Protection of the European pond turtle *Emys orbicularis* (L.) in Poland

S. MITRUS

Abstract

Due to the loss of suitable habitats, the European pond turtle *Emys orbicularis* (L.) in Poland is regarded as endangered. Most of its populations are small and reproduction may be successful only in warmer years. In the Radom district (central Poland), where such small populations live, an active protection program of the species has been initiated in 1989. During the egg-laying period clutches are marked and in September eggs or hatchlings are collected. Neonates are raised in captivity during winter, fed with life food and released the following spring. Until 1999, 415 turtles have been released to the populations from which hatchlings or eggs had been collected. After artificial raising neonates are able to overwinter with high survival rate. An additional active protection program is carried out in eastern and in western Poland, where reintroduction is planned in the future.

Key words

Emys orbicularis, hatchling, active protection, reintroduction, Poland.

Stapfia 69,
zugleich Kataloge des OÖ. Landesmuseums,
Neue Folge Nr. 149 (2000), 119-126

Introduction

The European pond turtle *Emys orbicularis* (L.) is an endangered species in Poland, primarily due to the draining of wetlands, flood control of rivers, and urbanisation of natural habitats (SKIBINSKI 1954, MICHALOWSKI 1956, MLYNARSKI 1971, JUSZCZYK 1987, ZEMANEK 1991, KOSINSKI 1993) and possibly climate changes (MLYNARSKI 1971, ZEMANEK 1991).

In Poland, *E. orbicularis* is under full legal protection since 1935, but protection measures are insufficient. Detailed data are lacking, but *E. orbicularis* was apparently much more abundant in the late 19th and early 20th century (cf. MLYNARSKI 1971, BERGER 1975, JUSZCZYK 1987). Since the Second World War intensive draining has been undertaken, and many of the turtles habitats have been degraded and the species has become rare (cf. ZEMANEK 1991, JABLONSKI 1992). At present, only a single large population exists in eastern Poland – the Leczna–Wlodawa Lake District (RÓZYCKI & SOLTYS 1996, JABLONSKI 1998). This population is currently not critically endangered, but other populations are small, or in some cases, only consist of solitary individuals (MITRUS & ZEMANEK 2000).

In the 1980s scientific research on the biology of *E. orbicularis* and conservation programs were initiated (ZEMANEK 1988, JABLONSKI 1992), mainly carried on within the "Program for Protection of the European Pond Turtle in Poland" (JABLONSKI 1998, MITRUS & ZEMANEK 1998), a ministerial program sponsored by the EcoFund – Polish Debt. for Environmental Swap, National Fund for Protection of Environment, GEF / SPD (Global Environmental Foundation) and Provincial Administration Offices. The program is carried out in collaboration between scientists and volunteers (JABLONSKI 1998).

The conservation plan presently includes:

- public education,
- protection of habitats for survival and reproduction,
- protection of nests,
- raising neonates in captivity and releasing them to existing populations,
- research and populations monitoring.

Reintroduction of the turtle into selected areas is planned for the future.

Education

Most people in Poland are well disposed towards turtles and there are almost no reports on killing the animals or disturbing their nests (MLYNARSKI 1971). However, activities such as fishing can be harmful, when single *E. orbicularis* are angled and fishermen injure the turtle's jaws by tearing out the fishhook (JABLONSKI 1998, MITRUS & ZEMANEK, pers. observ.). Only education could be helpful in this case.

Occasionally females are caught during migration to their nesting places and released else where (KOSINSKI 1993). Such practices can impede the egg-laying process as disturbed females might lose eggs in aquatic habitats (FEDORCHENKO & KOTENKO, unpubl. data, after ZEMANEK & MITRUS 1997). As people generally pick up turtles out of curiosity, education would reduce this problem.

