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Parnassius mnemosyne (Lepidoptera: Papilionidae) in North Moravia: review of present and past distribution, proposal for conservation

Parnassius mnemosyne (Lepidoptera: Papilionidae) na severní Moravě: současné a historické rozšíření, návrh ochrany

Tomáš KURAS[1)], Jiří BENEŠ[2)], Alois ČELECHOVSKÝ[2)], Vladimír VRABEC[3)] & Martin KONVIČKA[4)]

[1)] Department of Ecology, Palacký University, Tř. Svobody 26, CZ-771 46 Olomouc, Czech Republic; e-mail: kuras@risc.upol.cz

[2)] Department of Zoology, Palacký University, Tř. Svobody 26, CZ-771 46 Olomouc, Czech Republic; e-mail: benes.j@post.cz, celechov@prfnw.upol.cz

[3)] Department of Zoology and Fishery, Czech University of Agriculture, CZ-165 21 Praha 6 - Suchdol, Czech Republic; e-mail: vrabec@af.czu.cz

[4)] Faculty of Biological Sciences, University of South Bohemia, Branišovská 31, CZ-370 05 České Budějovice, Czech Republic; e-mail: konva@tix.bf.jcu.cz

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Abstract. Historical and recent distribution of the Clouded Apollo, *Parnassius mnemosyne* (Linnaeus, 1758) in North Moravia is reviewed and evaluated. Altogether 87 localities are recorded on the basis of field research, revisions of collection material and literature records. The butterfly has disappeared from many areas of its former occurrence. Thus, only 16 localities may be considered as recent (the species occurred there after 1990). Among them, localities in the Litovelské Pomoraví Protected Landscape Area, the Javorníky Mountains and stream valleys in the western and southern foothills of the Nízký Jeseník Mountains still host abundant and viable populations. Four time periods are distinguished (until 1900, 1900-1950, 1951-1990, after 1990); the highest rate of population extinctions (42 localities) was occurred the period 1951-1990. The most common cause of population extinction are changes in forest management (coniferisation and replacement of coppicing and selectively harvested woods by mature forest). Proposal for conservation via altered forest management of inhabited sites is based on a metapopulation model.

INTRODUCTION

Comparative studies of the historical and recent distribution of vanishing species serve as a valuable tool for estimating the extent of nature degradation (Schaffer et al. 1998). Such an approach is vital in insect conservation, because direct data on past population sizes and changes are virtually non-existent for these animals. Conservation-relevant lessons have been learned from several studies of the historical distribution of butterflies (cf. Thomas 1995). Many of them dealt with entire butterfly faunas of large regions (e.g., Heath et al. 1984, van Swaay 1990, Kudrna 1994, Beneš & Kuras 1998), but reviews of historical distribution of single species were also published (e.g., Väisänen & Somerma 1985). Compared to works on many species, single-species studies allow a greater precision and a more reliable interpretation, especially if focused on species for which a good historical record and an autecological information is available. In this

paper, we present a comprehensive review of the historical and recent distribution of an endangered butterfly *Parnassius mnemosyne* (Linnaeus, 1758) in the region of North Moravia.

Parnassius mnemosyne precisely meets the criteria stated above. The species is legally protected in the Czech Republic and endangered throughout Europe (Heath 1981, Kudrna & Seufert 1991, Čaputa 1992). It is extinct in Bohemia: V. Vrabec, who studied its last population there (Vrabec 1994), did not observe the species since 1995. The butterfly has been popular among collectors since the 19th century, owning to the remarkable intraspecific variability characteristic for the genus *Parnassius* Latreille, 1804 (cf. Rebel & Rogenhofer 1893, Bryk 1935). Adámek (1944) and Stiova (1984) reviewed the distribution of *P. mnemosyne* in the area under study. Much other information is scattered in the literature (for references see Results). Recently, its ecology (Väisänen & Somerma 1985, Aagaard & Hanssen 1992, Napolitano et al. 1988, Kudrna & Seufert 1991, Vrabec 1994, Meglécz et al. 1997a, Meglécz et al. 1999, Konvička & Kuras 1999) and molecular genetics (Descimon & Napolitano 1993, Napolitano & Descimon 1994, Meglécz et al. 1997b, Meglécz et al. 1998, Meglécz & Solignac 1998) has been extensively studied.

According to these papers, *P. mnemosyne* is a colonial, poorly dispersing species, that occurs in closed populations (sensu Warren 1992). The low mobility of adults ensures that a colony probably existed wherever the species was reported/collected in the past. This ecological trait, coupled with the popularity of the species among collectors and naturalists, allows us to assess the of historical distribution of *P. mnemosyne* in North Moravia from archival data, and to estimate the scope of its decline in the region. Moreover, we attempt to specify the conservation status of the species in the area of interest and to propose appropriate conservation measures.

MATERIAL AND METHODS

The study area

The region of "North Moravia" is understood within the borders of the former administrative region "Severomoravský kraj" (see Fig. 1), as it was delimited in July 1, 1960 (Anonymus 1968).

The following "List of localities" covers all localities which belong to the squares of the faunistic grid mapping of the Czech Republic (Novák 1989) that cover (even partially) the area of North Moravia. The list therefore includes some adjacent Bohemian, South Moravian and Polish localities.

Data collecting and processing

We attempted to review all relevant literary sources and examined as many as possible unpublished reports and collections (both public and private). Moreover, we visited as many as possible of the localities indicated by the archival data, during *P. mnemosyne* flight period or we communicated with lepidopterists who visited them recently. Since 1990, we personally visited 64 of the 87 localities treated in the List of localities, many of them repeatedly (cf. Kuras & Konvička 1996, Beneš & Kuras 1997, Konvička & Kuras 1999).

The museum material presented in this paper came from the following institutions: KMVC - Regional Museum of Eastern Bohemia, Hradec Králové; MMBC - Moravian Museum, Brno; NMPC - National Museum, Praha; RMFM - Regional museum of the Beskydy Mts, Frýdek-Místek; RMKO - Regional Museum, Kolín; RMKR - Regional Museum, Kroměříž; RMOL - Regional Museum, Olomouc; RMOS - Regional Museum, Ostrava; RMPR - Regional Museum of J. A. Komenský, Přerov; RMSU - Regional Museum, Šumperk; RMVS - Regional Museum, Vsetín; RMZL - Regional Museum of South-Eastern Moravia, Zlín; SMOC - Silesian Museum, Opava; UPOL - Department of Zoology, Palacký University, Olomouc.

Besides usual faunistic data (collector, number of specimens etc.), we give all relevant and available information about the listed localities (both recent and historical). The information on phytogeographical units follows Slavík (1988).

Arrangement of presented data

The List of localities are organised as follows for each locality:

(a) Serial number of the locality. The localities are arranged according to increasing numbers of their faunistic grid mapping squares (Pruner & Míka 1996). The square numbers are given in parentheses. The localities visited by the authors are marked by asterisk (*).

