Pol. J. Environ. Stud. Vol. 21, No. 2 (2012), 425-433

Original Research

Species Composition and Abundance of Click-Beetles (Coleoptera, Elateridae) in Agrobiocenozes in Southern Lithuania

Povilas Mulerčikas[1]*, Vytautas Tamutis[1, 2], Sonata Kazlauskaitė[1]

[1]Department of Biology and Plant Protection, Lithuanian University of Agriculture, Studentų 11, Akademija, Kaunas distr., LT-53361, Lithuania
[2]Kaunas T. Ivanauskas zoological museum, Laisvės al. 106, LT-44253 Kaunas, Lithuania

Received: 2 March 2011
Accepted: 1 August 2011

Abstract

Click-beetle (Coleoptera: Elateridae) species composition and abundance in agrobiocenozes were examined. The research was carried out in four locations in southern Lithuania with different agrobiocenozes and soil types. In total 687 imago click-beetle specimens were caught belonging to 13 species and 10 genera. The most numerous species detected were *Selatosomus aeneus* (Linnaues, 1758), *Agriotes lineatus* (Linnaues, 1767), *Agriotes obscurus* (Linnaues, 1758), and *Negastrius pulchellus* (Linnaues, 1758). *Zorochros dermestoides* (Herbst, 1806) was recorded for the first time for Lithuanian fauna.

The number of specimens entering the traps declined steadily depending on soil granulometric structure. It has been observed to be higher in lighter soils and lower toward heavier soil types. The least number of click-beetle specimens was trapped in the agrobiocenozes with the intensively cultivated land over all study areas except sandy soils. This infers that intensive tillage may affect the abundance of click-beetles in agrobiocenozes. The summary of research data clearly indicates that the highest abundance of click-beetles was detected in the seminatural meadow with light granulometric structure soil.

Keywords: Elateridae, Coleoptera, agrobiocenozes, abundance, species composition

Introduction

Click-beetles (Elateridae: Coleoptera) is one of the biggest families of beetles in the world, with more than 12,000 species belonging to 600 genera [1]. Click-beetle species composition has not been fully explored in Lithuania. 65 click-beetle species are referred to in the monograph "Fauna of Lithuania. The beetles 1." [2]. Some species have been announced later [3-6] or noted for Lithuania by Cate [7, 8]. Although 73 click-beetle species are noted for Lithuania at this moment, only 25 species were atributted to the "common" category by Pileckis and Monsevičius (1995). Other species were qualified as rare and very rare [2]. *Stenogostus rufus* (De Geer, 1774) and *Anostirus purpureus* (Poda, 1761) are included in the Lithuanian Red Data Book [9, 10].

Click-beetles are most commonly found in uncultivated land areas such as perennial crops, pastures, and meadows. Many more of them are detected in the plots adjacent to the meadows, in weedy and quack grass-invaded areas, especially in fields where row crops were grown [2]. Different click-beetle species choose to dwell in diverse soils, for instance *Selatosomus aeneus* resides in light sand or sandy loam soils and *Agriotes ustulatus* (Schaller, 1783) prefers heavy loam soils [11].

The most important click-beetle species as agrobiocenozes dwellers and agricultural plant pests are recog-

*e-mail: povilas.mulercikas@gmail.com

Table 1. Locations and soil types of investigated areas.

Location	Coordinate	Elevations (m)	Soil type
Noreikiškės env.	54º53'6.49"N, 23º50'15.27"E	106	Loamy soil – *Calc(ar)i- Hypostagnic Luvisols (LVj-w-cc)*
Braziūkai env.	54º53'46.09"N, 23º29'2.29"E	83	Sandy soil – *Dystri- Haplic Arenosols (ARh-dy)*
Gudeliai env.	54º31'25.11"N, 23º40'55.24"E	117	Hard loamy clay soil – *Eudocaleari- Epihypogleyic Cambisols (CMg-p-w-can)*
Leipalingis env.	54º5'28.17"N, 23º51'39.17"E	124	Sandy loam soil – *Eutri- Haplic Arenosols (ARh-eu)*

nized, including *Selatosomus aeneus*, *Agriotes lineatus*, *Agriotes obscurus*, *Agriotes ustulatus*, *Agriotes sputator* (Linnaues, 1758), and *Hemicrepidius niger* (Linnaues, 1758) [12-15]. Larvae of these species are polyphagous and injurious to plants. Usually they feed on underground plant parts and injure germinating seeds, tubers, and roots [2, 16-18]. The damage caused by click-beetle larvae can be so high that either reseeding of entire field of crop is necessary or the whole yield of row crop can be destroyed [11].