Another problem is the collection of turtles for captive care (JUSZCZYK 1987, ZEMANEK 1991; JABLONSKI 1992, 1998). In Poland, this practice is rare and typically results from incidental encounters with the animals in nature. There are examples of the release of illegally kept turtles back to their natural habitat after discussions with the "owners", which were sometimes simply unaware that *E. orbicularis* is a protected species (MITRUS & ZEMANEK, unpubl. data).

The examples presented above show that conservation of the European pond turtle is more efficient when combined with education, which is more important in rural areas than in big cities. Education is carried out by participants of the program – lectures at schools and during children's excursions to European pond turtle habitats (MITRUS & ZEMANEK, unpubl. data).

Habitat protection

European pond turtles require wetlands and nesting sites which are sunny, sandy areas covered by xerothermic vegetation (MITRUS & ZEMANEK 2000). Due to the lack of information about nesting-site locations such sites are often classified as barrens. Polish law demands from foresters to afforest barrens. Only information about localisation of nesting sites can protect them against afforesting. If nesting places are destroyed, females look for new sites, sometimes much farther away from water reservoirs (MITRUS & ZEMANEK, unpubl. data), possibly affecting the survival rate of hatchlings due to a higher risk of mortality during the longer way to water.

In collaboration with forestry authorities in central Poland, some nesting areas in which trees had been planted were regained by cutting the trees, and European pond turtles returned back to the nesting places close to water reservoirs (MITRUS & ZEMANEK, unpubl. data).

Controlling the water level at *E. orbicularis* breeding sites is also of importance. At the "Borowiec" reserve situated at Zwolenka river valley (central Poland), the protection program initiated the renovation of a dam belonging to an old mill (MITRUS & ZEMANEK 1998), stabilizing the water level in the old river. The water level is also controlled at the Polesie National Park (RÓZYCKI, pers. observ.) and further plans exist for western Poland (GUZIKOWSKI, MACIANTOWICZ, MAJCHER, NAJBAR, RÓZYCKI & RYBACKI, pers. observ.).

Protection of nests

Protection of clutches against predators and accidental damages is probably the easiest and cheapest way to increase the reproductive success of *E. orbicularis*. Occasionally females construct nests on fields or field roads (KOSINSKI 1993, MITRUS & ZEMANEK 2000). It is likely that such nests will be destroyed by cars or agriculture vehicles. Since 1992, in "Borowiec" reserve, such clutches have been transferred to safer places. After egg-laying, clutches are dug out and placed into boxes with wet soil, without turning eggs over, and buried in an artificial chamber close to other clutches. The fate of seven transferred clutches are known – in four clutches turtles hatched from most eggs; from three clutches no offspring hatched for unknown reasons; one clutch was smashed by an agriculture vehicle. All eggs would have probably been destroyed without their translocation.

Fig. 1.
Marked nest of *E. orbicularis*. Nests are marked during the egg-laying period. In September, eggs or hatchlings are collected (see text and figures 3, 4). (Photo: R. DRÓZDZ)

When nest predation rates are high, nests can be covered with wire mesh. Such protection probably does not influence the development of embryos under the soil. As the hatchlings are not able to leave protected nests, it is important to control the nests every day from mid-August onward, or remove the cover before the hatching period. Because in the Radom district nest predation by mammals is low (MITRUS & ZEMANEK 2000) the method is only sporadically used.

In other areas this method may be very useful, but transferring the threatened clutches or protecting them by wire mesh can only be done if the localisations of clutches are known. Such methods of clutch protection requires a good knowledge of the turtles' biology.

Active protection measures

The survival rate of turtles from egg deposition to hatching and during the first year of life is low (WILBUR & MORIN 1988, IVERSON 1990, HEPPELL 1998). In the northern part of the distribution area climate conditions probably have a strong influence on the mortality rate. If the summer is not sufficiently warm (the average temperature of July and August below 18° C – ZEMANEK 1991), embryos of the European pond turtle cannot complete their development (MICHALOWSKI 1956, ZEMANEK 1991). Therefore in Poland turtles can reproduce successfully only in some years. For a large population such a situation is not dangerous, as females are able to lay eggs over many years. If some years are too cold for the complete development of embryos, other years are warm enough to ensure successful reproduction. However, small populations might be more affected by episodic recruitment. Accidental death of some adults and reproductive failing in some years could be detrimental for the mostly small Polish populations.