(b) Name of the locality. Names of settlements are given according to Pruner & Míka (1996). If the same locality holds different valid names all of them are mentioned. For localities originally published in German and for museum records with German labels, we list the original name and the Czech name in square brackets. The German names were cross-referenced in Pfohl (1922), Hosák & Šrámek (1970, 1980) and Turek (1974).

(c) The phytogeographical unit to which the locality belongs (Slavík 1988); e.g., thermophyticum (a region of thermophilous flora and vegetation), mesophyticum (temperate oceanic flora and vegetation of deciduous forests), and oreophyticum (montane flora and vegetation).

(d) Altitude of the locality.

(e) Period of the last occurrence. Dates of the occurrence of *P. mnemosyne* were split into four periods modified after Kudrna (1994): 1 - until 1900, 2 - 1901 to 1950, 3 - 1951 to 1990, 4 - after 1990. For localities with records from later periods only, we assume the occurrence of *P. mnemosyne* in previous period(s).

"Reference(s)" - gives literature references, both published and unpublished. An indirect localisation (following author's description of natural conditions or earlier/later references) are indicated by "cf.".

"Material examined" - we present numbers of specimens in a respective collection captured from one locality in a given year. The term "more spec." denotes that there are more than 10 specimens originating from the same year and deposited in one collection (we omit exact dates of collection and do not report sexes of the material studied, because we believe that this information would be redundant for such a well-known species).

"Unpublished data" - unpublished and not-documented, but reliable information (i.e. nature conservation inventories, personal communication to experienced entomologists etc.).

"Habitat(s)" - information on habitats occupied by *P. mnemosyne*. It was either extracted from the referred literature or observed by the authors.

"Note(s)" - any supplementary information (such as the present state of localities, years of the last sightings, a possible cause of decline/extinction, etc.) which we considered relevant in this context.

RESULTS

I. List of localities of *Parnassius mnemosyne* in North Moravia

1. Reichenstein [= Rychleby Castle nr. Javorník] (5667), mesophytic, alt. 450 m. Period 1.
Material examined: 2 spec. (date and collector unknown), NMPC.
Habitat: Račí údolí mountain stream valley.

***2. Králický Sněžník Mt.** (5767), oreophytic, alt. ca 1100 m. Period 3.
References: cf. Wocke (1872), Pax (1919, 1921), Moucha & Novák (1953), Dabrowski & Krzywicki (1982).
Note: Single specimen observed at a montane meadow in 1952 (Moucha & Novák 1953).

***3. Na Pomezí Nature Reserve** (nr. Lipová-lázně) (5768), mesophytic, alt. 550 m. Period 3.
Unpublished data: Observed in June 1985 (recorded in the Inventory list of the Na Pomezí Nature Reserve, depon. in AOPK ČR, Olomouc, author unknown).
Habitats: Mountain stream valley, beech forest, mesophilous meadows.
Note: Despite repeated visits at the locality the species was not confirmed there by the authors.

***4. Ostružná-Petříkov** (5768), oreophytic, alt. ca 380 m. Period 3.
Reference: Novák & Moucha (1955).
Notes: Abundant in 1955 (Novák & Moucha 1955). The locality probably vanished due to changes in forest composition (coniferisation).

5. Petersdorf [= Petrovice, nr. Zlaté Hory] (5770), mesophytic, alt. ca 470 m. Period 2.
References: cf. Wocke (1872), cf. Niepelt (1912-13), cf. Pax (1919, 1921), cf. Hykeš (1925), cf. Anonymus (1927), cf. Wolf (1927).
Material examined: 1929, 1 spec. (collector unknown), SMOC.
Note: The locality might be identical with No. 6.

6. Biskupská kupa Hill (nr. Zlaté Hory) (5770), oreophytic, alt. ca 870 m. Period 2.
References: Wocke (1872), Niepelt (1912-13), Pax (1915, 1919, 1921), Hykeš (1925), Anonymus (1927), Wolf (1927)

*__7. Dolní Morava-Horní Morava__ (5866), oreophytic, alt. ca 730 m. Period 3.
Reference: Kudrna (1994).
Habitat: Morava River valley.
Note: Not observed since the 1950s (A. Kačírek, pers. comm.).

*__8. Dolní Morava-Velká Morava__ (5866), mesophytic, alt. ca 670 m. Period 2.
Reference: Komárek (1949).
Habitat: Morava River valley (Komárek 1949).

9. Staré Město (5867), mesophytic, alt. ca 550 m. Period 3.
Reference: Kudrna (1994).
Material examined: 1985, 1 spec., J. Majer leg. et coll.
Unpublished data: J. Majer specified the record in Kudrna (1994).
Habitats: Meadows next to deciduous forest (J. Majer, pers. comm.).

10. Králíky-Červený Potok (58-5966), mesophytic, alt. 540 m. Period 3.
References: cf. Moucha & Novák (1953), Novák & Moucha (1955).
Habitat: Mixed forest.
Notes: Single specimen observed in 1952. The locality was misinterpreted as "Červená Voda" in Novák & Moucha (1953) (cf. Moucha & Novák 1955).

11. Wiesenberg - Wolfsgrube [= Vlčí důl valley, nr. Loučná nad Desnou] (5968), oreophytic, alt. ca 750 m. Period 2.
Material examined: 1941, 2 spec., 1943, more spec., all J. E. Kammel & R. Mück leg., SMOC.
Habitat: Mountain stream valley.

*__12. Velké Losiny - env.__ (5968), mesophytic, alt. ca 400 m. Period 2.
References: Stiova (1973, 1984).

*__13. Praděd Mt. - env.__ (5969), oreophytic, alt. above 800 m. Period 1.
References: cf. Hudeček (1930), Komárek (1949), Paikert (1967), Stiova (1984).
Habitat: Most probably some of the adjoining stream valleys.
Note: The population vanished due to destruction of a native beech forest (Stiova 1984).

*__14. Brumovice-Pocheň__ (5972), mesophytic, alt. ca 330 m. Period 2.
Reference: Beneš & Kuras (1997).
Material examined: 2 spec. (date unknown), Schlusche leg., SMOC.
Habitat: Forested stream valley.

15. Bludov (nr. Šumperk) (6067), mesophytic, alt. 300 m. Period 2.
Reference: Paikert (1967).
Material examined: 1936, 1 spec., 1937, 2 spec., 1938, 1 spec., 1940, 5 spec., all J. E. Kammel coll. [= leg.], SMOC; 1 spec. (date unknown), R. Jenisch leg., MMBC.

16. Šumperk (6067), mesophytic, alt. ca 320 m. Period 2.
Material examined: 1932, 1 spec., 1933, 1 spec., both A. Montag leg., RMSU.