Larvae of some click-beetle species dwell in forest litter and putrefying wood (especially in dry stumps). Larvae are partially predatory, feeding on larvae and pupae of other insects, and also on wood and mycelium of fungus that putrefy the wood. Larvae of some click-beetle species are necrofagous and saprofagous [2]. Adults are recognized as harmless, though they sometimes nibble the shoots of plants. They feed on flower nectar, leaking plant juice, and the sweet secretions of aphids [17].

The elaterid fauna of Lithuania in agrobiocenozes has not been well studied from the ecological point of view and the occurrence of these species is closely related with some soil factors like soil type, agrobiocenozes type, different soil conditions, and intensity of soil cultivation. The aim of our study is to assess the click-beetle species composition and abundance in four different agrobiocenozes with diverse soil types.

Experimental Procedures

Our study was conducted in four lacations in southern Lithuania (Fig. 1) with different soil types: loamy soil – *Calc*(*ar*)*i- Hypostagnic Luvisols* (*LVj-w-cc*) (1), sandy soil – *Dystri- Haplic Arenosols* (*ARh-dy*) (2), hard loamy clay soil – *Eudocaleari- Epihypogleyic Cambisols* (*CMg-p-w-can*) (3), ans sandy loam soil – *Eutri- Haplic Arenosols* (*ARh-eu*) (4) (Table 1) (classification of the soil following [19]). The research was carried out from May to October 2009. Four agrobiocenozes with different soil cultivation intensities – intensively cultivated land, reclaimed pasture, I-II year perennial grasses, and seminatural meadow – were selected in each location.

Intensively cultivated land is a field with no less than three years intensive soil cultivation (deep plowing in autumn, harrowing during the growing season and etc.) consecutively. Reclaimed pasture represents perennial grassland, which is deeply tilled in autumn and used again as farmland. I-II year perennial grass is newly sown and used no more than two years as perennial grassland, which is a couple of times a year mowed or grazed by livestock. Before that it served as an intensively cultivated land. Seminatural meadow is a perennial grassland which for many years (>20) was not renewed. Seminatural meadow in some cases have been grazed and mowed. Composition of vegetation varies and is dominated by various gramineous.

Specification of the crops in the investigated field trials is given in Table 2.

Pitfall traps were used for click-beetle sampling. Traps were made from a half-liter plastic dish with height of 17 mm and width of 10 mm. Formaldehyde of 4% solution was used for beetle conservation. Trials were set in the field randomly. 5 pitfall traps were established in each field. Between different traps 10 m distance was preserved. The same distance was kept from the field borders. The traps were checked every two weeks and click-beetle specimens were collected. Beetles were identified using descriptive keys [1, 2].

Statistical data processing was performed using the ANOVA program of package SELEKCIJA [20]. Standard error was calculated using Microsoft Office Excel 2003. Dominance data were presented as the proportions of the individuals of a species in each agrobiocenozes. The following classes of dominance (D) dominants are used: D1 – subrecedents (>1.0%), D2 – recedents (1.1-2.0%), D3 – subdominants (2.1-5.0%), D4 – dominants (5.1-10%), D5 – eudominants (>10%) [21].

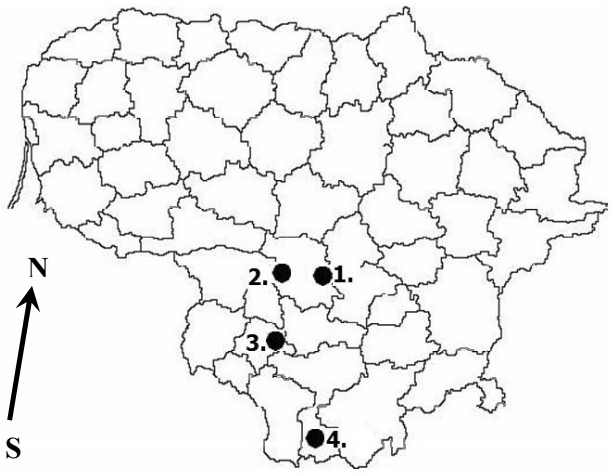

Fig. 1. Locations of study areas: 1. Noreikiškės env., 2. Braziukai env., 3. Gudeliai env., 4. Leipalingis env. (Scale 1:4,500,000).