Fig. 2.
Females on the way to and at nesting sites are very alert. During the nesting period nesting sites are racked in a checker board pattern of paths, which enables to find females due to their tracks.

Fig. 3.
Opened breeding chamber (in September). To complete development before autumn, embryos of the European pond turtle need a mean temperature during summer above 18 C, which is in Poland not achieved each year. (Photo: M. RĘBIS)

An active protection program on a small population in the Radom district has been carried out since 1989 (ZEMANEK 1992, MITRUS & ZEMANEK 1998) with the purpose to increase its population size. Based on local reports, about 40 years ago the population was large. The subsequent decrease in numbers can be attributed to changes of the natural habitat. During the active protection program, increasing the population size is achieved by reducing mortality of the European pond turtles during their first period of their life (MITRUS & ZEMANEK 1998).

The nests of the European pond turtle are marked during the egg-laying period (ZEMANEK 1992) (Fig. 1). If possible, the individuals are observed with binoculars on their way to and at the nesting sites. In some cases, the ground is raked in a checker board pattern (Fig. 2) to make the turtle tracks visible.

In the first half of September, egg-chambers are dug out. The nests are opened from one side. During digging, recently emerged hatchlings are occasionally found (Fig. 3). Subsequently the eggs are placed in containers with moistened soil and transported to a hatchery in Cracow, where turtles hatch. Neonates are raised in aquariums 40x50 cm, 10-25 specimens in each (Fig. 4). The water temperature is kept at about 20° C. Many neonates in the first weeks of life are not able to dive and the water level is kept at about 3-4 cm. Water plants and stones are used for basking. Conventional bulbs and Fluorescent lamps ("Biolux", light spectrum similar to the sun) provide light and warmth. Turtles are fed with life prey (mostly larvae of Chironomidae and other insects, earthworms and crickets), vitamins and mineral supplements (small pieces of

os sepiae, cuttle-fish cartilage; vitamins are mixed with the food). It is important to provide living animals as food because the turtle will hunt for them after release.

The following spring, young turtles are released into their natural habitat (ZEMANEK 1992, MITRUS & ZEMANEK 1998). The survival rate in captivity is 90,9% (data from 439 individuals). Within about 9 months their carapace length increases about 1.5 times and the body mass about 3-4 times (Tab 1 and Fig. 5). Their shells are stronger than at hatching, enhancing their survival rate after release. As they are released directly into the water, mortality from overland travel from the nest site is reduced.

HARDING (1991) estimates that releasing 50-100 (or even more) hatchlings of the wood turtle *Clemmys insculpta* would be required to balance the removal of a single adult. Raising and releasing young turtles seems to be an easy way to protect small populations, because the mortality rate of 1-3 year old turtles is lower than that of hatchlings (IVERSON 1990, HEPPELL 1998). Releasing one-year-old specimens could reinforce the population rather fast.

How long should the turtles be kept in captivity to achieve the maximum success in protecting the species? Because of high cost and the aggressive behaviour of specimens during the second season in captivity (MITRUS & ZEMANEK, submitted), the best way appears to keep the turtles over one season. Additionally, during the second season, captive turtles which stopped growing in September did not resume growth until March (MITRUS & ZEMANEK, submitted). LUKINA (1976) reports that in unfrozen reservoirs during hibernation, although the turtles in one area were active and sufficient food was available, the stomachs of the turtles remained empty. *Emys orbicularis* seems to refrain from feeding during winter, as stomach contents might have adverse effects during hibernation.

