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BUTTERFLIES (LEPIDOPTERA: HESPERIOIDEA, PAPILIONOIDEA) OF THE KNYSZYN FOREST (PUSZCZA KNYSZYŃSKA) AND ADJACENT WOODLAND AREAS OF BIAŁYSTOK – IN THE YEARS 1995-2010

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ABSTRACT: A total number of 99 species of butterflies (Hesperioidea, Papilionoidea) was recorded in the Knyszyn Forest (Puszcza Knyszyńska) and adjacent woodland areas of Białystok during the study carried out in 1995-2010. Twenty four of them are mentioned in the Red List of Threatened Animals in Poland, 11 are legally protected, and six are listed in appendices of the Habitat Directive i.e.: *C. myrmidone*, *L. helle*, *L. dispar*, *P. arion*, *P. eros*, *L. achine*. Other most interesting records concerned *C. palaeno*, *H. lucina*, *G. alexis*, *P. optilete*, *A. eumedon*, *A. artaxerxes*, *B. eunomia*, *M. britomartis* and *C. tullia*. Diversity of butterflies (over 60% of native species) as well as the presence of priority species confirm that the Knyszyn Forest is one of the most important prime butterfly areas in Poland.

KEY WORDS: butterflies, Hesperioidea, Papilionoidea, faunistics, Puszcza Knyszyńska, NE Poland.

Introduction

For several last years, the knowledge on butterflies of north-eastern Poland has been considerably improved. Besides data from the Białowieża Forest (Buszko et al. 1996, Buszko 2001), which has a long history of research, papers on other areas of great value for wildlife reasons in that part of the country have been appeared, i. e.: on the Biebrza National Park (Frąckiel 1999, Frąckiel and Sielezniew 2009), the Narew National Park (Winiarska 2001) and the Romincka Forest (Sielezniew and Sachanowicz 2003).

The Knyszyn Forest (Puszcza Knyszyńska) which is a one of the largest woodland areas in Poland also has not been omitted and a contribution containing fairly good knowledge of Papilionoidea and Hesperioidea has been issued (Klimczuk and Twerd 2000). Besides there are fragmentary data included in papers concerning butterflies of the whole country (Krzywicki 1982, Buszko 1997). The Knyszyn Forest

was relatively late appreciated by researchers but at present is one of the 16 Prime Butterfly Areas identified in Poland (Buszko 2003). Since the area turned out to be very valuable, inventory study was continued. In the last 10 years many new data were collected. By this reason I recognized preparation of a new contribution as important and expedient. Furthermore the occasion was taken to adjust data to the new law of the nature conservation been being in force since 2004 (Dz. U. 2004. Nr 92, poz. 880).

Study area

The study was conducted in the Knyszyn Forest (KF) and adjacent woodland areas located in the city of Białystok and its immediate environs (Fig. 1).

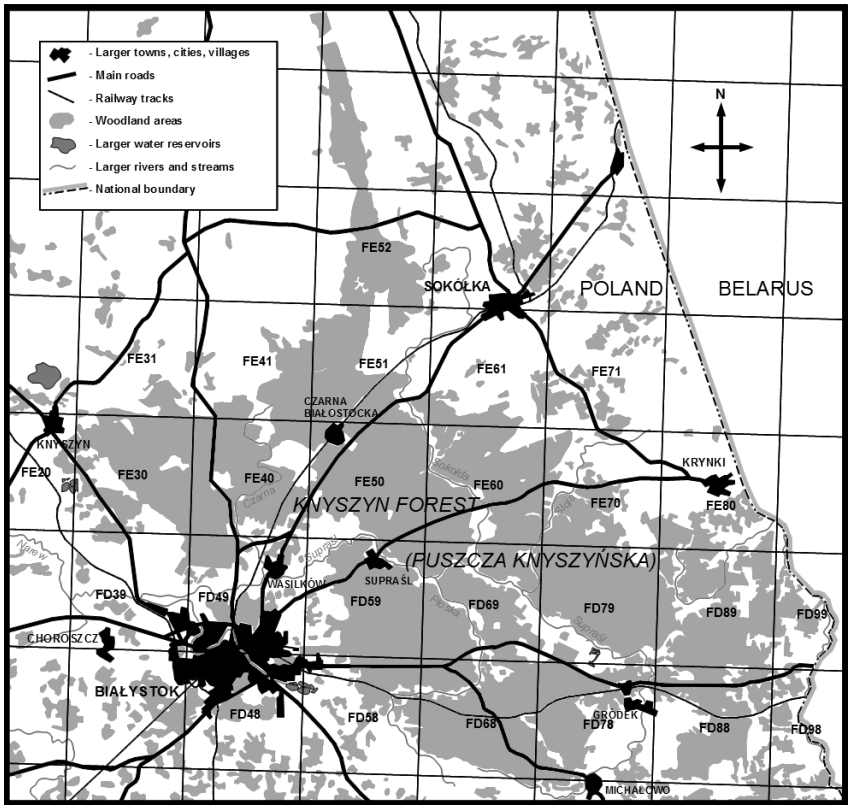

Fig. 1. Study area

The main study area – the KF is a one of the most valuable natural objects of north-eastern Poland. It covers the surface of 1267,02 km^2, from which 83,1% consists of forests, and the rest part is occupied mainly by farmlands (16,6%) and waters (0,3%) (Łaska 2006).

The KF is located within boundaries of two mezoregions: Białystok Upland (90%) and Sokółka Hills (10%). A varied relief was formed under the influence of glacial processes (Banaszuk 1995a, 1995b).

A distinctive feature of the KF is the location near to main watershed between Wisła and Niemen rivers. Bigger rivers of this area are: Supraśl, Sokołda, Czarna, Płoska and Słoja. Moreover there are many smaller rivers and streams. The curiosity is the presence of numerous natural leakages of underground waters (Górniak and Jekaterynczuk-Rudczyk 1995).

Varied lay of the land results in the development of diverse plant communities. Potentially, the largest percentage share have coniferous communities: high coniferous forest *Carici digitatae-Piceetum* (26,2%), fresh mixed coniferous forest *Serratulo-Piceetum* (14,3%) and subboreal vicariant of subcontinental pine forest *Peucedano-Pinetum* (11,9%). The large area is also occupied by subcontinental lowland linden-oak-hornbeam forest *Tilio cordatae-Carpinetum betuli* (20,1%), subboreal vicariant. Besides there occur: thermophilous oak-hornbeam forest *Melitti-Carpinetum*, wet mixed coniferous forests *Querco-Piceetum* and *Myceli-Piceetum*, lowland riparian ash-alder forest *Fraxino-Alnetum*, lowland ash-elm floodplain forest *Ficario-Ulmetum*, alder fen forest *Carici elongatae-Alnetum*. The characteristic of the KF is the presence of plant communities of clearly marked boreal feature; one should here mention: boreal vicariant of riparian forests – *Piceo-Alnetum*, bog-pine forest *Vaccinio uliginosi-Pinetum*, bog-pine forest *Carici chordorrhizae-Pinetum*, bog-spruce forest *Sphagno girgensohnii-Piceetum* and pine-birch boggy forest *Thelypteri-betuletum*. An interesting association is *Tilio-Piceetum* – an element of eutrophic subboreal forests of middle taiga, which represents a specific form of *Tilio-Carpinetum*. In total the forest communities on mineral soils take 88,8%, and on hydrogenic – 11,2% (Łaska 2006).