Table 2. Specification of the crops in the investigated field trials.

Agrobiocenozes	Number of investigated areas							
	Noreikiškės env.		Braziūkai env.		Gudeliai env.		Leipalingis env.	
	crop	adjacent	crop	adjacent	crop	adjacent	crop	adjacent
Intensively cultivated land	barley	grass	oat	grass, shrubs	barley	wheat	maize	grass, wheat
Reclaimed pasture	wheat	different crops	ray	grass, shrubs	wheat	grass, roadside	triticale	roadside, wheat
I-II year perennial grasses	red clover, gramineous	grass	white clover, gramineous	grass	red clover, gramineous	grass	white clover, gramineous	grass
Seminatural meadow	mainly gramineous	meadows	mainly gramineous	meadows	mainly gramineous	meadows	mainly gramineous	meadows

Table 3. List of detected click-beetle species in different soil types.

Names of species	Soil types				Total/D%
	1.**	2.**	3.**	4.**	
Actenicerus sjaelandicus	-	-	-	23/D5*	23/**(D3)***
Agriotes lineatus	27/D5*	51/D5*	47/D5*	16/D5*	141/**(D5)***
Agriotes obscurus	17/D5*	70/D5*	22/D5*	1/D1*	110/**(D5)***
Agriotes sputator	13/D4*	-	4/D3*	4/D3*	21/**(D3)***
Agrypnus murinus	1/D1*	8/D3*	1/D2*	13/D4*	23/**(D3)***
Adrastus limbatus	1/D1*	-	-	-	1/**(D1)***
Cidnopus aeruginosus	-	8/D3*	-	-	8/**(D2)***
Hemicrepidius hirtus	15/D5*	-	3/D3*	4/D3*	22/**(D3)***
Hemicrepidius niger	5/D3*	2/D1*	3/D3*	2/D2*	12/**(D2)***
Oedostethus quadripustulatus	58/D5*	-	4/D3*	-	62/**(D4)***
Negastrius pulchellus	2/D2*	13/D3*	-	91/D5*	106/**(D5)***
Selatosomus aeneus	-	153/D5*	-	3/D2*	156/**(D5)***
Zorochros dermestoides	-	1/D1*	-	1/D1*	2/**(D1)***
Total: species/individuals	8/139*	9/306*	7/84*	10/158*	13/687*

The following classes of dominance (D) dominants are used: D1 – subrecedents (>1.0%), D2 – recedents (1.1-2.0%), D3 – subdominants (2.1-5.0%), D4 – dominants (5.1-10%), D5 – eudominants (>10%).
*Number of individuals/category of dominance.
**1. Loamy soil – *Calc(ar)i- Hypostagnic Luvisols* (*LVj-w-cc*); 2. Sandy soil – *Dystri - Haplic Arenosols* (*ARh-dy*); 3 Hard loamy clay soil – *Eudocaleari- Epihypogleyic Cambisols* (*CMg-p-w-can*); 4. Sandy loam soil – *Eutri- Haplic Arenosols* (*ARh-eu*).

Results and Discussion

Species Composition

The sampling period included click-beetles of 13 species belonging to 10 genera (*Actenicerus* Kiesenwetter 1858, *Agriotes* Eschscholtz 1829, *Agrypnus* Eschscholtz 1829, *Adrastus* Eschscholtz 1829, *Cidnopus* C. G. Thomson 1859, *Hemicrepidus* Germar 1839, *Oedostethus* Le Conte 1853, *Negastrius* C. G. Thomson 1859, *Selatosomus* Stephens 1830, and *Zorochros* C. G. Thomson 1859) (Table 3).

The largest number of click-beetle species detected in the sandy loam soil was 10 species. The least number of click-beetle, 7, species was found in the hard loamy clay soil.

Click-beetle species composition in different soil types was diverse. *Agriotes lineatus*, *Agriotes obscurus*, *Agrypnus murinus* (Linnaues, 1758), and *Hemicrepidius niger* (Linnaues, 1758) were found in all investigated areas.

Table 4. List of species, number of individuals, and category of dominance of detected click-beetles in different agrobiocenozes.