Fig. 4.
Neonates of the European pond turtle in captivity. While raising, they are fed with life food. Since 1989 in the Radom district 415 one- or two years old turtles were released, to the areas where the eggs and hatchlings had been collected.
(Photo R. DRÓZDZ)

Table 1.
Straight carapace length (SCL) and body mass (BM) with standard deviation (SD) of *E. orbicularis* hatchlings from central Poland and nine-month-old individuals raised in captivity (after MITRUS & ZEMANEK, submitted).

Date	SCL [mm] ± SD	BM [g] ± SD
7.09.1997 (hatchlings)	26.49 ± 1.05 (n = 81)	5.26 ± 0.47 (n = 81)
25.05.1998 (prior to release)	46.36 ± 4.12 (n = 192)	21.26 ± 4.66 (n = 191)
17.09.1998 (hatchlings)	26.59 ± 0.96 (n = 60)	5.04 ± 0.49 (n = 60)
19.05.1999 (prior to release)	38.04 ± 4.15 (n = 52)	14.70 ± 4.12 (n = 52)

Until 1999 at Zwolenka river valley area and Okólny Lug project nature reserve (central Poland), 415 young European pond turtles were released (Tab. 2) at the same areas from which eggs and hatchlings had been collected. In the 1999-2000 breeding season, 66 individuals from 5 clutches have been kept. Unfortunately until 1998 released individuals were not marked and thus their survival is impossible to estimate. Only indirect information is known. During the second half of the 80s, middle-sized and small individuals were very rare (ZEMANEK 1991). At present, the number of such stages is greater than that of adults (MITRUS & ZEMANEK 1998 and unpubl. data). As in 1991 and 1994, a success of natural reproduction was noted (MITRUS & ZEMANEK 1998). It cannot be determined how many individuals hatched naturally, and how many individuals were raised during the protection program.

Since 1998, all released *E. orbicularis* are marked by notching the marginal scutes (PLUMMER 1989, MAZZOTTI 1990). Although released individuals spent the first winter in captivity without hibernation, the turtles are able to overwinter and to grow at a high rate under natural conditions (MITRUS & ZEMANEK, unpubl. data). In 1998, at the "Borowiec" reserve, 69 turtles were released, 17 (24.6%) were re-captured in 1999, some of them repeatedly through out the year.