One should underline, that larger part of the area was subject to long-term influences of the forest management causing deformations of the potential natural vegetation. From this reason, natural and close to natural forest communities take only 11,7% of the present real vegetation of the KF; 88,3% of the area are taken by the secondary non-forest and forest communities, which are well identified and described (Łaska 2006). The great biodiversity of the area is also confirmed by a knowledge of the 835 species of vascular plants, from which 176 are legally protected (Łaska 2010).

High natural values of the KF have been reflected in the establishment of various forms of nature conservation. In 1988 the Puszcza Knyszyńska Landscape Park was founded. It covers 744,47 km^2 and its protective zone – 522,55 km^2 (Łaska 2006). Moreover, within the Natura 2000 Network there are functioning: Special Bird Protection Area "Puszcza Knyszyńska" PLB200003 and Special Area of Conservation Sites "Ostoja Knyszyńska" PLH200006 (Łaska 2009). The presence of 24 nature reserves should also be noted (Magrel 2008).

As mentioned above the study also included forests and areas adjacent to them located within boundaries of Białystok and in its immediate environs. Selected localities of the city area can serve as an indicator of urbanization pressures and as a reference to the continuous area of the KF. It is worth noting that there are two nature reserves within boundaries of the city (Magrel 2008).

Materials and methods

The study area encompassed 26 squares (10 x 10 km each) of UTM grid system (Universal Tranversal Mercator), as shown on the Fig. 1. In each square observations

were performed on one to several sites. However for purposes of this paper a list of species was presented with resolution of squares (Tab. 1).

The whole study area was detected to have many suitable habitats for butterflies as glades, forest meadows, woodland margins (along rivers and streams as well as adjacent to open terrains), low bogs and boggy pine forests. Although the living-space was limited in the large surface by dense forest structure, it was increased by anthropogenic open areas as roadsides, railway tracksides, forest compartment lines and paths, rides, gravel pits, power lines.

Data included in the paper came from the years 1995-2010 and they were based on author's own field study (exceptions to this rule were clearly stated). Some older data were already published in the previous paper (Klimczuk and Twerd 2000). Due to the long period of data collection, in order to illustrate the degree of their timeliness, the last year of record in relation to the whole area is given for each species in the last column of Tab. 1. The basic method was the observation of adults especially on sunny days throughout the season (from April to September) in different habitats. The finding of species on the basis of egg and larva was more important only in a few cases. Specimens difficult to identify in the field were determined after collecting and if necessary, prepared genitalia were examined. The observations were intended to obtain mainly qualitative data. In descriptions of selected species the numbers of individuals recorded per day were given for particular areas in hectares or length in meters or kilometers (in the case of linear habitats such as forest roads or edges of forests) as approximate data on relative abundance. Research documentation including daily records, simple electronic database, comparative collection, photographs of butterflies and their habitats is held by the author.

Nomenclature of butterflies was applied in accordance with Karsholt and van Nieukerken (2011). Species protected by law are indicated on the basis of the Regulation of Minister of the Environment dated 28 September 2004 (Dz. U. 2004. Nr 220, poz. 2237). Systematic names of plants were used in compliance with Mirek et al. (2002).

Results

A total number of 99 butterfly species (Hesperioidea and Papilionoidea) was recorded in the study area in the years 1995-2010 (Tab. 1). Fifty four of them were observed in at least half ($\geq$ 13) of all UTM squares, and three species were found in only one square. The highest number of species (75) was recorded in the square FD59, mainly owing to the diversity of habitats.

Some species deserve special attention because of conservation status and/or restricted distribution range at the national or regional scale. Therefore more detailed data on their occurrence in the KF and Białystok are presented below in systematic arrangement:

***Erynnis tages* (L.)** was found at three localities in three UTM squares. A total of only four individuals was recorded and the last observation came from 21 July 2000 (Białystok-Las Solnicki, FD48).

***Heteropterus morpheus* (Pall.)** was found at 18 localities in 11 UTM squares. It occurred locally in wet meadows and low bogs located along rivers and in the woods.

***Aporia crataegi* (L.)** was recorded at more than 25 localities in 16 UTM squares, observed on the margins and clearings in dry pine forests, in mid-field bounds and roadsides, and also at the edges of deciduous forests. It was observed singly and in small numbers (up to several individuals during the day within several hundred meters). More numerous occurence was noted in the western part of the KF (FE30) and in the areas adjacent to the KF from the north-west (FE31 and FE41). Larvae were found on *Sorbus aucuparia* L. emend. Hedl., *Malus* sp., *Pyrus* sp., *Prunus domestica* L. subsp. *syriaca* (Borkh.) Janch. and *Crataegus monogyna* Jacq.

***Colias palaeno* (L.)** was recorded in two the largest boggy pine forests: in the Moskal Bog (bagno Moskal) (FE40) – on the basis of study in 1997 and 2001 (up to six individuals were observed during the day in the area of about 40 ha), and in the southern part of the nature reserve Jesionowe Góry (FE51) – in 2010 (on 5 June one or two males were observed in the area of about 25 ha).

***Colias croceus* (Fourc.)** was recorded twice (on 27 July 1995 and on 28 July 1995) at the locality of Białystok-Uroczysko Bagno (FD48) and once near the village of Studzianki (21 August 2009, FE50). The species was observed in single specimens.

***Colias myrmidone* (Esp.)** was recorded at 11 localities in five UTM squares in the eastern part of the KF; in 1998-1999 reported in large numbers especially in the second generation. Particularly numerously the species appeared in the sun-warmed post-clear-cutting and pine forest crop habitats, where *Chamaecytisus ruthenicus* (Fisch. ex Woł.) Klásk. and nectariferous plants in sufficient quantity were growing. During the day up to several dozen individuals were observed in the areas of 0,5-4 ha. The butterfly also occurred on open roadsides, forest compartment lines, railway tracksides and edges of dry pine forests. Since 2007 the species was observed in small numbers (up to several adults during the day). Eggs and larvae on *C. ruthenicus* were also found.