Names of species	Agrobiocenozes				Total/D%
	Intensively cultivated land	Reclaimed pasture	I-II year perennial grasses	Seminatural meadow	
Actenicerus sjaelandicus	-	-	1/D1*	22/D5*	23/**(D3)***
Agriotes lineatus	6/D3*	55/D5*	24/D5*	56/D5*	141/**(D5)***
Agriotes obscurus	17/D5*	36/D5*	10/D4*	47/D5*	110/**(D5)***
Agriotes sputator	5/D3*	2/D2*	2/D2*	12/D3*	21/**(D3)***
Agrypnus murinus	1/D1*	7/D3*	1/D1*	14/D4*	23/**(D3)***
Adrastus limbatus	1/D1*	-	-	-	1/**(D1)***
Cidnopus aeruginosus	3/D3*	3/D2*	2/D2*	-	8/**(D2)***
Hemicrepidius hirtus	2/D2*	10/D4*	3/D2*	7/D3*	22/**(D3)***
Hemicrepidius niger	2/D2*	8/D3*	1/D1*	1/D1*	12/**(D2)***
Oedostethus quadripustulatus	8/D4*	-	16/D4*	38/D5*	62/**(D4)***
Negastrius pulchellus	13/D5*	4/D3*	88/D5*	1/D1*	106/**(D5)***
Selatosomus aeneus	69/D5*	32/D5*	12/D4*	43/D5*	156/**(D5)***
Zorochros dermestoides	2/D2*	-	-	-	2/**(D1)***
Total: species/individuals	12/129*	9/157*	11/160*	10/241*	13/687*

The following classes of dominance (D) dominants are used: D1 – subrecedents (>1.0%), D2 – recedents (1.1-2.0%), D3 – subdominants (2.1-5.0%), D4 – dominants (5.1-10%), D5 – eudominants (>10%).
*Number of individuals/category of dominance.

Nevertheless, an attraction of some click-beetle species to particular soil type has been observed. The study revealed that species *Selatosomus aeneus* was detected in the sandy loam soil as well as in the sandy soil. Tarnawski and Buchholz (also Pileckis and Monsevičius) characterize this particular species as an agricultural pest frequent in drier sand and sandy loam soils [1, 2]. *Negastrius pulchellus* is known as a psamophylic species [2, 22]. However, individuals of this species were detected in the soils of heavier structure. Such a fact indicates that this species can tolerate a wider range of soil types.

Oedostethus quadripustulatus (Fabricius, 1792) has been detected only in soils with a heavy granulometric structure. Although some authors state that this species is found only in sandy areas [2, 22]. *Agriotes sputator* is mentioned in the literature as one of the most common and most damaging click-beetle species which usually is found in heavier arable soils, meadows, and pastures. Individuals of the species usually focus on quack grass-invaded areas [2]. *Agriotes sputator* has been detected as in the light sandy loam in the heavier loam soils. *Actenicerus sjaelandicus* (O. F. Muller, 1764) was found only in the sandy loam soil in the seminatural meadow and in the I-II year perennial grasses. Tarnawski and Buchholz, Pileckis, and Monsevičius (also Tamutis et al.) refer to this species as infrequent hygrophylic and polyphagous, usually found in moist meadows, marshy areas, and peat soils [1, 2, 23]. *Hemicrepidius hirtus* (Hebst, 1784) is reported in the literature as a pest of crops.

Polyphagous larvae are common in moist arable soils [2]. The biggest number of click-beetles during the study was found more in soil types with heavier granulometric structure. *Cidnopus aeruginosus* (Olivier, 1790) has been discovered only in the sandy soil over the entire study period. This species by other authors is assigned as habitant of forest, outskirts and meadows. *Cidnopus aeruginosus* dwells in soils with light granulometric structure. Polyphagous larvae often are found in cultivated fields that injure the underground parts of plants. Sometimes larvae can be predacious [1, 2]. *Zorochros dermestoides* has been detected in sites where soil granulometric structure was light. This species is described as psamophylic by other authors as well. According to some authors the species dwells in sandy loam and loamy soils. It can withstand soaked soil [1, 22, 24, 25].

It is important to note that this species is being found for the first time in Lithuania. *Zorochros dermestoides* is prescribed for Lithuania in the online database Fauna Europaea Web Service [8]. Nevertheless, Lithuanian scientists have not yet approved this claim. *Adrastus limbatus* (Fabricius, 1776) has been detected once, and only in areas with loamy soil (1 individual). Apparently, this species could be random in the investigated agrobiocenozes as it usually is discovered in woodland habitats [1, 2]. The analysis of click-beetle species distribution in various agrobiocenozes did not show significant differences (Table 4). The biggest number of species has been defined in intensively cultivated land (12 species). Therefore, species com-

position there has been enriched by the random, rare, and exotic species to agrobiocenozes: *Adrastus limbatus*, *Zorochros dermestoides,* and *Actenicerus sjaelandicus*. These species were found only in some research areas. The smallest number of click-beetle species was detected in reclaimed pasture – 9 species (Table 4).