17. Hvězda Mt. (nr. Sobotín-Rudoltice) (6068), oreophytic, alt. ca 800 m. Period 3.
Reference: Kudrna (1994).
Material examined: 1973, 1 spec., Z. Laštůvka leg. et coll.
Habitat: Clearings in mixed forest (Z. Laštůvka, pers. comm.).
Notes: Not abundant in 1973 (Z. Laštůvka, pers. comm.). The record presented in Kudrna (1994) was supplied by Z. Laštůvka.

*__18. Hermsdorf__ [= Svobodné Heřmanice] (6072), mesophytic, alt. ca 400 m. Period 2.
References: cf. Paikert (1967), cf. Čížová (1994), Beneš & Kuras (1997).
Material examined: 2 spec. (date and collector unknown), SMOC.
Habitat: Forested stream valley.
Note: Paikert (1967) and Čížová (1994) misinterpreted "Hermsdorf" as Heřmánky (cf. Turek 1974, Pfohl 1922, Hosák & Šrámek 1970).

*__19. Birkowitz__ [= Březová nr. Opava] (6073), mesophytic, alt. ca 520 m. Period 2.
References: Stief (1938), Beneš & Kuras (1997).
Material examined: 1932, 1 spec., K. Stief leg., RMOS.
Note: Our interpretation of the original locality name follows Turek (1974), Hosák & Šrámek (1970) and Pfohl (1922) although we cannot also exclude the Březové settlement near Litovel.

*__20. Slavkov__ (Hvozdnice valley) (6073), mesophytic, alt. ca 300 m. Period 3.
Reference: Beneš & Kuras (1997).
Material examined: 1956, 1 spec., Z. Tesař leg., SMOC; 1965, 3 spec., L. Tichý leg. et coll.
Habitats: Stream valley, floodplain forest and meadows.

*__21. Stěbořice__ (6073), mesophytic, alt. ca 300 m. Period 1.
References: Anonymus (1895), Wolf (1927), Skala (1931), Beneš & Kuras (1997).
Habitat: Stream valley, mixed forest.

*__22. Vitošov__ (nr. Hrabová) (6167), mesophytic, alt. 290 m. Period 3.
References: Stiova (1973, 1984).
Habitat: Beech forest with clearings.

*__23. Valšovský Důl Valley__ (nr. Dlouhá Loučka) (6169), mesophytic, alt. 320 m. Period 4.
Material examined: 1968, 2 spec., J. Kuja leg. et coll.; 1997, 3 spec., A. Čelechovský leg. et coll.; 1997, 6 spec., T. Kuras leg. et coll.
Habitats: Huntava and Olešnice stream valleys, beech and mixed forests, mesophilous meadows.
Note: Abundant in 1997-1999.

*__24. Roudno__ (6171), mesophytic, alt. 580 m. Period 2.
Reference: Beneš & Kuras (1997).
Material examined: 1937, 2 spec., 1938, 3 spec., all Werner coll. [= leg.], SMOC.
Habitat: Moravice River valley.

*__25. Mladecko - Dolní Mlýn__ (6172), mesophytic, alt. 330 m. Period 3.
References: Paikert (1967), Stiova (1973, 1984), Beneš & Kuras (1997).
Habitat: Hvozdnice Stream valley, deciduous forest.
Note: The population vanished in early 1970s (Stiova 1984).

*26. **Melč** (6172), mesophytic, alt. 340 m. Period 2.
References: Hykeš (1925), Paikert (1967), Beneš & Kuras (1997).
Material examined: 1907, 1 spec. (collector unknown), SMOC.
Habitats: Moravice River valley, beech and mixed forests, mesophilous meadows.

*27. **Ziegenrücken** [= Kozí hřbety nr. Domoradovice] (6173), mesophytic, alt. 330 m. Period 2.
Reference: Beneš & Kuras (1997).
Material examined: 1934, 1 spec., 1935, 2 spec. (collectors unknown), SMOC.
Habitats: Moravice River valley, beech and mixed forests, meadows.

*28. **Mohratal** [= Moravice River valley nr. Hradec nad Moravicí] (6173), mesophytic, alt. ca 300 m. Period 2.
References: Anonymus (1895), Skala (1923, 1931), Wolf (1927), Paikert (1967), Beneš & Kuras (1997).
Material examined: 1914, 2 spec., L. Bohatschek leg., RMOS, SMOC; 1931, 1 spec. (collector unknown), SMOC.
Habitats: Moravice River valley, beech and mixed forests, meadows.

*29. **Podvihovský Mlýnek** (nr. Opava-Podvihov) (6173), mesophytic, alt. 310 m. Period 3.
References: Paikert (1967), cf. Stiova (1973), Beneš & Kuras (1997).
Habitats: Sedlinka Stream valley, mixed forest, wet meadows.
Note: The population vanished in the 1970s (F. Paikert, pers. comm.).

30. Burgstadt [= Třebovské hradisko Castle nr. Moravská Třebová] (6266), mesophytic, alt. 410 m. Period 1.
References: Tuppy (1910), Skala (1912).
Note: Three specimens were collected in 1849 (Tuppy 1910).

*31. **Mohelnice** (6267), thermophytic, alt. 280 m. Period 4.
References: Stiova (1984), Konvička (1995, 1999).
Note: Following the locality description in Stiova (1984), it is probably identical with No. 32.

*32. **Moravičany** (6267), thermophytic, alt. 240 m. Period 4.
References: Kostkan et al. (1991), Hudec et al. (1995), Konvička (1995), Konvička & Kuras (1999), Konvička (1999).
Material examined: 1962, 4 spec., 1963, 3 spec., 1968, more spec., 1971, 7 spec., 1981 2 spec., 1982, more spec., 1983, 2 spec., all L. Široký leg., VMHK; 1972, more spec., L. Stiova leg., RMOS; 1995, 2 spec., A. Čelechovský leg. et coll.; 1996, 2 spec., 1998, 4 spec., T. Kuras leg. et coll.; 1996, 4 spec., J. Beneš leg. et coll.
Habitats: Clearings in the mesophilous deciduous forest Doubrava, alluvial meadows and the adjacent wetland Kačení louka Reserve.
Notes: Recently abundant population, interchange of individuals with the adjoining localities Nos. 34 and 35 (Kuras & Konvička 1996, Konvička & Kuras 1999).

*33. **Červenka** (6268), thermophytic, alt. 230 m. Period 2.
References: Bryk (1935), Adámek (1944).
Note: Locality possibly identical with one of Nos. 32, 34, 35.

*34. **Mladeč-Nové Zámky** (6268), thermophytic, alt. 230 m. Period 4.
References: Kostkan et al. (1991), Konvička (1995), Kuras & Konvička (1996), Konvička & Kuras (1999), Konvička (1999).

Material examined: 2 spec. (date unknown), J. E. Kammel leg., SMOC; 1995, 2 spec, A. Čelechovský leg. et coll.; 1995, 4 spec., V. Vrabec leg. et coll.; 1996, 2 spec., J. Beneš leg. et coll.
Habitats: Edges of deciduous forest, alluvial meadows.

