeus, 1758)             | 4  | 3  | <i>Pterostichus melas</i> (Creutzer, 1799)             | 4  | 4  |
| <i>Leistus piceus</i> Froelich 1799                     | 6  | 4  | <i>Pterostichus minor</i> (Gyllenhal, 1827)            | 8  | 5  |
| <i>Leistus rufomarginatus</i> (Duftschmidt, 1812)       | 5  | 4  | <i>Pterostichus morio carpathicus</i> Kullt, 1944      | 5  | 1  |
| <i>Leistus terminatus</i> (Hellwig in Panzer, 1793)     | 5  | 4  | <i>Pterostichus negligens</i> (Sturm, 1824)            | 5  | 4  |
| <i>Licinus cassideus</i> (Fabricius, 1792)              | 1  | 1  | <i>Pterostichus niger</i> (Schaller, 1783)             | 6  | 4  |
| <i>Licinus depressus</i> (Paykull, 1790)                | 2  | 1  | <i>Pterostichus nigrata</i> (Paykul, 1790)             | 8  | 2  |
| <i>Licinus hoffmansegi</i> (Panzer, 1797)               | 4  | 4  | <i>Pterostichus oblongopunctatus</i> (Fabricius, 1787) | 5  | 4  |
| <i>Lorocera pilicornis</i> (Fabricius, 1775)            | 4  | 2  | <i>Pterostichus ovoideus</i> (Sturm, 1824)             | 4  | 2  |
| <i>Masoreus wetherhalli</i> (Gyllenhal, 1813)           | 1  | 1  | <i>Pterostichus pilosus</i> (Host, 1789)               | 5  | 4  |
| <i>Microlestes maurus</i> (Sturm, 1827)                 | 2  | 1  | <i>Pterostichus pumilio</i> (Dejean, 1828)             | 5  | 4  |
| <i>Microlestes minutulus</i> (Goeze, 1777)              | 2  | 1  | <i>Pterostichus strenuus</i> (Panzer, 1797)            | 7  | 2  |
| <i>Microlestes plagiatus</i> (Duftschmidt, 1812)        | 2  | 1  | <i>Pterostichus unctulatus</i> (Duftschmidt, 1812)     | 5  | 4  |
| <i>Nebria brevicollis</i> (Fabricius, 1792)             | 6  | 2  | <i>Pterostichus vernalis</i> (Panzer, 1796)            | 8  | 5  |
| <i>Notiophilus biguttatus</i> (Fabricius, 1799)         | 4  | 2  | <i>Stenolophus discophorus</i> F. von Waldheim, 1824   | 8  | 1  |
| <i>Notiophilus palustris</i> (Duftschmidt, 1812)        | 4  | 2  | <i>Stenolophus mixtus</i> (Herbst, 1784)               | 8  | 1  |
| <i>Notiophilus rufipes</i> Curtis, 1829                 | 4  | 2  | <i>Stomis pumicatus</i> (Panzer, 1796)                 | 6  | 2  |
| <i>Oodes gracilis</i> A. et G. B. Villa, 1833           | 8  | 2  | <i>Syntomus foveatus</i> Fourcroy, 1785                | 5  | 2  |
| <i>Oodes helopioides</i> (Fabricius, 1792)              | 8  | 2  | <i>Syntomus obscuroguttatus</i> (Duftschmidt, 1812)    | 5  | 2  |
| <i>Ophonus sabulicola</i> (Panzer, 1796)                | 1  | 1  | <i>Syntomus pallipes</i> (Dejean, 1825)                | 5  | 1  |
| <i>Ophonus azureus</i> (Fabricius, 1775)                | 2  | 1  | <i>Syntomus truncatellus</i> (Linnaeus, 1761)          | 4  | 1  |
| <i>Ophonus diffinis</i> (Dejean, 1829)                  | 2  | 1  | <i>Synuchus vivalls</i> (Illiger, 1798)                | 4  | 2  |

Tab. 1. Continuation 2

| Species                                   | PH | VC | Species                                       | PH | VC |
|---|----|----|---|----|----|
| <i>Trechoblemus micros</i> (Herbst, 1784) | 4  | 2  | <i>Trechus quadristriatus</i> (Schrank, 1781) | 4  | 1  |
| <i>Trechus latus</i> Putzeys, 1846        | 5  | 4  | <i>Trechus striatulus</i> Putzeys, 1847       | 5  | 4  |
| <i>Trechus pilisensis</i> Csiki, 1918     | 5  | 4  | <i>Zabrus spinipes</i> Fabricius, 1798        | 1  | 1  |
| <i>Trechus pulchellus</i> Putzeys, 1846   | 5  | 4  | <i>Zabrus tenebrioides</i> (Fabricius, 1777)  | 3  | 1  |

## Explanations:

Scale of humidity preference: 1 - 8 (1 - strongly xerophilous, 4-5 - mezohygrophilous, 8 - strongly hygrophilous)

Scale of vegetation cover preference:

- 1 - herbage cover without any three od shrub (fields, meadows, ruderals)
- 2 - indifferent to vegetation cover (eurytopic in the largest sense)
- 3 - herbage cover with dispersed group of trees or shrubs
- 4 - continuous forest stands
- 5 - ripicolous species

\*) *Agonum moestum* is here understood in its traditional concept as a single species

Preference for humidity and vegetation cover (shadowing) in Carabids is positively correlated to certain degree, as a sufficient shadowing of the ground by shrub or tree vegetation reduces evaporation from soil surfaces and its heating by direct insolation and vice versa. In spite of this in mesohygrophilous geobiocoenoses of oak to beech-fir vegetation tier many species behave more or less as stenotopic "forest" or "open landscape" species. However, towards the higher vegetation tiers (spruce, dwarf pine and alpine vegetation tier), in conditions of higher annual precipitation and humidity, stenotopy of some forests species decreases. Such species (e. g. *Pterostichus foveolatus*, *Pterostichus pilosus*) also can reach a considerable abundance and dominance in subalpine and alpine meadows (Belanské Tatry). Similarly some forest species (for example *Carabus nemoralis*) in the northernmost part of their area (Russia) can easily penetrate even into large cities, while in Central Europe they behave as stenotopic forest species. Some species characteristic of floodplain forests (for example *Carabus granulatus*) successfully survive in lowlands in some reed stands richly supplied by water or in higher altitudes in fields or . From this reason, the proposed characteristics (Tab. 1) represent a simplification and idealisation of the complex ecological relationships of individual species. Of course, they may evoke discussion and criticism and can be still précised and completed.

They do not characterize the whole scale of conditions in which a species occurs or can occur, but they try to express the condition, which is supposed to be optimal and natural for each species. Their coding is arranged increasingly from the most xerophilous species to the most hygrophilous and from the open landscape species to the forest species.

These characteristics are based on synthesis of rich literary data (their list exceeds extent of this contribution) and on results of quantitative field sampling carried out by the author in 1970-2004 in a relatively large number of localities and habitat types, especially in Slovakia and Moravia, and yielding several hundred thousand individuals.

The characteristics were already used and tested for evaluation of changes in Carabid communities in floodplain forest in the area affected by operation of the Gabčíkovo hydraulic structures and of influence of changing hydrological regimen and simulation of floods in the Ranšpurk nature reserve (Šustek 2000, 2001, 2002).

**Acknowledgments**

The data used in this study very obtained thanks to financial support of the VEGA grant agency, projects number 1078/94 and 4086/2004.

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