Click-beetle species that dominated in all types of investigated agrobiocenozes are *Agriotes lineatus*, *Agriotes obscurus*, and *Agriotes sputator*. All these species are referred to literature sources as pests of crops and commonly are discovered in humus-rich cultivated land and meadows. Usually the representatives of these species damage cereals, maize, and potatoes [2, 11, 12]. *Agrypnus murinus* was also detected in all types of agrobiocenozes. However, mostly it was identified in seminatural meadows. Other references state that the larvae of this species can be both predacious and phytophagous as well. Larvae develop in the soil, which is humus-rich arable land, meadows, in the soil of deciduous forest glades, and edges [2, 26]. Some other authors state that larvae of *Agrypnus murinus* are phytophagous on their early stages and later stages become predacious and attack other insect larvae. Laboratory tests were carried out with larvae of this species. The results showed that larvae, regardless of their stage, often attack other insect larvae and especially click-beetle larvae of the genus *Agriotes* [27]. *Negastrius pulchellus* has been defined as dominant over the study period in the I-II year perennial grasses, although it has been reported in other agrobiocenozes as well. This is a mezohigrophylic species that is usually found on the banks of rivers and wet meadows [1, 2]. *Selatosomus aeneus* was detected in both seminatural meadows and in intensively cultivated land. Some literature sources claim this species is widespread psalmophylic and polyphagous. It dwells in woods, outskirts, glades, meadows, and arable land. The larvae live in cultivated soils; sometimes they dwell in the putrefying wood. Actually, this species is identified as a major pest of crops [1, 2, 27]. *Cidnopus aeruginosus* was found only in cultivated land (intensively cultivated land, reclaimed pasture, I-II year perennial grasses). The literature refers to larvae of this click-beetle species living in the humus-rich arable soil [2]. They can feed on the underground plant parts or prey on other insect larvae as well [1].

Abundance

During the research period a total of 687 click-beetle individuals have been caught (Table 3). The biggest number of click-beetles was captured in the sandy soil – on an average of 20.4 individuals per agrobiocenozes. Nevertheless, this number was significantly higher ($P<0.05$) when compared with other investigated areas with different soil types. By the way, a significant difference between the sandy loam soil and loamy soil was not observed. A statistically reliable minimal number of individuals has been detected in the hard loamy clay soil – on average 5.6 individuals were defined (Fig. 2).

The number of click-beetles entering traps declined steadily depending on soil granulometric structure. This has been observed to be higher in lighter soil and lower toward heavier soil types (Fig. 2). It is also worth noting that differences of individuals belonging to various species in different agrobiocenozes were inconsistent. However, when estimating the overall situation the influence of the intensity of agricultural activity to click-beetle abundance was observed. The total number of individuals captured in the investigated agrobiocenozes was distributed as follows: seminatural meadow – 241 indv., I-II year perennial grasses – 160 indv., reclaimed pasture – 157 indv., intensively cultivated land – 129 indv. (Table 4).

In the sandy soil type the biggest number of click-beetles was caught in the seminatural meadow, on average 22.2 individuals per trap. The lowest number of click-beetles was detected in I-II year perennial grasses, on average 3.4 individuals per trap. The abundance of individuals in seminatural meadow agrobiocenozes was significantly higher ($P<0.05$) compared with I-II year perennial grasses. Nevertheless, the differences in results obtained in sites with I-II year perennial grasses were not reliable compared with results received in other agrobiocenozes with the same soil type.

In the sandy loam soil the highest abundance of individuals has been exhibited in I-II year perennial grasses – on average 19.4 individuals per trap. This result showed a statistically significant ($P<0.05$) difference compared with other investigated agrobiocenozes in this area. Meanwhile, the difference between results obtained in seminatural meadow, intensively cultivated land, and reclaimed pasture has been unreliable $P>0.05$ (Fig. 3). The lowest number of click-beetles was defined in the intensively cultivated land – on average 2 individuals per trap (Fig. 2). Such a large difference between the highest and the lowest abundance of click-beetles was defined because of *Negastrius pulchellus* dominance in I-II year perennial grasses agrobiocenozes (Table 4).