*35. **Mladeč** (6268), thermophytic, alt. ca 240 m. Period 4.
Material examined: 1942, more spec., 1943, more spec., all A. Rudolf leg., SMOC; 1995, 2 spec., A. Čelechovský leg. et coll.; 1995, 1 spec., T. Kuras leg. et coll.
Habitats: Clearings and alluvial meadows in floodplain forest.

*36. **Úsov** (6268), thermophytic, alt. ca 280 m. Period 4.
References: Konvička (1995, 1999).
Habitat: Clearings in the northern part of the forest Doubrava.
Note: Last observation in 1993 (V. Motlíček, pers. comm.).

*37. **Litovel** (62-6368), thermophytic, alt. 230 m. Period 3.
References: Paikert (1967), Stiova (1973, 1984).
Material examined: 1942, 2 spec., A. Rudolf leg., KMVC; 1942, 1 spec., A. Rudolf leg., RMOS; 1963, 2 spec., 1964, more spec., 1974, 2 spec., L. Stiova leg., RMOS.
Habitat: Floodplain forest.
Note: The locality might be identical with No. 34 or 35.

*38. **Střeň** (62-6368), thermophytic, alt. 230 m. Period 3.
Material examined: 1953, 1 spec., V. Nemrava leg., KMVC.
Habitat: Floodplain forest.

*39. **Dolní Žleb** (nr. Šternberk) (6269), mesophytic, alt. ca 340 m. Period 4.
Material examined: 1997, 5 spec., A. Čelechovský leg. et coll.; 1997, 4 spec., T. Kuras leg. et coll.
Habitats: Stream valley, beech forest clearings along a road.
Notes: Abundant population in 1995-1998, adults frequently encountered flying over a strip of trees coppiced under high-voltage transmission line.

*40. **Šternberk** (6269), mesophytic, alt. ca 270 m. Period 4.
Material examined: 1924, 1 spec., MMBC, 1924, 3 spec., SMOC, 1924, 2 spec., KMVC, all A. Rudolf leg.; 1931, 2 spec., K. Stief leg., SMOC; 1935, 1 spec., T. Biehal leg., RMOL.
Note: Observed in early 1990s by L. Vojkůvka (pers. comm.).

*41. **Vítkov-Klokočov** (6272), mesophytic, alt. ca 400 m. Period 3.
References: Stiova (1973), Čížová (1994), Beneš & Kuras (1997).
Habitat: Čermná stream valley, beech forest.
Note: The localities Nos. 41 and 43 possibly refer to one population.

*42. **Spálov** (6272), mesophytic, alt. 400 m. Period 4.
References: Stiova (1973, 1984), Kudrna (1994), Čížová (1994), Beneš & Kuras (1997).
Material examined: 1958, 1 spec., F. Dias leg., RMOS; 1959, more spec., 1960, more spec., 1968, more spec., 1994, 2 spec., all J. Kozel leg. et coll.; 1962, 2 spec., J. Černý leg., coll. R. Kovář; 1988, 1 spec., T. Kuras leg. et coll.
Habitats: Suchá Stream valley, beech and mixed forests, meadows.
Notes: The site was regularly visited in 1995-1998, but the species was not observed there since 1994; the population is declining or it has already disappeared.

*43. **Vítkov** (6272), mesophytic, alt. ca 450 m. Period 3.
References: Hykeš (1925), Stiova (1973), Beneš & Kuras (1997).
Habitat: Čermná stream valley, beech forests.

*44. **Fulnek** (6273), mesophytic, alt. 280 m. Period 2.
References: Paikert (1967), Čížová (1994), Beneš & Kuras (1997).
Material examined: 1931, 1 spec., A. Rudolf leg., SMOC.

45. Bílovec (6274), mesophytic, alt. ca 290 m. Period 2.
References: Skala (1931), Čížová (1994), Beneš & Kuras (1997).

46. Kornitz [= Chornice] (6366), mesophytic, alt. ca 320 m. Period 2.
Reference: Paikert (1967).
Material examined: 1917, more spec., R. Jenisch leg., MMBC; 1944, more spec., J. E. Kammel coll. [= leg.], SMOC.

47. Hartinkov (6366-67), mesophytic, alt. 510 m. Period 3.
Material examined: 1961, 2 spec., Valenta coll. [= leg.], RMZL.

*48. **Bielkowitztal** [= Bělkovické údolí valley nr. Bělkovice-Lašťany] (6369-70), mesophytic, alt. ca 280 m. Period 2.
References: Adámek (1940, 1944).
Material examined: 2 spec. (date unknown), K. Stief leg., RMOL.
Habitats: Stream valley, mixed forests, meadows.

*49. **Hlubočky** (6370), mesophytic, alt. ca 280 m. Period 3.
References: Bryk (1935), Adámek (1944), Paikert (1967), Stiova (1973, 1984).
Material examined: 1912, 4 spec., 1914, 1 spec., 1918, 4 spec., 1921, 6 spec., 1922, 1 spec. (collectors unknown), NMPC; 1912, 1 spec., M. Kudla leg., RMOL; 1915, 2 spec., 1924, 4 spec., A. Kašpar leg., RMOL.
Habitats: Stream valley, mixed forests, meadows.

*50. **Hlubočky-Hrubá Voda** (6370), mesophytic, alt. ca 330 m. Period 3.
Reference: Skala (1912).
Material examined: 1960, 2 spec., 1963, 6 spec., 1965, 1 spec., all M. Kudla leg., RMOL; 1964, more spec., L. Široký leg., KMVC; 1960, 2 spec., 1963, 1 spec., all M. Kudla leg., UPOL.
Unpublished data: In 1966-1969 observed by J. Kuja (pers. comm.). Last observation in 1972 (M. Janovský, pers. comm.).
Habitats: Stream valley, mixed forests, meadows.

51. Habicht [= Jestřabí nr. Hlubočky-Hrubá Voda] (6370), mesophytic, alt. 580 m. Period 2.
Reference: Skala (1912).

*52. **Jívová** (6370), mesophytic, alt. ca 560 m. Period 3.
Material examined: 1957, 2 spec., M. Kudla leg., RMOL.
Habitats: Stream valley, mixed forests, meadows.

*53. **Smilov** (6370), mesophytic, alt. ca 600 m. Period 2.
References: Skala (1912), Hein (1928-1929).
Material examined: 1926, 5 spec., A. Kašpar leg., RMOL.
Habitats: Stream valley, mixed forests, wet meadows.
Note: The disappearance of the species from the localities Nos. 48-50, 52 and 53 might had been affected by extensive build-up of weekend houses in the Bystřice river valley (since 1960s).

*54. **Jakubčovice nad Odrou** (6372), mesophytic, alt. 310 m. Period 3.
Unpublished data: Rare occurrence up to 1960s (J. Kozel, pers. comm.).
Habitat: Stream valley, mixed forests.