***Hamearis lucina* (L.)** was recorded only from two localities. At the locality of Machnacz (FE51) the species was observed at various time intervals since 1997 and its presence was also confirmed in 2010. In a narrow belt-like area ca. three km in length (with variable spatial structure of vegetation: small clearings, forest margins, scrub) along the railway, imagines were observed singly or in small numbers every few tens of meters. On 20 May 2010 a total of 19 individuals was counted. The second locality – the vicinity of Supraśl (FD59) – known before 2000, was not subsequently surveyed for *H. lucina*.

***Lycaena helle* (Den. & Schiff.)** occurred in the KF very locally primarily on damp peaty meadows in the valleys of rivers Supraśl and Sokołda. It was recorded at 16 localities in 10 UTM squares. The species was also observed near the village of Przechody in the valley of the river Płoska (I. Dziekańska and M. Sielezniew pers. comm.). The largest population occupying the largest area was noted near Ogrodniczki (the valley of Supraśl and Pilnica rivers, FD59), where more than 50 individuals during the day were observed (checked in the area of about 30 ha). This locality has been known since 2006. The greater part of it is taken by extensively managed peaty meadows with plenty of growing *Polygonum bistorta* L. Fragments of meadows especially close to the forest margin are out of agricultural use. Another site where the species was observed in large numbers is situated in the valley of Supraśl River near Piłatowszczyzna (FD79) where over 30

individuals were registered in a small area (ca. 1 ha) on 17 July 2007. The population was threatened by overgrowing of the meadow. Four localities in the Sokołda River valley (the north-eastern vicinity of the village of Sokołda – FE60, Podłaźnie – FE60, the vicinity of the nature reserve Surażkowo – FE60 and Stryjeńszczyzna – FD69) are situated in a short distance from each other (an open area ca. 5 km away lies between the most extreme positions). Of all the currently known localities in the KF, the most isolated appears to be the low bog in the nature reserve Woronicza (FE60); over 3,5 km of woodland seperates it from the nearest one. The population existing there was estimated as one of the smallest; during the day from one to four individuals in the 6 ha area were encountered. Although the species is associated with the environment of wet meadows, the males were also observed in the sunny places in dry pine forest, to a distance of about 50 m from breeding habitats (noted in Krzemienne, FD69). At three localities *L. helle* occurred sympatrically with *Boloria eunomia* (Esp.) (see below).

***Lycaena dispar* (Haw.)** was recorded in 18 UTM squares at more than 40 localities. The KF provides that butterfly with many favourable habitats. The species also occurred within the boundaries of Białystok (FD48 and FD49). It was found locally on wet meadows, low bogs, edges of carrs, river valleys, as well as in more dry habitats – rural areas, ruderal environments and railway tracksides. However it was usually recorded in small numbers i.e. from one to several adults during the day within several hundred meters and at some localities it was easier to confirm the presence of the species on the basis of eggs and larvae found on *Rumex aquaticus* L., *R. hydrolapathum* Huds., *R. crispus* L. and *R. obtusifolius* L. The observed long flight period (June, first half of July, August up to the third decade) suggested that there were partially two and partially one generation per year.

***Favonius quercus* (L.)** was recorded only from four localities in three UTM squares despite of the existence of many favourable habitats.

***Satyrium w-album* (Knoch)** was found at four localities in four UTM squares.

***Satyrium pruni* (L.)** was recorded from nine localities in six UTM squares. Single individuals (rarely up to three-four per day) were usually found mostly on the edges of carrs and other moist woodland, where they were nectaring on flowers of *Aegopodium podagraria* L., *Filipendula ulmaria* (L.) Maxim. and *P. bistorta*.

***Satyrium spini* (Den. & Schiff.)** was recorded from five localities in five squares in some parts of the KF and in Białystok. Single specimens were observed in dry habitats on flowers of *Thymus serpyllum* L. emend. Fr. and on damp meadows.

***Cupido minimus* (Fuessly)** was recorded at six localities in five UTM squares. One-two individuals per day were encountered on dry railway tracksides, roadsides and in gravelly places. The last observation has come from the year 1999.

***Cupido argiades* (Pall.)** was recorded at many localities in 20 UTM squares; one of more frequently encountered butterflies in the study area.

***Glaucopsyche alexis* (Poda)** was recorded in seven UTM squares at 11 localities, mainly in pine forest environments, on roadsides, clearings and railway tracksides. Single

individuals were also encountered on the edges of deciduous forests. The species was observed more frequent in the eastern parts of the KF where it was recorded at seven of 11 total localities (FD78, FD88, FD89). Larvae were found on *Melilotus officinalis* (L.) Pall., *M. alba* Medik. and *Medicago sativa* L. s. str. The attendance by *Lasius* ants was noted.

***Phengaris arion* (L.)** was recorded in 11 UTM squares at 16 localities, most of them were situated in the eastern part of the KF, where there were favourable habitats for the species (the large area occupied by dry pine forests). I encountered mostly single individuals, only sometimes up to about 10 during the day within several hundred meters. The species was also observed within the boundaries of Białystok in the Pietrasze Forest (FD49) in the 90s of the last century by Twerd (Tab. 1) and also in 2010 (M. Sielezniew, pers. comm.). Localities near Sowlany and Ogrodniczki (FD59), north-east of Białystok, are the two localities nearest to the mentioned above. The first of these, situated on the outskirts of the KF is more open than the latter; it is covered with patches of low trees (mainly pine and birch) and on the south side it partially occupies area of the former dumping site. The butterfly was also found in small woods adjacent to the KF on the north-east (the vicinity of the village of Słójka, FE71). Everywhere it was observed *T. serpyllum* i.e. main larval host plant occurred.

***Plebejus argyrognomon* (Bgstr.)** was recorded at two localities: Białystok–Las Pietrasze (FD49) – one male (17 August 2001) and Sowlany (FD59) – one male (3 August 2003).

***Plebejus optilete* (Knoch)** was registered as one of the rarest butterflies in the KF, recorded in two the largest boggy pine forests. Data from the Moskal Bog (bagno Moskal) (FE40) date from 90s of the last century and further study is required. On the contrary in the southern part of the nature reserve Jesionowe Góry (FE51) the species was found just in 2010 (23 June – one female).

***Aricia eumedon* (Esp.)** was recorded only from the vicinity of the village of Sosnowik (FE70), where it was found in 2000. In the first half of July a few individuals were observed during the day in the area of about 1 ha on the managed peat meadow near the stream Poczopówka (observation made together with J. Buszko and J. Twerd). *Geranium palustre* L. was recorded to occur on the margin of the meadow. This locality was not subsequently visited.

***Aricia agestis* (Den. & Schiff.)** was found just in 2003, in total recorded from five localities in five UTM squares. Mostly single individuals were observed, rarely up to five per day (as noted on 21 July 2010 in the area of 0,5 ha on dry meadows near Ruda, FE20).