In the loamy soil the biggest number of click-beetles detected in seminatural meadow agrobiocenozes was on average 16 individuals per trap. The abundance of click-beetles discovered in seminatural meadow was significantly ($P<0.05$) different from the other three investigated agrobiocenozes. Meanwhile, there were not defined any significant differences among results obtained from intensively cultivated land, reclaimed pasture, and I-II year perennial grasses. The lowest number of click-beetles was found in the intensively cultivated land – on average 3.2 individuals per trap (Fig. 2).

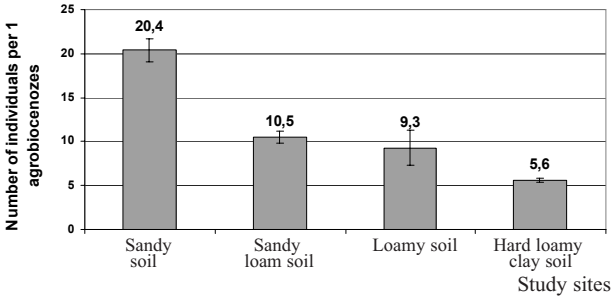

Fig. 2. Mean (±SD) number of click beetles in the studied sites.

In the hard loamy clay soil the highest abundance of click-beetles was detected in the agrobiocenozes of reclaimed pasture – on average 8.4 individuals per trap, while the lowest number of click-beetles was found in intensively cultivated land – only one individual per trap. Among all these agrobiocenozes, statistically significant difference was defined ($P<0.05$). The results obtained from the intensively cultivated land and I-II year perennial grasses also differed significantly. The defined difference was insignificant when comparing results from reclaimed pasture and seminatural meadow $P<0.05$. Meanwhile, there were no observed significant differences among results obtained from the reclaimed pasture, I-II year perennial grasses, and seminatural meadow (Fig. 3).

The summary of research data clearly indicates that the highest abundance of click-beetles was discovered in the seminatural meadow with light granulometric structure soil. The least statistically reliable number of individuals was detected in the seminatural meadow with the hard loamy clay soil. The differences of all exceeded on the average of 20 individuals per trap (Fig. 3). Meanwhile, within area 4 (Fig. 1) with sandy loam soil in the seminatural meadow the abundance of click-beetles has been detected significantly less than in the same agrobiocenozes with sandy soil type located in area 2. Although both areas were similar in soil structure, it is likely that the soil moisture content influenced the distribution of click-beetles. The soil moisture content in area 4 was slightly higher. According to the literature, some click-beetle species avoid wet soils and usually move to drier places [1].

The agrobiocenozes of reclaimed pasture exhibited a high fluctuation in abundance of detected individuals over the entire study period. The reliably highest ($P<0.05$) number of individuals was detected in agrobiocenozes with sandy soil. The number of individual per trap in the reclaimed pasture agrobiocenozes ranged from 2.6 indiduals per trap (sandy loam soil) to 16 indiduals per trap (sandy soil) (Fig. 3).

The highest and most statistically reliable number of individuals was detected in the intensively cultivated land with sandy soil – on average 19.6 individuals per trap. However, the least and most statistically reliable abundance of click-beetles was discovered in the hard loamy clay soil – only one individual per trap (Fig. 3). Click-beetle species *Selatosomus aeneus* was indicated as eudominant in the sandy soil. By the way, only three individuals of this particular species over the other research areas were found. In total, 153 individuals of *Selatosomus aeneus* were indicated and 69 of them were detected in the intensively cultivated land agrobiocenozes. There were no statistically significant differences defined in results among intensively cultivated land with diverse soil types ($P>0.05$). The abundance of individuals in the intensively cultivated land when compared with other types of agrobiocenozes differed reliably only from the I-II year perennial grasses. Significant differences have also been observed among results obtained in the reclaimed pasture and I-II year perennial grasses ($P<0.05$). Meanwhile, among the intensively cultivated land, reclaimed pasture, and seminatural meadow significant differences have not existed (Fig. 3).

The least number of click-beetles has been trapped in the agrobiocenozes with the intensively cultivated land over all the study areas except sandy soil. Thus we can conclude that intensive tillage may affect the abundance of click-beetles in agrobiocenozes. According to other authors, intensive soil tillage may be one means for click-beetles control [12].