*55. **Odry** (6372-73), mesophytic, alt. ca 300 m. Period 2.
References: Hykeš (1925), Čížová (1994), Beneš & Kuras (1997).
Material examined: 1947, 1 spec., J. Cikl leg., RMOS.

56. Odry-Veselí (6372-73), mesophytic, alt. ca 400 m. Period 4.
Unpublished data: Regularly observed until early 1990s but not confirmed recently (L. Veselý & I. Prášil, pers. comm.).
Habitat: Stream valley, mixed forests.

*57. **Suchdol nad Odrou** (6373), mesophytic, alt. 270 m. Period 2.
References: Čížová (1994), Beneš & Kuras (1997).
Material examined: 1939, 1 spec., A. Rudolf leg., RMOS.

*58. **Nesselsdorf** [= Kopřivnice] (63-6474), mesophytic, alt. 320 m. Period 2.
Material examined: 1 spec. (date unknown), R. Peschke coll. [= leg.], SMOC.

59. Neutischein [= Nový Jičín] (63-6474), mesophytic, alt. 280 m. Period 2.
References: Rebel & Rogenhofer (1893), Skala (1912), Bryk (1914a,b, 1935), Adámek (1944), Paikert (1967), Čížová (1994).
Material examined: 4 spec. (date and collector unknown), NMPC.

*60. **Grygov** (Les Království forest) (6469), thermophytic, alt. 205 m. Period 2.
References: Stiova (1984), Konvička (1995).
Material examined: 1922, 1 spec. (collector unknown), SMOC; 1926, 1 spec., P. Pekarsky leg., RMOS; 1927, more spec., 1930, 1 spec., 1938, more spec. (all collector unknown), NMPC; 1937, 2 spec., A. Rudolf leg., SMOC, RMOS; 1941, more spec., 1942, more spec., all J. E. Kammel leg., SMOC; 1946, 2 spec., J. Hrbek leg., UPOL; 1949, 1 spec., 1950, 5 spec., all J. Bleša leg., RMOL; 1949, 1 spec., 1950, 7 spec., 1951, 1 spec., all M. Kudla leg., RMOL; 1950, 4 spec., J. Fajt leg., SMOC.
Habitats: Floodplain and mesophilous deciduous forests, alluvial meadows.

61. Liliendorf [= Přáslavice-Kocourovec] (6470), mesophytic, alt. ca 330 m. Period 2.
Reference: Skala (1912).

62. Výkleky (6470), mesophytic, alt. 320 m. Period 2.
Material examined: 1945, 1 spec., J. Čáp leg. et coll.

*63. **Lipník nad Bečvou, Týn nad Bečvou** (6471), mesophytic, alt. ca 230 m. Period 2.
References: John (1900), Joukl (1912), Skala (1912), Exler (1920), Rubín (1955), Burda (1982), Stiova (1984).
Note: The population disappeared after 1951 (Burda 1982).

64. Lipník nad Bečvou-Loučka (6471), mesophytic, alt. ca 300 m. Period 4.
Material examined: 1994, 1 spec., J. Novák leg. et coll.
Note: The localities Nos. 64 and 65 possibly refer to one contiguous population.

*65. **Lipník nad Bečvou-Podhoří** (Peklo settlement and environs towards Loučka-Slavkov) (6471), mesophytic, alt. ca 350 m. Period 4.
Material examined: 1951, 1 spec., J. Čáp leg. et coll.; 1993, 1 spec., T. Kuras leg. et coll.; 1995, 4 spec., L. Veselý leg. et coll.; 1993, 2 spec., 1994, 1 spec., 1996, 3 spec., all A. Čelechovský leg. et coll.
Unpublished data: Abundant in 1995-1998.
Habitat: Stream valley, beech forests.

*66. **Hranice-Lhotka** (6472), mesophytic, alt. ca 300 m. Period 3.
Material examined: 1965, 2 spec., J. Novák leg. et coll.

67. **Hodslavice-Domoraz** (6474), mesophytic, alt. ca 400 m. Period 2.
Reference: Burda (1982).
Note: Only one larva found before 1950 (Burda 1982).

*68. **Huštýn Mt., Mořkov** (6474), oreophytic, alt. ca 740 m. Period 3.
References: Bryk (1935), Stiova (1975, 1984), Burda (1982), Čížová (1994).
Material examined: 1922, more spec., A. Rudolf leg., SMOC; 1925, 1 spec., 1937, 1 spec., 1939, 4 spec., 1941, 1 spec., 1951, 3 spec., 1952, 4 spec., 1953, 5 spec., 1956, more spec., all A. Rudolf leg., RMOS; 1934, 4 spec., 1935, 4 spec., all Dittner leg., RMOS; 1935, more spec., 1936, more spec., all Bahnert coll. [= leg.], SMOC; 1936, 6 spec., K. Walloch leg., SMOC; 1937, 1 spec., K. Fischer leg., RMOS; 1953, 6 spec., 1959, 2 spec., all F. Burda coll. [= leg.], RMOS.
Habitat: Clearings in beech forests.
Note: The population vanished at the end of 1950s due to forest succession at clearings (Burda 1982).

*69. **Kotouč Hill** (nr. Štramberk) (6474), mesophytic, alt. ca 450 m. Period 2.
References: Skala (1912), Čížová (1994).

70. **Nový Jičín-Straník** (6474), mesophytic, alt. ca 360 m. Period 2.
Reference: Burda (1982).

*71. **Trojačka Hill** (nr. Mořkov) (6474), oreophytic, alt. ca 500 m. Period 2.
Reference: Burda (1982).
Note: One specimen found in 1923 (Burda 1982).

*72. **Hutě pod Smrkem** (nr. Staré Hamry) (64-6576), oreophytic, alt. 570 m. Period 3.
Material examined: 1952, 1 spec., 1953, 1 spec., both A. Rudolf leg., RMFM; 1953, more spec., A. Rudolf leg., RMOS.
Habitat: Ostravice River valley.
Note: The locality was flooded by the Šance water reservoir in 1970.

*73. **Citov** (6570), thermophytic, alt. ca 200 m. Period 3.
References: cf. Hudeček (1930), cf. Stiova (1984), Čelechovská (1999).
Material examined: 1 spec. (date unknown), L. Hudeček leg., RMPR.
Habitats: Floodplain forests, alluvial meadows.
Note: Period 3 was estimated with respect to records from surrounding locality No. 74.

*74. **Bochoř** (Hrubý les forest) (6570), thermophytic, alt. ca 200 m. Period 3.
References: Hudeček (1923), cf. Hudeček (1930), cf. Stiova (1984), Čelechovská (1999).
Material examined: 1952, 2 spec., 1955, 1 spec., all V. Nemrava leg. et coll.
Habitat: Floodplain forest.

*75. **Přerov-Henčlov** (6570), thermophytic, alt. ca 200 m. Period 2.
References: Hudeček (1923), cf. Hudeček (1930), cf. Stiova (1984), Čelechovská (1999).
Habitat: Floodplain forest.