***Aricia artaxerxes* (F.)** was recorded only near Żednia (FD68). The small population (up to five individuals were encountered during the day) dependent on *Geranium sanguineum* L. as a larval host plant was observed to inhabit dry sandy railway trackside ca. 500 m in lenght. For the first time the species was noticed here in 2001 and it still persisted (confirmed in 2008 and 2010) despite the reconstruction of local road and removing by cutting the belt of trees and shrubs. The search for other localities have not brought positive results, although *G. sanguineum* is a plant that often occurs in the KF and is primarily related to the quite well represented association *Peucedano-Pinetum*.

***Polyommatus eros* (Ochs.) – subspecies: *Polyommatus eros eroides* (Friv.)**, one of the most threatened by extinction native species of butterflies, for the first time was observed near the village of Grzybowce (FD88) in 1998. The occurrence of the species was proved only in the eastern part of the KF at seven localities all in five UTM squares. Its distribution range almost overlapped the range of *C. myrmidone*. In 1998-2001 the population of *P. eros* in the KF was determined to be not numerous and scattered. No more than a few individuals per day were seen within several kilometers. Eggs and young caterpillars were also found on leaves of *C. ruthenicus* in July and August. From among recent data there were only two records confirmed the presence of *P. eros* in the KF – both from the vicinity of the village of Skroblaki (FD88 and FD89). On 17 July 2004 one male was observed there on the roadside in a fairly open partially agricultural area. It started from flowers of *T. serpyllum* and sat on panicles of oat (*Avena* sp.). On 12 July 2008 a female ovipositing on leaf of *C. ruthenicus* was recorded (observation made together with I. Dziekańska and M. Sielezniew). Both *C. myrmidone* and *P. eros* occurred in this part of the KF, within which a quite large area is occupied by younger forest stands (up to 30 years old) resulting from the afforestation of former farmlands among other things. Both species live here in anthropogenic habitats exposed primarily to influences of forest management. They persist largely through post-clearcutting sites which are unfortunately ephemeral.

***Polyommatus daphnis* (Den. & Schiff.)** occurred very locally in the study area. For the first time the species was recorded in 1999 at the locality of Białystok-Uroczysko Bagno (FD48) where it still persisted in small numbers (the last observation from 2009). In total the species was found at four localities in four UTM squares.

***Polyommatus coridon* (Poda)** was recorded only at the localities of Białystok–Uroczysko Bagno (FD48) and Białystok–Las Pietrasze (FD49).
***Argynnis niobe* (L.)** was recorded from three localities in three UTM squares. Single individuals were observed on dry forest edges, meadows and clearings. For the last time the species was noticed in 1997 near Kozińce (FE30).

***Argynnis laodice* (Pall.)** was recorded in 21 squares at many sites, in favourable habitats (damp meadows and low bogs at edges of carrs and wet mixed forests) often encountered. At some localities over 20 individuals were noted during the day (in the nature reserve Woronicza such quantity of adults was recorded within 50 m of the forest edge).

***Boloria eunomia* (Esp.)** was recorded at five localities in five UTM squares. Two of these populations (the Moskal Bog – FE40 and the nature reserve Jesionowe Góry – FE51) were associated with boggy pine forests and *Oxycoccus palustris* Pers. as a larval host plant. On these localities the species occurred sympatrically with *C. palaeno* and *P. optilete*. Three populations of *B. eunomia* inhabited low bogs and damp meadows with *P. bistorta* as a larval host plant (the reserve Woronicza – FE60, Waliły – FD79, Świsłoczany – FD98). At these localities *L. helle* also occurred, which was generally more widespread in the KF (see above). The highest abundance of *B. eunomia* was noted in the boggy pine forest in the nature reserve Jesionowe Góry and on the lowland wet meadow near the village of Świsłoczany where up to 60 individuals were observed during the day in the areas of about 25 ha and 6 ha respectively.

***Boloria euphrosyne* (L.)** was recorded at 23 localities in 14 UTM squares and observed in varying numbers of individuals: from single to five-ten, rarely to about 20 daily within 100 m. The species was encountered on roadsides, railway tracksides, clearings and woodland margins primarily in dry habitats. One population was also recorded in the Moskal Bog where it existed sympatrically with *B. eunomia*.

***Nymphalis xanthomelas* (Esp.)** was registered only on 15 July 2004 in the western part of the KF near the villages of Ruda and Chraboły (FE20 and FE30). A total number of four individuals was observed on the forest edge (ca. 1 km in length) with lots of willow trees and shrubs adjacent to wet meadows.

***Melitaea didyma* (Esp.)** was recorded at 21 localities in 12 UTM squares, encountered on roadsides, railway tracksides, clearings, heaths and post-clear-cutting habitats in dry pine forests and on their edges. Larger populations were observed in the eastern part of the KF.

***Melitaea britomartis* (Assm.)** was recorded at 20 localities in 10 UTM squares. Adults were observed on clearings, forest margins, roadsides, railway tracksides in dry habitats and on edges of wet meadows. During the day usually up to a few individuals were observed within several hundred meters. More abundant occurrence was noticed near the village of Straszewo (FD88) in 1998 and 1999 and in the vicinity of the village of Lipowy Most (FD69) in 2007 where the number of individuals exceeded 20 and 10 within 500 m and 200 m respectively.

***Lasiommata maera* (L.)** was recorded at 20 localities in eight UTM squares, observed in open places mainly in coniferous and mixed conifer forests. Adults were observed singly and also in groups up to about 10, rarely over 20 individuals within several hundred meters. Most colonies were found in the middle part of the KF in the squares FD59, FD69 and FE60. The butterflies readily visited the flowers of *Trifolium* sp. (red blooming), *Knautia arvensis* (L.) J. M. Coult. and *Hieracium* sp.

***Lopinga achine* (Scop.)** was observed in eight UTM squares. Most localities (of all more than 25 recorded) were situated in the central and northern part of the KF. In the eastern part the species was observed only in the vicinity of the nature reserve Chomontowszczyzna (FD79), however one should note that this part of the KF as well as lying west of a line Wasilków-Czarna Białostocka were not well examined for the occurrence of the species. In the case of two adjacent localities – Machnacz and Polanki (FE51) – the species was recorded in 1996 and was confirmed in 2010 in practically unchanged within 14 years environment. *L. achine* was observed on clearings, forest roads and margins in mixed coniferous forests with deciduous brushwood and in oak-hornbeam communities. Usually individuals were encountered singly or in small numbers, rarely up to over a dozen at one site, but at some localities over 30 adults were observed during the day within a few kilometers.