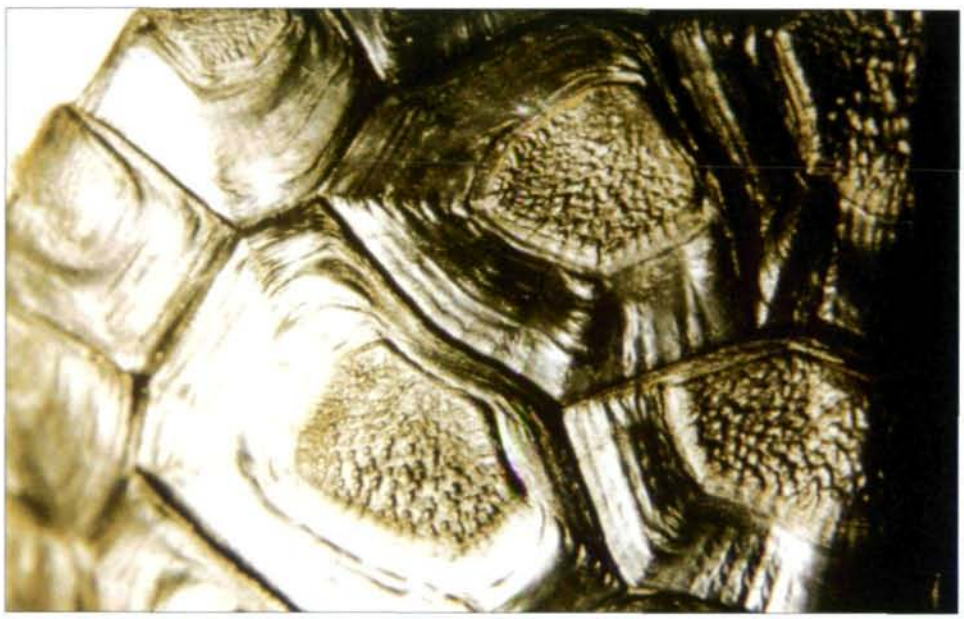

Fig. 5.
Detail view of dorsal carapace of neonates of the European pond turtle five months after hatching. Scutes of neonates carapaces are not smooth and growth rings are clearly visible. During about 9 months in captivity carapace length of the turtles increases about 1.5 times.

Table 2.
Number of released European pond turtles during the active protection program in central Poland.

	Number of individuals released									
Site	**1990**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**Total**
"Borowiec"	12	4+4*	11	8	20	39	10*	69	34+12*	**223**
Mierziaczka-Barycz	–	–	8	–	10	–	–	30	–	**48**
Siekierka	–	–	–	–	–	–	–	20	20	**40**
"Okólny Lug"	–	7	7	–	10	20	–	60	–	**104**
Total	**12**	**11+4***	**26**	**8**	**40**	**59**	**10***	**179**	**54+12***	**415**

* – number of turtles released after two breeding seasons;
"Borowiec" reserve, Mierziaczka-Barycz villages and Siekierka village are situated in the Zwolenka river valley;
"Okólny Lug", located about 40 km from the "Borowiec" reserve, is a projected nature reserve at a large marshy area.

Plans for reintroduction

Apart from central Poland, active protection of the European pond turtle is also carried out in eastern Poland – at the Leczna–Wlodawa Lake District (JABLONSKI 1992, JABLONSKI 1998). In 1999, activities were started at the Polesie National Park (RÓZYCKI, unpubl. data) and in western Poland (GUZIKOWSKI, MACIANTOWICZ, NAJBAR & RYBACKI, unpubl. data).

Reintroductions are planned at localities where *E. orbicularis* disappeared (JUSZCZYK 1987, ZEMANEK 1991, JABLONSKI 1998). Documenting the success of such a program requires long-term monitoring. Individuals (neonates) for reintroduction should be taken from the closest population to the place of reintroduction (SNIESHKUS 1995).

In western Poland, strong populations exist as well as solitary individuals (GUZIKOWSKI, MACIANTOWICZ, NAJBAR & RYBACKI, unpubl. data). Reintroduction plans are connected with wetland protection, with the task to measure the survival rate of released individuals.

Hazards by other species

The illegal import of exotic tortoises and *Emys* spp. from Russia and other countries of the former Soviet Union during the 90s was considerable, but cannot be quantified. Most of the animals have been sold for captive care, but some were probably released. Most of the specimens are from the *E. orbicularis* subspecies group, although sometimes specimens of other subspecies are found (MITRUS & ZEMANEK, unpubl. data). The scale of the problem is unknown.

In Poland, the most popular turtle in captivity is the slider turtle (*Trachemys scripta elegans*). By official documents (U.S. Fish and Wildlife Service – after SALZBERG 1998), from 1994 to 1997 alone, almost 450 000 slider turtles were exported to Poland. Fortunately, in contrast to some European countries (France – ARVY & SERVAN 1998, Italy – LUISELLI et al. 1997), reports about released specimens in nature are scarce (MITRUS & ZEMANEK, unpubl. data). It is still unknown whether the slider turtle causes significant effects on native *E. orbicularis* populations (LUISELLI et al. 1997, CADI & JOLY 1998). *Trachemys s. elegans* is probably unable to reproduce in Poland. However, the situation should be monitored because the effects of introduced species on native turtles are completely unknown. Poland does not have any legal regulations against the import of slider turtles. Such exclusive laws were enacted by the European Community and will be enacted automatically when Poland joins EC. For the conservation of *E. orbicularis*, it would be better if these were accepted even earlier.