*76. **Přerov** (6570), thermophytic, alt. ca 210 m. Period 2.
References: John (1910), Joukl (1912), Skala (1912), Exler (1920), Rubín (1955), cf. Stiova (1984).
Material examined: 3 spec. (date unknown), F. Hradil leg., RMVS.

Note: According to L. Brabec (pers. comm.), the 3 specimens were most probably collected in the early 1900s.

*77. **Kokory, Přerov-Žeravice** (6570), thermophytic, alt. ca 230 m. Period 2.

References: Hudeček (1923), cf. Hudeček (1930), cf. Stiova (1984).

*78. **W. Meseritsch** [= Valašské Meziříčí] (6573), mesophytic, alt. ca. 350 m. Period 2.

Material examined: 1921, 4 spec., M. Bukuwky leg., SMOC.

79. **Rajnochovice** (Kelčský Javorník Mt.) (65-6672), mesophytic, alt. ca 600 m. Period 2.

Material examined: 1 spec. (date unknown), F. Urbášek leg., MMBC.

*80. **Chropyně** (6670), thermophytic, alt. 200 m. Period 3.

Reference: Čelechovská (1999).



Fig. 1. Schematic map of North Moravian localities of *Parnassius mnemosyne* (Linnaeus, 1758). Large white circle - last record of the species from Period 1, two white concentric circles - last record from Period 2, white circle with black centre - last record from Period 3, large black circle - last record from Period 4.

Obr. 1. Schematická mapa severomoravských lokalit *Parnassius mnemosyne* (Linnaeus, 1758). Bílá kolečka - poslední nález druhu z 1. období, bílá kolečka s bílým středem - poslední nález ze 2. období, bílá kolečka s černým středem - poslední nález ze 3. období, černá kolečka - poslední nález ze 4. období.

Material examined: 1937, 4 spec., M. Bukuwky leg., SMOC; 1961, 3 spec., J. Póla leg., RMKR; 1948, 1 spec., 1961, 2 spec., all J. Póla leg., RMOL, RMKR.
Habitats: Floodplain forest, alluvial meadows.

*81. **Kroměříž** (66-6770), thermophytic, alt. 200 m. Period 2.
Reference: Rebel & Rogenhofer (1893), Skala (1912).

*82. **Vsetín** (6673-74), mesophytic, alt. ca 340 m. Period 2.
Reference: Adámek (1944).

*83. **Velký Javorník Mt.** (Javorníky Mts) (6676), mesophytic, alt. 1070 m. Period 4.
Reference: Stiova (1984).
Habitat: Mountain ridge pastures surrounded by sparse beech forests.
Note: The localities Nos. 83, 84, 86 and 87 are probably inhabited by one contiguous population.

*84. **Malý Javorník Mt.** (Javorníky Mts) (6676), mesophytic, alt. 1020 m. Period 4.
Unpublished data: Common in the 1990s, I. Hrdlička (pers. comm.).
Habitat: Mountain ridge pastures surrounded by sparse beech forest.

85. **Vizovice** (6773), mesophytic, alt. ca 300 m. Period 2.
Reference: Adámek (1944).

*86. **Kohútka** (Javorníky Mts) (6775), mesophytic, alt. ca 910 m. Period 4.
Reference: Dernický (1945).
Unpublished data: Common in the 1990s, I. Hrdlička (pers. comm.).
Habitat: Mountain meadows surrounded by beech forests.
Note: Abundant in 1995.

*87. **Portáš** (Javorníky Mts) (6775), mesophytic, alt. ca 960 m. Period 4.
Habitat: Mountain meadows surrounded by beech forests.
Note: Abundant in 1995.

II. Data with imperfect localisation

Following literature and museum records could not be localised exactly.

Beskydy Mts
Reference: Bryk (1935).
Material examined: 1928, 1 spec. (collector unknown), SMOC; 1937, 1 spec., Werner leg., SMOC.
Note: The localities Nos. 67, 68 and 70-72 fall into this region.

Altvatergebirge [= Hrubý Jeseník Mts]
References: Pax (1915, 1919, 1921).
Material examined: 1 spec. (date and collector unknown), NMPC.
Note: The localities Nos. 11-13 fall into this region.

Javorníky Mts
Reference: Burda (1982).
Material examined: 1981, more spec., 1982, more spec., 1983, 4 spec., all F. Burda leg., RMOS.
Note: Possibly the Javorníky mountains main ridge (localities Nos. 83, 84, 86 and 87).

Mährische Gesenke [= Jeseníky Mts]
References: Pax (1919, 1921).
Note: The localities Nos. 3-6 and 11-13 fall into this region.

Glatzer Schneegebirge [= Králický Sněžník Mts]
References: Pax (1921), Stephan (1923).
Note: The localities Nos. 2 and 7-10 fall into this region.

Oderské vrchy Hills
Reference: Čížová (1994).
Material examined: 1942, 1 spec., P. Pekarsky leg., RMOS.
Note: The localities Nos. 41-45 and 54-57 fall into this region.

Olomouc
References: Bryk (1914b, 1935), Skala (1912), Paikert (1967), Adámek (1944), Konvička (1995, 1999).
Material examined: 2 spec. (date unknown), R. Wawerka leg., RMOS; 1922 1 ex., R. Wawerka leg., NMPC; 1937, 1 spec., A. Rudolf leg., KMVC; 1937, 2 spec. (collector unknown), SMOC; 1947, 1 spec. (collector unknown), RMKO; 1950, 3 spec., R. Devera leg., RMKO; 1960, 1 spec., M. Kudla leg., UPOL.
Note: The localisation corresponds to the localities Nos. 31-38, 48-53 and 60.

Umg. M. Ostrau [= Ostrava env.]
Material examined: 1938, 1 spec., K. Fischer leg., RMOS.
Note: Only the locality No. 29 falls into this region.

Perchtoldesdorf
Material examined: 1929, 1 spec. (collector unknown), SMOC.
Note: According to Turek (1974), "Perchtoldesdorf is an abandoned village between the towns of Branná and Štíty not inhabited since the 16th century". The collector perhaps labelled the specimen with a locally used name, which is now indecipherable.

North Moravia
Reference: Kaspar (1908).
Material examined: 5 spec. (date unknown), A. Biener leg., NMPC.
Note: All of the mentioned localities may be included.

DISCUSSION

It follows from Fig. 1 that *Parnassius mnemosyne* had a wide historical distribution in North Moravia in the past. The material presented in this paper documents the occurrence of *P. mnemosyne* at 87 localities (imperfectly localised data excluded). Seventy-one localities (82%) may be considered as historical (Periods 1, 2 and 3), 16 localities (18%) are classified as recent (Period 4). This decline in number of localities unequivocally documents a major recession of the species in the area under study, which is further highlighted by the fact that the six sites discovered as new localities after 1990 (Nos. 36, 39, 56, 64, 84, 87) are all situated closely to well-known historical sites. Therefore, it is possible that the species has been known from such localities for a long time, and their „discovery" is an artefact due to different labelling of specimens from the same locality by different authors. The decline of *P. mnemosyne* still continues. This is exemplified by three localities (36, 42, 56), where the species vanished during the last decade. However, the highest number of extinctions falls into the Period 2 (1901-1950), when the species disappeared from 42 localities.