***Coenonympha tullia* (Müll.)** was found at three localities in three adjacent squares in the central part of the KF (FE40, FE50, FE60) and at one locality on the eastern edge of the KF (Narejki, FD98). In the nature reserve Budzisk (FE50) it was recorded only in 2010 (15 June – one or two individuals) on the peaty forest meadow (ca. 1,8 ha). The population inhabiting the low bog in the nature reserve Woronicza (FE60) had the best

conditions for the development owing to the large area of the well preserved habitat with many nectariferous plant species and possible larval host plants as *Carex* spp. and *Eriophorum* spp. It was also the most numerous (during the day over 10 individuals were observed in the area of over 2 ha). In turn, on the meadow along the river Czarna near Katrynka (FE40) only one individual was observed on 25 June 1996 in a small area of 0,5 ha and already at that time an overgrowth of trees and bushes was noticed there.

***Melanargia galathea* (L.)** for the first time was found in 2008 at the locality of Białystok-Uroczysko Bagno (FD48), where three individuals within 200 m were observed on dry meadows adjacent to pine forest (19 July 2008). By 2010 the species was recorded in the square FD48 at three localities in all, moreover in the square FD49 (Białystok-Las Pietrasze, a numerous occurrence in 2010 along the southern edge of the forest) and in the region of the village of Ruda (FE20). The butterfly was also observed by Sielezniew near Sowlany (FD59) in 2008 (M. Sielezniew, pers. comm.).

***Hipparchia hermione* (L.)** was recorded from the KF on the basis of one specimen caught by Twerd near the village of Kołodno (UTM: FD69) in 1998 (Klimczuk and Twerd 2000). Despite searching for the species in various places it was not found later.

One should remark that *P. argyrognomon* and *P. coridon* are the two species which have been recorded only outside the boundaries of the KF.

It is also worth noting that over the recent 10 years, it became increasingly difficult to observe *Nymphalis polychloros* (L.) and *Hipparchia semele* (L.).

As far as *Leptidea sinapis* (L.) and *Leptidea reali* (Reiss.) are concerned they were identified at individual localities on the basis of prepared genitalia according to Lorković (1993). *L. sinapis* was recorded at the locality of Białystok-Las Solnicki (FD48), whereas *L. reali* – in the vicinity of Ogrodniczki (FD59). Hitherto performed observations showed a wide distribution of the *sinapis-reali* group in the KF. However, a precise knowledge of distribution of each species is unknown.

Discussion

A total number of 99 recorded butterfly species represents over 60% of all species of this group known from Poland (Buszko and Nowacki 2000, Buszko and Masłowski 2008, Sielezniew and Dziekańska 2010). Twenty four species are mentioned in the Red List of Threatened Animals In Poland (Buszko and Nowacki 2002). Their threat and protection status is given in Tab. 2.

Taking into consideration distribution areas of butterflies in Poland (Buszko and Masłowski 2008, Sielezniew and Dziekańska 2010) as well as the results of the present study (number of localities and squares, relative number of individuals), the Knyszyn Forest may be considered as important stronghold for some endangered and vulnerable species. It concerns: *C. myrmidone*, *L. helle*, *G. alexis*, *P. arion*, *P. eros*, *B. eunomia*, *M. britomartis*, *L. achine*.

P. eros and *C. myrmidone* have got very similar ranges of distribution in the KF and exist in the very same habitats. The former species at present is recorded in Poland only from Podlasie (Buszko and Masłowski 2008). Its threat status is even suggested to change from EN to CR (critically endangered) (Sielezniew and Dziekańska 2010). In spite of difficulties caused by very low density of *P. eros* population some data of

biology were obtained in the KF and *C. ruthenicus* was identified successfully as a larval host plant of the butterfly (Klimczuk 2005). The latter species, *C. myrmidone*, belongs to the species becoming more and more endangered by extinction on Europe scale. According to the most recent data in European Union it has survived only in Poland, Romania and Slovakia (Marhoul and Dolek 2010). The declining trend has been noted also on the national scale. Recently the butterfly is observed only in the region of the KF and the Białowieża Primeval Forest and for this species the change of threat status is also suggested – from VU to CR (Marhoul and Dolek 2010, Sielezniew and Dziekańska 2010). Taking into account the decrease of abundance of *P. eros* and *C. myrmidone* in recent years in alone the KF, a proposal to change the threat status of both species is most justified.

Another threatened species recorded in dry places is *P. arion*. At present it occurs in eastern and southern Poland and it is most widespread in Podlasie (Sielezniew and Dziekańska 2010). Studies conducted on biology of the species at the locality of Sowlany (UTM: FD59) resulted in proving the association with *Myrmica schencki* Emery (Sielezniew et al. 2010).

Two other important species are *L. helle* and *B. eunomia* which exist in wet habitats.The former species is encountered primarily in the eastern and southern part of Poland. In Mazovia, Lower Silesia, Greater Poland and West Pomerania it is known from isolated localities (Buszko and Masłowski 2008). For instance in the Kampinos National Park it was found at a single locality only (Dziekańska and Sielezniew 2008). The latter species occurs in the eastern part of the country from the Augustów Forest and Mrągowo region to the Solska Forest (Buszko and Masłowski 2008). In years 2003-2004 it was recorded again (after several dozen years) in Pomerania (Bąkowski and Mnich 2010).

A woodland specialist *L. achine* has an insular range of distribution in Poland limited to the eastern part of the country (Buszko and Masłowski 2008). The species is most frequently observed in the Romincka Forest, KF, Białowieża Primeval Forest and Subcarpathia. Based on until now performed observations and data on the migration capacity of the butterfly (Bergman and Landin 2001, Bergman and Landin 2002) one can conclude that in a large area of the KF the species occurs in a compact manner, nevertheless the precise knowledge of the range requires detailed research. Of potential larval host plants mentioned in the literature (Buszko and Masłowski 2008, Sielezniew and Dziekańska 2010, Bergman 1999), in the KF occur: *Carex montana* L., *Brachypodium pinnatum* (L.) P. Beauv. and *B. sylvaticum* (Huds.) P. Beauv. (Sokołowski 1995, Zając and Zając 2001) and also *Carex brizoides* L. which was formerly recorded as very rare in shady mixed woodlands (Wójcicka 1937) and found in 2010 at one locality (M. Wołkowycki, pers. comm.).

Two remaining species from eight listed above are *G. alexis* and *M. britomartis* which were recorded to occur sympatrically at some localities in the KF. The former one is a rare species in Poland, with insular distribution, more frequently observed only in Podlasie (Buszko and Masłowski 2008). The latter species at present occurs at not many localities in the eastern part of the country, in Upper Silesia and in the region of Kielce (Buszko and Masłowski 2008).