Nevertheless, it must be acknowledged that the results revealing patterns of click-beetle species abundance and distribution depending on soil type and agrobiocenozes structure are still incomplete. In the future it would be appropriate to perform evaluation studies of other environmental factors in agrobiocenozes (soil moisture regime, soil density, relief of the area). Also it is worth attempting to use several types of traps (sticky trap, pheromone trap, entomological net).

Analysis of dominance revealed that through all the investigated areas click-beetle species *Agriotes lineatus* dominated, while the other species in separate locations in diverse agrobiocenozes dominated differently (Table 4). *Agriotes lineatus* has been recognized as absolute eudominant species – in total 141 individuals were detected in all soil types. The highest number of *Agriotes lineatus* specimens was observed in June (79) (Table 5). Later the abundance of the representatives of the species decreased – 30 individuals detected in July and only 2 individuals in August.

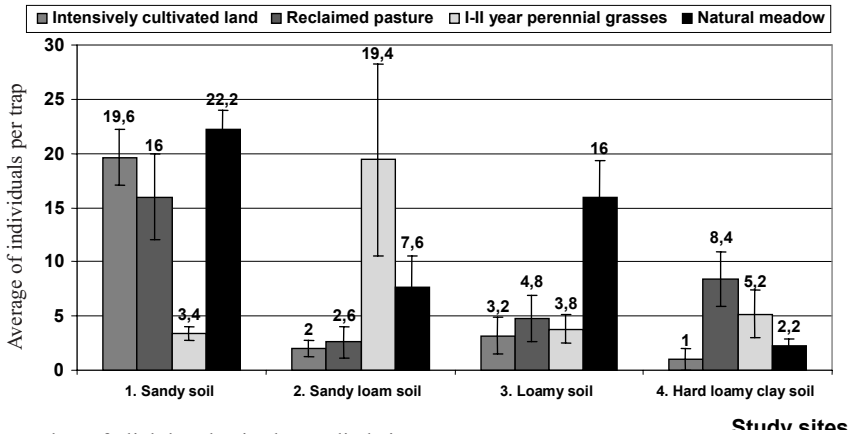

Fig. 3. Mean (±SD) number of click beetles in the studied sites.

Table 5. Number of detected click-beetle individuals during the sampling period.

Names of species	Sampling period					Total/D%
	May	June	July	August	September	
Actenicerus sjaelandicus	7/D3*	10/D3*	6/D3*	-	-	23/**(D3)***
Agriotes lineatus	30/D5*	79/D5*	30/D5*	2/D5*	-	141/**(D5)***
Agriotes obscurus	20/D4*	45/D5*	45/D5*	-	-	110/**(D5)***
Agriotes sputator	4/D2*	14/D3*	1/D1*	2/D5*	-	21/**(D3)***
Agrypnus murinus	6/D3*	12/D3*	4/D3*	1/D5*	-	23/**(D3)***
Adrastus limbatus	-	-	1/D1*	-	-	1/**(D1)***
Cidnopus aeruginosus	4/D2*	4/D2*	-	-	-	8/**(D2)***
Hemicrepidius hirtus	-	20/D4*	1/D1*	1/D5*	-	22/**(D3)***
Hemicrepidius niger	-	7/D3*	4/D3*	-	1/D5*	12/**(D2)***
Oedostethus quadripustulatus	-	15/D3*	43/D5*	1/D5*	3/D5*	62/**(D4)***
Negastrius pulchellus	88/D5*	17/D4*	1/D1*	-	-	106/**(D5)***
Selatosomus aeneus	56/D5*	79/D5*	21/D5*	-	-	156/**(D5)***
Zorochros dermestoides	1/ D1*	1/ D1*	-	-	-	2/**(D1)***
Total: species/individuals	9/218	12/306	11/154	5/7	2/4	13/687*

The following classes of dominance (D) dominants are used: D1 – subrecedents (>1.0%), D2 – recedents (1.1-2.0%), D3 – subdominants (2.1-5.0%), D4 – dominants (5.1-10%), D5 – eudominants (>10%).
*Number of individuals/category of dominance.

Most individuals of the species *Agriotes lineatus* were identified in the sandy soil (51 individuals) and the lowest number of them was discovered in the sandy loam soil (16 individuals) (Table 3). Actually, the highest number of individuals of this species was detected in the seminatural meadow – 56 individuals (Table 4). Other species dominated only in some locations and agrobiocenozes.