Historically, *P. mnemosyne* inhabited various types of deciduous forests in the area of interest, reaching from floodplain forests in lowlands to mountainous habitats. The high number of localities in river valleys, especially in the Nízký Jeseník Mts, was very remarkable.

Studies of gene flow among *P. mnemosyne* populations (Meglécz et al. 1997b, 1998) combined with reports on the species dispersal (Väisänen & Somerma 1985, Kudrna & Seufert 1991, Meglécz et al. 1999, Konvička & Kuras 1999) revealed that (1) dispersing butterflies are able to cross shorter distances up to 2.5 km (Konvička & Kuras 1999), which results into a clustering of individual populations, geographically closer populations being more similar genetically; and (2) that distances larger than 10 km (Meglécz et al. 1997b, 1998), as well as dispersal barriers (Descimon & Napolitano 1993, Napolitano & Descimon 1994), genetically isolate distant populations. It is therefore reasonable to group some localities into larger units which probably act (or acted in past) as interbreeding populations or metapopulations (see below), and between which we suppose at least historical interchange of individuals,

Such groups of localities have existed in the Králický Sněžník Mts and the Rychlebské hory Mts (1-4, 7-10); in the western valleys of the Hrubý Jeseník Mts (11-13, 15-17); in the Bystřice river valley (49-53); along the watershed of Moravice and Odra rivers (18, 20, 24-28 and 41-45, 54-57, respectively); in the stream valleys at western (23, 39, 40, 48) and southern (61-65) slopes of the Nízký Jeseník Mts; on the western foothills of the Beskydy Mts (58, 59, 67-71); in the main ridge of the Javorníky Mts (83, 84, 86, 87); and in the Morava river alluvium upstream (31-38) and downstream (60, 73-77, 80, 81) of Olomouc. On the other hand, the species has never been found in the north-east of the region of interest despite the most detailed lepidopterological research in parts of the area (the Ostravská pánev Basin and the Opavská pahorkatina Hills).

At present, the species survives only in stream valleys at the south-western and southern slopes of the Nízký Jeseník Mts, in the main ridge of Javorníky Mts, and in the part of the Morava river alluvium between the towns of Litovel and Mohelnice (= Litovelské Pomoraví Protected Landscape Area). Only five localities/groups of localities still host abundant populations which we tentatively assume to be viable in the present time. Of these, there are large, interconnected population systems only in the Litovelské Pomoraví (31, 32, 34, 35), and the Javorníky Mts (83, 84, 86, 87). The three remaining populations, Dlouhá Loučka (23), Dolní Žleb - Šternberk (39, 40) and Podhoří - Loučka (64, 65), are less numerous as *P. mnemosyne* inhabits smaller areas there. New localities could be discovered in the Rychlebské hory Mts, the Zlatohorská vrchovina Hills, the western foothills of the Hrubý Jeseník Mts, and of the some less accessible valleys of the Nízký Jeseník Mts.

Several factors were suggested as responsible for decline of the *P. mnemosyne*, changes in forest composition (i.e., replacement of deciduous forests by conifer plantations) being the most prominent reason (cf. Dabrowski & Krzywicki 1982, Čaputa 1992). However, it has long been mysterious why did the species disappear even from localities where the composition of forests remained basically unchanged. Now, the proximate causes of the species' recession are understood and a possible remedy is known: Kudrna & Seufert (1991), Meglécz et al. (1999) and Konvička & Kuras (1999) found that *P. mnemosyne* depends on early successional stages ("gaps") within woods (see also Kames 1975, Stiova 1984, Väisänen & Somerma 1985). Forest clearings are preferred by ovipositing females (Konvička & Kuras 1999), and high forest acts as a barrier to the dispersal of adults (Vrabec 1994). In the past, much larger areas of forests of Central Europe were either coppiced or managed for selective timber harvest. Under such

conditions, mosaics of shaded and insolated patches within forests were relatively fine-grained compared to the recent conditions of large tracks of even-aged high forest interspersed by large-area clearcuts. It follows that dispersing *P. mnemosyne* individuals had better chances to find new isolated sites in the fine-grained forest mosaics in the past than they have recently. The fact that most of the local extinctions in North Moravia occurred in the first half of this century supports the notion that they coincided with the forestry shift towards high forest planting, which occurred in most of Central Europe during that period (Ehlenberg 1988). Numerous extinctions in Bohemia (Vrabec 1994) which fall into the same period might be explained by the same process.

For colonial species that depend on unstable temporary habitats, metapopulation dynamics is a likely solution of ecological hardships (Thomas & Hanski 1997, Hanski & Gilpin 1997, Hanski 1998). Metapopulation dynamics, i.e., regular extinctions and recolonizations among habitat patches, was suggested for *P. mnemosyne* by Kudrna & Seufert (1991), Napolitano & Descimon (1994), Meglécz et al. (1999) and Konvička & Kuras (1999). Therefore, *P. mnemosyne* could be managed according to propositions derived from metapopulation models.

In those areas where the species still lives in large populations (i.e., the Litovelské Pomoraví area and the Javorníky Mts) dispersal among colonies should be supported by creating sunny corridors and occasionally coppiced "permanent" seral stages within forests (Konvička & Kuras 1999; see also Meglécz et al. 1999). This should not be difficult as the localities are included in Landscape Protected Areas, whose Administrations are responsible for well-being of legally protected species. We acknowledge that the recent management of the Litovelské Pomoraví forests is beneficial for *P. mnemosyne*. On the other hand, none of the smaller populations in the Nízký Jeseník Mts enjoys legal protection at present. All of them are endangered by a possible successional overgrown of sunny gaps and clearings. *P. mnemosyne* cannot survive without permanent presence of regularly-cut sites. We propose that a sufficient number of small clearings with a mosaic-like distribution should be created and regularly renewed at the localities of Dlouhá Loučka, Dolní Žleb, Šternberk, Loučka and Podhoří. Models of "minimum viable metapopulation" (Thomas & Hanski 1997) recommend that a minimum number of five inhabitable sites should exist at a given time (cf. Meglécz et al. 1999, Konvička & Kuras 1999). Furthermore, a higher number of small clearings is preferable to large-area clearcuts (Meglécz et al. 1999; see also Warren & Key 1991, Warren & Thomas 1992, Robertson et al. 1995). We believe that such measures would save the surviving *P. mnemosyne* populations. Ignoring the active conservation proposed here would lead to a grim prospect of inevitable extinctions, which had been the fate of most of the historical populations of the species. A regular monitoring of all North Moravian populations, coupled with modifications of the forest management, should ensure a long-term survival of the endangered butterfly.