Special concern is required for vulnerable and endangered species which were observed in the KF very locally, at a low number of localities, first of all for *A.*

artaxerxes recorded from only one site during the study. The other site of that species was noticed in the vicinity of Supraśl (Krzywicki 1982). Apart from the KF *A. artaxerxes* is known at present only from the Białowieża Primeval Forest, Biebrza valley, Toruń and Poznań areas (Buszko and Masłowski 2008, Frąckiel and Sielezniew 2009). Besides one should be taken into account here the following species: *C. palaeno*, *H. lucina*, *P. optilete* and also *A. eumedon* and *C. tullia*. Specific habitat requirements might be a limiting factor for these species in the KF with exception of *A. eumedon*. For this species the occurrence of *G. palustre* would be of great importance. This plant mentioned as a basic larval host plant for *A. eumedon* (Buszko and Masłowski 2008, Sielezniew and Dziekańska 2010) and noticed at the locality of Sosnowik during the study is a rare species in the KF (Sokołowski 1995).

The presence of a high number of localities of some other species in the study area is also valuable. For instance distributional ranges of *H. morpheus*, *A. crataegi*, *C. argiades*, *A. laodice*, *B. euphrosyne*, *M. didyma* and *L. maera* cover only part of area of Poland (Buszko and Masłowski 2008).

A low number of localities of *E. tages*, *S. pruni*, *S. spini*, *C. minimus*, *P. coridon* found in the study area may be explained by a rare occurrence of these species in this part of country (Buszko and Masłowski 2008), whereas *F. quercus*, more difficult to be observed (adults stay mostly in crowns of trees), probably is more widespread in the KF and *S. w-album* generally is rarely encountered in imago stage (Buszko and Masłowski 2008, Sielezniew and Dziekańska 2010).

P. argyrognomon was not known from the north-eastern part of Poland (Buszko and Masłowski 2008), thus this study brought first data in this subject, however there was no mention of the expansion of the species in the literature.

The expansion is taken into consideration with reference to three other species. *P. daphnis* in north-eastern Poland reaches the vicinity of Sokółka (Buszko and Masłowski 2008). *A. agestis* is a quite common species especially in central and southern part of the country (Buszko and Masłowski 2008), but its expansion is not excluded (Sielezniew and Dziekańska 2010). Until recently *M. galathea* was not recorded from the area of north-eastern Poland (Frąckiel 1999, Klimczuk and Twerd 2000, Buszko and Masłowski 2008). In the Biebrza National Park one individual of this species was observed for the first time in 2007, and in 2008 it occurred in large numbers at many sites (Frąckiel and Sielezniew 2009).

A very local occurrence of *P. argyrognomon*, *P. daphnis*, *P. coridon* and even *E. tages* may be caused by small resources of *Coronilla varia* L. (larval host plant), which was found seldom during the study carried out in the field.

Single and rather old-time observation (from 1998) of *H. hermione* may be related to a sharp decline in number of localities in Poland in the last few decades (Buszko and Masłowski 2008).

Although in the paper of Klimczuk and Twerd (2000), *Phengaris* (=*Maculinea*) *teleius* (Bgstr.) was listed, in the present paper it was not included considering the lack of caught or photographed specimens as well as the want of data on the occurrence of *Sanguisorba officinalis* L. (the larval host plant) in the KF (Sokołowski 1995, Zając and Zając 2001).

Taking into account the historical data *Carterocephalus palaemon* (Pall.) is the 100-th butterfly species known from the KF. It was recorded by Krzywicki (1982) during fragmentary study carried out near Supraśl in 1967, 1968 and 1972. In the years 1995-2010 it was not found. In this part of Poland this is not frequently encountered species (Buszko 1997, Buszko and Masłowski 2008), reported from the Białowieża Primeval Forest (Buszko 2001) and the Biebrza National Park (Frąckiel and Sielezniew 2009).

The following species: *Euphydryas maturna* (L.), *Melitaea diamina* (Lang) and *Coenonympha hero* (L.) were not found in the area. These species are known from neighbouring areas: the Białowieża Primeval Forest (Buszko 2001) and the Biebrza National Park (Frąckiel and Sielezniew 2009), so they were considered to occur in the KF with high probability. I also took into account, but with low probability of finding in the KF, following species: *Parnassius mnemosyne* (L.) recorded from the Białowieża Primeval Forest (Buszko 2001) and the Biebrza National Park (Frąckiel and Sielezniew 2009), *Euphydryas aurinia* (Rott.) known from the Białowieża Primeval Forest (Buszko 2001) and *Coenonympha oedippus* (F.) regarded as extinct in the Białowieża Primeval Forest (Buszko and Masłowski 2008) but occurring south-west of the KF in the Narew National Park (Winiarska 2001, Sielezniew et al. 2010).

Conclusions

The present paper compared to the previous one of Klimczuk and Twerd (2000) importantly improved the knowledge of the Knyszyn Forest butterflies by actualization of the species list (three new species recorded – *A. agestis*, *P. argyrognomon*, *M. galathea*, two species known from the old data registered again – *A. artaxerxes*, *N. xanthomelas*, and one species verified – *P. teleius*) and by more precise recognition of butterfly distributions and abundance (including such species as *C. myrmidone*, *L. helle*, *L. dispar*, *G. alexis*, *P. eros*, *B. eunomia*, *M. britomartis*, *L. achine*). In some cases the study has enabled an evaluation of trends over several years. Considering the very large area, I admit that the KF is still not evenly explored in a good way. However, the current state of knowledge indicates species for which detailed research should be continued. The total number of 99 (and taking into account historical data – up to 100) recorded species is relatively high compared with the number of species found in other surveyed areas: the Białowieża Primeval Forest - 114 species, including older data (Buszko et al. 1996, Buszko 2001), the Biebrza National Park - 98 species (Frąckiel and Sielezniew 2009), the Narew National Park - 40 species listed on the basis of preliminary study (Winiarska 2001), the Romincka Forest - 67 species listed on the basis of preliminary study (Sielezniew and Sachanowicz 2003) or the Kampinos National Park - 80 species (Dziekańska and Sielezniew 2008). Therefore present study emphasizes high natural values of the KF. Good conditions of the environment in this part of Poland are also shown by the fact, that only in one UTM square (FD48) comprising three research localities situated within the city of Białystok boundaries a total of 74 butterfly species was recorded.

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Tab. 1. List of butterfly species (Hesperioidea and Papilionoidea) recorded in the Knyszyn Forest and Białystok in 1995-2010 in relation to UTM squares.
* If the sign „+" is not placed, data should be treated together for the *sinapis-reali* complex.
** Observations by Twerd, included in the paper of Klimczuk and Twerd (2000), but not confirmed by the author.