In the different locations among all click-beetle species, some were distinguished by the highest abundance: *Agriotes obscurus*, *Negastrius pulchellus*, *Oedostethus quadripustulatus*, and *Selatosomus aeneus* (Table 3). However, these species dominated only in some soil types. For example, *Agriotes obscurus* was eudominant in sandy soil, hard loamy clay soil, and loamy soil. Meanwhile, only one individual of the species was detected in the sandy loam soil.

Over the entire sampling period *Selatosomus aeneus* was the most numerous species (156 individuals, e.i. 22.7%), though only in the sandy soil (153 individuals) (Table 3). The peak of activity for *Selatosomus aeneus* adults was observed in June (79 individuals) and only 21 individuals were identified in July, while none of them were detected later (Table 5).

The largest specimen number of this click-beetle was discovered in the intensively cultivated land – 69 individuals (Table 4). *Agriotes obscurus* also was a eudominant species (112 individuals, e.i. 16.3%). Adults of the species started their activity in May (20 individuals) (Table 5). The highest number of them was detected during the June-July sampling period (45 individuals each month). No *Agriotes obscurus* adults were observed later.

70 individuals of this species were detected in the sandy soil (Table 3). The largest specimen number of *Agriotes obscurus,* 47, was discovered in the seminatural meadow (Table 4). To eudominants also belonged *Negastrius pulchellus* (106 individuals, e.i. 15.4%). Adults of the species appeared early and 88 individuals were detected in May (Table 5). Later, the number of defined *Negastrius pulchellus* adults declined untill 17 individuals in June and 1 individual in July. None of them were observed later.

The largest specimen number of this click-beetle species was discovered in the sandy loam soil (Table 3). 88 individuals were detected in agrobiocenozes of I-II year perennial grasses (Table 4). *Oedostethus quadripustulatus* was recognized as a dominant species (62 individuals, e.i. 9%). None of the adults of the species were observed in May, while 15 individuals were caught in June (Table 5). The peak of activity for *Oedostethus quadripustulatus* adults was detected in July (43 individuals) and only 1 and 3 individuals were identified in August and September, respectively.

The highest number of this species was discovered in the loamy soil – 50 individuals (Table 3). 38 adults were indicated in the seminatural meadow (Table 4). Four click-beetle species belonged to subdominants: *Hemicrepidius hirtus* (22 individuals, 3.2%), *Agrypnus murinus* (23 individuals, 3.34%), *Agriotes sputator* (21 individuals, 3.05%), and *Actenicerus sjaelandicus* (23 individuals in the sandy loam

soil, 3.34%). Meanwhile, two species belonged to recedents: *Cidnopus aeruginosus* (8 individuals, 1.16%) and *Hemicrepidius niger* (12 individuals, 1.74%). Finally, the remaining two click-beetle species were subrecedent: *Adrastus limbatus* (1 individual, 0.14%) and *Zorochros dermestoides* (2 individuals, 0.29%) (Tables 3 and 4).

Conclusions

687 click-beetle adults belonging to 10 genera and 13 species were collected in 2009.

Agriotes lineatus, *Agriotes obscurus*, *Negastrius pulchellus*, and *Selatosomus aeneus* were recognized as eudominants. The most numerous species was *Selatosomus aeneus,* with 156 adults in the sandy soil. *Zorochros dermestoides* were detected for Lithuanian fauna for the first time.

Most Elateridae species started their activity in May and the highest abundance of their adults was observed in June, while later the number of detected specimens decreased dramatically. However, adults of *Negastrius pulchellus* appeared early and their peak was observed in May.

The biggest number of click-beetles was captured in the sandy soil – on average 20.4 individuals per agrobiocenozes. A statistically reliable minimal number of individuals has been detected in the hard loamy clay soil – on average 5.6 individuals were defined. The largest specimen number of click-beetles was discovered in the seminatural meadow (240 individuals) and the least – in the intensively cultivated land (130 individuals).

The summary of research data clearly indicates that the highest abundance of click-beetles was discovered in the seminatural meadow with light granulometric structure soil. The least statistically reliable number of individuals was detected in the seminatural meadow with hard loamy clay soil.

The lowest specimen numbers of click-beetles were trapped in the agrobiocenozes with intensively cultivated land over the entire study areas except sandy soils. This infers that intensive tillage may affect the abundance of Elateridae species in agrobiocenozes.

The number of click-beetle specimen entering the traps declined steadily depending on soil granulometric structure. It has been observed higher in lighter soil and lower toward heavier soil types.

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