Acknowledgements

The active protection of the turtle *Emys orbicularis* (L.) is sponsored by the EcoFund – Polish Debt for Environmental Swap, Narodowy Fundusz Ochrony Srodowiska (National Fund for Protection of Environment), GEF / SPD (Global Environmental Foundation) and Provincial Administration Offices in Radom and Warsaw.

The active protection program in central Poland is beeing carried out with Dr. Maria ZEMANEK. I would like to thank all my friends who helped with the protection, especially Robert DRÓZDZ, Adam KOTOWICZ, Rafal MAZURKIEWICZ, Maciej REBIS and Dariusz STEPIEN. Thanks are due to Robert JEHLE for linguistic review.

Zusammenfassung

Emys orbicularis gehört in Polen zu den gefährdeten Arten. Die Gründe dafür liegen vor allem in der Veränderung ihres natürlichen Lebensraumes. Die meisten Populationen sind klein, und eine erfolgreiche Reproduktion ist nur in warmen Jahren möglich. Im Distrikt Radom (Mittelpolen) wurde 1989 ein Schutzprogramm initiiert. Jedes Jahr werden Gelege markiert und im September Eier oder Schlüpflinge gesammelt. Die Jungtiere werden während des Winters in Gefangenschaft gehalten, mit Lebendfutter versorgt und im folgenden Frühjahr freigelassen. Bis 1999 wurden 415 Schildkröten zu ihren ursprünglichen Populationen zurückgebracht. Nach einer sol-

chen künstlichen Haltung sind Schlüpflinge leichter in der Lage zu überwintern, und ihre Überlebensrate ist höher. Auch in Ost- und Westpolen werden Schutzprogramme durchgeführt. Pläne für Wiederansiedlungen von Europäischen Sumpfschildkröten bestehen vor allem in Westpolen.

References

ARVY C. & J. SERVAN (1998): Imminent competition between *Trachemys scripta* and *Emys orbicularis* in France. — In: FRITZ U. et al. (Eds.), Proceedings of EMYS Symposium Dresden 96, Mertensiella **10**: 33-40.

BERGER L. (1975): Fauna slodkowodna Polski. Gady i plazy. — PWN, Warszawa-Poznan, pp. 109.

CADI A. & P. JOLY (1998): CompÈtition pour l'exposition au soleil entre une espece autochrone (*Emys orbicularis*) et une especte exotique (*Trachemys scripta*). — 2nd International Symposium on *Emys orbicularis*. Program and abstracts: 8.

CONGDON J. D., DUNHAM A. E. & R.C. VAN LOBEN SELS (1994): Demographics of Common Snapping Turtles (*Chelydra serpentina*): Implications for Conservation and Management of Long-lived Organisms. — Amer. Zool. **34**: 397-408.

HARDING J. H. (1991): A Twenty Year Wood Turtle Study in Michigan: Implication for Conservation. — In: Proceedings of the first International Symposium on Turtles and Tortoises, Conservation and Captive Husbandry. Chapman University, Orange, California, 31-35.

HEPPELL S. S. (1998): Application of Life-History Theory and Population Model Analysis to Turtle Conservation. — Copeia **2**: 367-375.

IVERSON J. B. (1990): Patterns of survivorship in turtles (order Testudines). — Can. J. Zool. **69**: 385-391.

JABLONSKI A. (1992): Próba aktywnej ochrony zólwia blotnego *Emys obicularis* (L.). — Czynna ochrona zwierzat, PWN, Warszawa, 107-115.

JABLONSKI A. J. (1998): Zólw blotny. Monografie przyrodnicze Nr 3. — Wydawnictwo Lubuskiego Klubu Przyrodników, Swiebodzin, pp. 48.

JUSZCZYK W. (1987): Plazy i gady krajowe. Czesc 3: Gady - Reptilia. — PWN., Warszawa, pp. 214.