	Family	UTM square																										N. of squares	Last year of record
L.p.	Species	FD 48	FD 58	FD 68	FD 78	FD 88	FD 98	FD 39	FD 49	FD 59	FD 69	FD 79	FD 89	FD 99	FE 20	FE 30	FE 40	FE 50	FE 60	FE 70	FE 80	FE 31	FE 41	FE 51	FE 61	FE 71	FE 52		
	Hesperiidae																												
1.	*Erynnis tages* (L.)	+	+																					+				3	2000
2.	*Carcharodus alceae* (Esp.)	+			+	+			+							+		+	+		+							8	2009
3.	*Pyrgus malvae* (L.)	+	+	+	+	+		+	+	+		+	+					+	+				+	+				14	2010
4.	*Pyrgus alveus* (Hbn.)	+				+				+	+		+					+	+					+				8	2010
5.	*Heteropterus morpheus* (Pall.)		+							+	+	+			+	+		+	+					+	+		+	11	2010
6.	*Carterocephalus silvicola* (Meig.)	+	+	+		+											+	+	+					+			+	9	2010
7.	*Thymelicus lineola* (Ochs.)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	26	2010
8.	*Thymelicus sylvestris* (Poda)	+	+	+		+	+		+	+	+	+	+	+	+	+	+	+	+	+			+	+	+		+	21	2010
9.	*Hesperia comma* (L.)	+				+		+		+			+			+												6	2010
10.	*Ochlodes sylvanus* (Esp.)	+	+	+	+	+	+	+	+	+	+	+	+			+	+	+	+	+		+	+	+	+		+	22	2010
	Papilionidae																												
11.	*Papilio machaon* (L.)	+	+	+		+	+	+	+	+	+		+	+		+	+	+	+	+	+	+	+	+	+	+		22	2010
	Pieridae																												
12.	*Leptidea sinapis* (L.)	+	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*		*	*	*	*		*	*	23	2010*
13.	*Leptidea reali* (Reiss.)	*	*	*	*	*	*	*	*	+	*	*	*	*	*	*	*		*		*	*	*	*		*	*	23	2010*
14.	*Anthocharis cardamines* (L.)	+	+			+	+	+		+	+					+	+	+	+			+		+			+	14	2010
15.	*Aporia crataegi* (L.)				+	+	+	+			+		□□		+	+	+		+			+	+	+	+	+	+	16	2010
16.	*Pieris brassicae* (L.)	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	25	2010
17.	*Pieris rapae* (L.)	+		+	+	+	+	+	+	+	+		+	+		+	+	+	+	+	+	+	+	+	+	+	+	23	2010
18.	*Pieris napi* (L.)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	26	2010
19.	*Pontia edusa* (F.)	+	+			+		+	+	+	+			+			+		+		+			+			+	13	2010
20.	*Colias palaeno* (L.)																+							+				2	2010
21.	*Colias croceus* (Fourc.)	+																+										2	2009

22. *Colias myrmidone* (Esp.)					+	+						+	+								+							5	2010
23. *Colias hyale* (L.)	+	+		+	+	+	+	+	+	+		+	+	+	+		+	+		+				+	+	+	+	20	2010
24. *Gonepteryx rhamni* (L.)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	26	2010
Riodinidae																														
25. *Hamearis lucina* (L.)									+**																+				2	2010
Lycaenidae																														
26. *Lycaena phlaeas* (L.)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	25	2010
27. *Lycaena helle* (Den. & Schiff.)				+	+	+	+		+	+	+								+						+	+			10	2010
28. *Lycaena dispar* (Haw.)	+	+	+	+	+	+		+	+	+	+		+		+	+	+	+	+				+	+	+	+			18	2010
29. *Lycaena virgaureae* (L.)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	26	2010
30. *Lycaena tityrus* (Poda)	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+		+	+	+	+	+				23	2010
31. *Lycaena alciphron* (Rott.)	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+			+	+	+				22	2010
32. *Lycaena hippothoe* (L.)	+	+	+	+	+	+	+	+	+	+					+	+		+			+	+	+						16	2010
33. *Thecla betulae* (L.)	+				+			+	+			+	+																6	2010
34. *Favonius quercus* (L.)	+								+					+															3	2010
35. *Callophrys rubi* (L.)	+	+	+	+	+			+	+	+		+	+		+	+		+						+				14	2010
36. *Satyrium w-album* (Knoch)	+							+		+														+					4	2008
37. *Satyrium pruni* (L.)			+			+			+	+						+		+											6	2008
38. *Satyrium spini* (Den. & Schiff.)	+							+				+		+										+					5	2010
39. *Satyrium ilicis* (Esp.)	+	+	+		+	+		+	+	+		+				+	+	+						+			+		14	2010
40. *Cupido minimus* (Fuessly)	+			+			+	+							+														5	1999
41. *Cupido argiades* (Pall.)	+	+	+	+	+	+	+	+	+	+		+		+	+	+		+	+		+	+	+	+	+				20	2010
42. *Celastrina argiolus* (L.)	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+		24	2010
43. *Glaucopsyche alexis* (Poda)				+	+			+**	+			+					+							+					7	2009
44. *Phengaris arion* (L.)			+	+	+	+		+**	+	+		+							+	+						+			11	2010
45. *Plebejus argus* (L.)			+		+				+	+			+					+	+	+				+					9	2010
46. *Plebejus idas* (L.)	+			+	+	+		+	+			+	+						+	+		+							11	2010
47. *Plebejus argyrognomon* (Bgstr.)								+	+																				2	2003
48. *Plebejus optilete* (Knoch)																+**								+					2	2010
49. *Aricia eumedon* (Esp.)																			+										1	2000
50. *Aricia agestis* (Den. & Schiff.)	+								+	+				+				+											5	2010
51. *Aricia artaxerxes* (F.)			+																										1	2010