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SOUHRN

Práce shrnuje znalosti o historickém a současném rozšíření jasoně dymnivkového, *Parnassius mnemosyne* (Linnaeus, 1758), na severní Moravě, získané na základě literárních údajů, revize muzejních sbírek a výzkumu v terénu.

Předložený seznam lokalit obsahuje následující údaje a charakteristiky:

(a) Pořadové číslo lokality. Lokality jsou řazeny podle čísel mapovacích čtverců (viz Pruner & Míka 1996). Kódy čtverců faunistického mapování jsou uvedeny v závorce. Lokality, které byly navštíveny některým z autorů, jsou označeny hvězdičkou (*).

(b) Název lokality. Názvy sídel jsou podle seznamu Pruner & Míka (1996). Pokud je lokalita známa pod více jmény, uvádíme je všechna. Pro lokality, které byly publikovány s německým jménem a pro muzejní dokladové exempláře s německy psanými etiketami, uvádíme české názvy v hranatých závorkách. Německá jména byla dešifrována dle lexikonů: Pfohl (1922), Hosák & Šrámek (1970, 1980), Turek (1974).

(c) Fytogeografické zařazení jednotlivých lokalit je provedeno dle Slavíka (1988), rozlišeno je termofytikum (oblast s teplomilnou vegetací), mesofytikum (oblast s temperátní oceánickou flórou a vegetací opadavých lesů), oreofytikum (montánní flóra a vegetace).

(d) Nadmořská výška lokality.

(e) Období posledního výskytu motýla. Rozlišujeme čtyři časové periody: 1. - před rokem 1900, 2. - od 1901 do 1950, 3. - od 1951 do 1990, 4. - po roce 1990 (srov. Kudrna 1994). Pro lokality s výskytem doloženým pouze v pozdějších periodách předpokládáme výskyt jasoně i v periodách předchozích.

„Reference(s)" [= Odkazy] - seznam odkazů na literaturu (publikované i rukopisné prameny).

„Material examined" [= Materiál] - zde uvádíme údaje o sbírkových dokladových exemplářích s udáním letopočtu jejich nálezu. Termín „more spec." [= více ex.] znamená, že v příslušné sbírce je více než 10 dokladových exemplářů ze stejného roku. Vzhledem k zaměření této práce neuvádíme přesná data nálezů a pohlaví dokladových exemplářů.

„Unpublished data" [= Nepublikované údaje] - nepublikované nebo nedoložené, ale významné informace (např. ústní sdělení entomologů, údaje státní ochrany přírody, apod.).

„Habitat(s)" - informace o konkrétním prostředí osídleném jasoněm dymnivkovým. Charakteristika je provedena na základě excerpce dostupných pramenů nebo na základě vlastního terénního pozorování autorů.

„Note(s)" [= Poznámky] - doplňkové informace (např. o současném stavu lokality, období posledního pozorování, způsobu zániku populace, atd.).

Historický výskyt jasoně dymnivkového na severní Moravě byl zjištěn celkem na 87 lokalitách (viz obr. 1). V období po roce 1990 se motýl vyskytoval či vyskytuje pouze na 16 z nich. Výskyt na šesti z těchto lokalit je uváděn poprvé, naopak na třech z nich motýl pravděpodobně vyhynul v první polovině 90. let. K roku 1999 je tudíž známo 13 osídlených lokalit. Je dokumentován výrazný úbytek jasoně v tomto století (všechny nově zjištěné lokality se nacházejí v bezprostředním sousedství historických lokalit, takže se pravděpodobně týkají týchž populací). Ze čtyř časových period (před r. 1900, 1900-1950, 1951-1990, po r. 1990) byl největší pokles počtu lokalit (42) zaznamenán v období 1900-1950.

Jasoň obýval v Severomoravském kraji různé typy listnatých lesů (od lužních lesů nížin po lesy horských poloh), přičemž řada populací žila v říčních údolích. Na základě známé disperzní schopnosti druhu můžeme lokality výskytu sloučit do skupin, které pravděpodobně obývaly propojené populace (metapopulace); ty existovaly v oblasti Králického Sněžníku a Rychlebských hor (lokality č. 1-4, 7-10), v západních údolích Hrubého Jeseníku (11-13, 15-17), v údolí Bystřice (49-53), v povodí Moravice a Odry (18, 20, 24-28 a 41-45, 54-57), v údolích na jihozápadě a jihu Nízkého Jeseníku (61-65), na hřebeni Javorníků (83-84, 86-87), v západním předhůří Beskyd (58-59, 67-71) a v nivě řeky Moravy severozápadně (31-38) a jižně (60, 73-77, 80, 81) od Olomouce. Druh se ale pravděpodobně nikdy nevyskytoval v Ostravské pánvi a Opavské pahorkatině. V současnosti přežívá pouze v Litovelském Pomoraví (31-32, 34-35), Javorníkách (83-84, 86-87) a v Nízkém Jeseníku (23, 39-40, 64-65). Zatímco v prvých dvou oblastech žije v relativně velkých a životaschopných populacích (jež jsou navíc chráněny statutem CHKO), poslední 3 přežívající populace v Nízkém Jeseníku jsou bezprostředně ohroženy.

Jasoň dymnivkový je vázán na ranná sukcesní stádia v lesních komplexech (světliny, paseky, lesní průseky a lemy lesních cest): tato místa preferují kladoucí samice a zde také probíhá larvální vývoj. Imaga nejsou schopna přeletět rozsáhlejší úseky vysokého zapojeného lesa, ačkoli jde o druh listnatých lesů. Podmínkou přežití jasoně je tudíž cílený management. Hlavní příčinou ohrožení druhu je, vedle úplné změny druhového složení lesů, upuštění od pařezinového

hospodaření a výběrové těžby (která dávala porostům charakter světlých listnatých lesů) a převod takto obhospodařovaných lesů na stejnověké vysokokmenné porosty. Pro jeho ochranu navrhujeme následující opatření:

V Litovelském Pomoraví a Javorníkách, kde existuje větší počet topograficky blízkých kolonií a jasoň dymnivkový tvoří metapopulace, mohou k jeho přežití napomoci slunné koridory mezi jednotlivými koloniemi (pasekami), případně návrat k pařezinovému hospodaření v lesních porostech. V obou případech zodpovídají za management správy příslušných CHKO. Zbytkovým populacím v Nízkém Jeseníku, jež se v současnosti netěší územní ochraně, hrozí bezprostřední zánik v případě, že na lokalitách zarostou stávající paseky a současně nevzniknou paseky nové v bezprostřední blízkosti. Jistý podíl světlin v lesích obývaných jasoněm je proto nezbytný (přitom větší počet menších světlin upřednostňujeme před menším počtem velkých holosečí). Pravidelný monitoring všech severomoravských populací, jakož i cílené úpravy lesního hospodaření, by měly zajistit dlouhodobé přežití tohoto kriticky ohroženého druhu.