KOSINSKI M. (1993): Wystepowanie i charakterystyka populacji zólwi blotnych *Emys orbicularis* na terenie Chelmskiego Parku Krajobrazowego. — Chronmy Przyr. Ojcz. **49**: 67-75.

LUISELLI L., CAPULA M., CAPIZZI D., FILLIPI E., TRUJILLO JESUS M. & C. ANIBALDI (1997): Problems for Conservation of Pond Turtles (*Emys orbicularis*) in Central Italy: is the Introduced Red-Eared Turtle (*Trachemys scripta*) a Serious Threat? — Chelonian Conservation and Biology **2**: 417-419.

LUKINA G. P. (1976): Ékologiya razmnasheniya bolotnojø cherepakhy v vostochnom priazov'e. — Nauch. Tr. Kubansk. Gosud. Univ., Krasnodar **218**: 78-80.

MAZZOTTI S. (1990): Studio di una populazione di *Emys orbicularis* L. — Natura e Montagna **39**/3-4: 25-28.

MICHALOWSKI J. (1956): Perspektywy ochrony plazów i gadów w Polsce. — Chronmy Przyr. Ojcz. **12**/6: 9-16.

MITRUS S. & M. ZEMANEK (1998): Reproduction of *Emys orbicularis* (L.) in Central Poland. — In: FRITZ U. et al. (Eds.),Proceedings of EMYS Symposium Dresden 96, Mertensiella **10**: 187-191.

MITRUS S. & M. ZEMANEK (2000): Distribution and biology of Emys orbicularis in Poland. — Stapfia **69**: (vorliegender Band).

MITRUS S. & M. ZEMANEK (submitted): The turtle *Emys orbicularis* (L.) neonates overwintering in breeding chambers. — Proceedings of 2nd Emys Symposium, Le Blanc 1999.

MLYNARSKI M. (1971): Nasze gady. — PZWS, Warszawa, pp. 178.

PLUMMER M. V. (1989): Collecting and Marking. — In: HARLESS M. & MORLOCK H. (Eds.), Turtles. Perspectives and Research. John Wiley & Sons, Malabar, Florida, 45-61.

RÓZYCKI A. & M. SOLTYS (1996): Ocena stanu liczebnosci populacji zólwia blotnego - *Emys orbicularis* (L.) na terenie Poleskiego Parku Narodowego i sposoby jego ochrony. — Typescript at Polesie National Park manager's office.

SALZBERG A. (1998): Chelonian Conservation News. — Chelonian Conservation and Biology **3**: 147-150.

SCESHKUS E. (1995): Is it possible to preserve the Pond Turtle *Emys orbicularis* in the northernmost parts of its distribution? — Memoranda Soc. Fauna Flora Fennica **71**: 125-127.

SKIBINSKI S. (1954): O rezerwat zólwia blotnego na rzece Uherce w Stankowie. — Chronmy Przyr. Ojcz. **10**/3-4: 55-60.

WILBUR H. M. & P.J. MORIN (1988): Life history evolution in turtles. — In: GANS C. (Ed.), Biology of the Reptilia, vol. 16, Alan R. Liss, Inc., New York, 387-522.

ZEMANEK M. & S. MITRUS (1997): Biologia i ochrona zólwia blotnego *Emys orbicularis* w województwie radomskim. — Chronmy Przyr. Ojcz. **53**/1: 67-83.

ZEMANEK M. (1991): Wystepowanie zólwia blotnego, *Emys orbicularis* (L.) w Polsce i zagadnienia jego ochrony. — Przegl. zool. **35**/3-4: 337-347.

ZEMANEK M. (1992): Rezerwat przyrody Borowiec w dolinie Zwolenki. — Ochr. Przyr. **50**/II: 173-195.

Address of the Author:

Slawomir MITRUS
Department of Ecosystem Studies,
Institute of Environmental Sciences,
Jagiellonian University,
Gronostajowa 3, 30-387 Kraków
Poland
e-mail: mitrus@eko.uj.edu.pl