52. *Cyaniris semiargus* (Rott.)	+	+	+	+	+	+	+	+	+	+		+	+		+	+	+	+				+	+				18	2010
53. *Polyommatus amandus* (Schn.)	+	+	+	+	+	+	+	+	+	+	+	+			+	+	+	+	+		+	+	+	+	+	+	23	2010
54. *Polyommatus icarus* (Rott.)	+	+		+	+	+	+	+	+	+		+	+	+	+	+	+	+		+	+	+	+	+	+		22	2010
55. *Polyommatus eros* (Ochs.)					+	+						+							+	+							5	2008
56. *Polyommatus daphnis* (Den. & Schiff.)	+		+					+									+										4	2009
57. *Polyommatus coridon* (Poda)	+							+																			2	2003
Nymphalidae																													
58. *Argynnis paphia* (L.)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	26	2010
59. *Argynnis aglaja* (L.)	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+			23	2010
60. *Argynnis adippe* (Den. & Schiff.)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	25	2010
61. *Argynnis niobe* (L.)	+								+						+												3	1997
62. *Argynnis laodice* (Pall.)	+	+	+	+	+	+		+	+	+	+	+	+		+	+	+	+	+		+		+	+		+	21	2010
63. *Issoria lathonia* (L.)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	26	2010
64. *Brenthis ino* (Rott.)	+	+	+	+	+	+	+		+	+	+			+	+	+	+	+					+	+		+	18	2010
65. *Boloria eunomia* (Esp.)						+					+					+		+						+			5	2010
66. *Boloria euphrosyne* (L.)	+	+	+	+		+	+		+			+			+	+		+			+	+	+				14	2010
67. *Boloria selene* (Den. & Schiff.)	+	+	+	+	+	+		+	+	+	+	+		+	+	+	+	+	+		+	+	+	+		+	22	2010
68. *Boloria dia* (L.)	+	+	+	+	+	+		+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	24	2010
69. *Vanessa atalanta* (L.)	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+		+	23	2010
70. *Vanessa cardui* (L.)	+		+	+	+	+		+	+	+	+	+	+	+		+	+	+					+				16	2010
71. *Aglais io* (L.)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	26	2010
72. *Aglais urticae* (L.)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	25	2010
73. *Polygonia c-album* (L.)	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+			+	+	+	+		+	22	2010
74. *Araschnia levana* (L.)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	25	2010
75. *Nymphalis antiopa* (L.)	+	+	+	+	+	+	+	+	+	+		+			+	+	+	+		+				+		+	18	2010
76. *Nymphalis polychloros* (L.)	+				+			+		+					+	+	+	+					+				9	2007
77. *Nymphalis xanthomelas* (Esp.)														+	+												2	2004
78. *Melitaea cinxia* (L.)		+	+	+	+	+			+						+	+	+	+									10	2010
79. *Melitaea didyma* (Esp.)	+	+	+	+	+			+	+	+		+			+			+		+							12	2009
80. *Melitaea britomartis* (Assm.)				+	+	+			+	+		+	+				+	+						+			10	2010
81. *Melitaea athalia* (Rott.)	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+		+	+	+	+	+	+		23	2010

82. *Limenitis populi* (L.)		+	+	+					+	+						+	+	+	+				+			+	11	2010
83. *Limenitis camilla* (L.)	+	+	+		+			+	+	+						+	+	+				+	+			+	13	2010
84. *Apatura ilia* (Den. & Schiff.)	+		+		+	+				+							+						+			+	8	2010
85. *Apatura iris* (L.)	+		+		+	+			+			+				+	+	+					+	+	+		12	2010
86. *Pararge aegeria* (L.)	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+			+	+	+		+	22	2010
87. *Lasiommata megera* (L.)	+	+		+	+		+	+	+			+	+	+	+					+	+	+	+				15	2010
88. *Lasiommata maera* (L.)		+	+		+				+	+						+	+	+									8	2010
89. *Lopinga achine* (Scop.)									+	+	+						+	+	+				+			+	8	2010
90. *Coenonympha tullia* (Müll.)						+										+	+	+									4	2010
91. *Coenonympha arcania* (L.)	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+			+	+	+	+	+	+	23	2010
92. *Coenonympha glycerion* (Borkh.)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+			+	+	+	+	+	+	24	2010
93. *Coenonympha pamphilus* (L.)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+			25	2010
94. *Aphantopus hyperantus* (L.)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	26	2010
95. *Maniola jurtina* (L.)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	26	2010
96. *Hyponephele lycaon* (Rott.)	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+		+	+	+	+			+	+		21	2010
97. *Melanargia galathea* (L.)	+							+						+													3	2010
98. *Hipparchia hermione* (L.)										+**																	1	1998
99. *Hipparchia semele* (L.)	+		+		+			+	+										+	+							7	2002
Number of species in the square	74	57	60	57	72	59	43	64	75	66	40	59	43	39	57	61	60	70	39	34	38	43	70	43	32	41		

Tab. 2. Threat and protection status of butterfly species (Hesperioidea and Papilionoidea) of the Knyszyn Forest and Białystok.
* Categories in accordance with the Red List of Threatened Animals In Poland (Głowaciński 2002):
EN – endangered, VU – vulnerable, NT – near threatened, LC – least concern, DD - data deficient.
** Categories in accordance with the Polish Red Data Book of Animals, Invertebrates (Głowaciński and Nowacki 2004):
EN – endangered, VU – vulnerable, LR - lower risk; LR (=NT+LC).
*** Categories in accordance with the European Red List of Butterflies (van Swaay et al. 2010):
CR – critically endangered, EN – endangered, VU – vulnerable, NT – near threatened, LC – least concern.
Europe – geographical Europe area.
EU27 – The European Union area, comprising 27 Member States.

L.p	**Family** Species	Red List PL*	Red Data Book PL**	Legally protected in Poland	Habitat Directive Appendix No.	European Red List*** Europe	EU27
	Hesperiidae						
1.	*Heteropterus morpheus* (Pall.)	NT				LC	LC
	Papilionidae						
2.	*Papilio machaon* (L.)	LC				LC	LC
	Pieridae						
3.	*Colias palaeno* (L.)	EN	EN	+		LC	LC
4.	*Colias myrmidone* (Esp.)	VU	VU	+	II and IV	EN	CR
	Riodinidae						
5.	*Hamearis lucina* (L.)	VU				LC	LC
	Lycaenidae						
6.	*Lycaena helle* (Den. & Schiff.)	VU	VU	+	II and IV	EN	LC
7.	*Lycaena dispar* (Haw.)	LC	LR	+	II and IV	LC	LC
8.	*Glaucopsyche alexis* (Poda)	VU				LC	LC
9.	*Phengaris arion* (L.)	EN	EN	+	IV	EN	EN
10.	*Plebejus optilete* (Knoch)	EN		+		LC	LC
11.	*Aricia eumedon* (Esp.)	VU				LC	LC
12.	*Aricia artaxerxes* (F.)	EN				LC	LC
13.	*Polyommatus eros* (Ochs.)	EN	EN	+	II and IV	NT	NT
	Nymphalidae						
14.	*Boloria eunomia* (Esp.)	EN	EN	+		LC	LC
15.	*Boloria euphrosyne* (L.)	NT				LC	LC
16.	*Nymphalis xanthomelas* (Esp.)	DD				LC	NT
17.	*Melitaea didyma* (Esp.)	VU				LC	LC
18.	*Melitaea britomartis* (Assm.)	VU				NT	NT
19.	*Limenitis populi* (L.)	LC				LC	NT
20.	*Apatura ilia* (Den. & Schiff.)	LC				LC	LC
21.	*Apatura iris* (L.)	LC				LC	LC
22.	*Lopinga achine* (Scop.)	EN	EN	+	IV	VU	VU
23.	*Coenonympha tullia* (Müll.)	VU		+		VU	NT
24.	*Hipparchia hermione* (L.)	EN		+		NT	NT