

Abstract

The aim of the research was to investigate the presence of allochthonous species of turtles in the nature of Latvia, as well as to withdraw them from the nature according to the "Plan on protection of *Emys orbicularis* in Latvia", officially approved by the Latvian Ministry of Environment (Pupiņš & Pupiņa 2007a). The methods of the research were: 1) information campaign and survey; 2) interviews with inhabitants; 3) field expeditions; 4) laboratory study of viability of found turtles. In course of research, five new allochthonous species and subspecies of the turtles were recorded for the first time, and new data were obtained about finding *Trachemys scripta elegans* in the nature of Latvia. Most of the registered animals (80%) were removed from the nature. Since allochthonous turtles get there in the result of escape from pet-lovers and, apparently, illegal introduction into nature by their owners, education of population is of great importance.

Keywords

Alien, reptiles, management, North Europe

First records of 5 allochthonous species and subspecies of Turtles (*Trachemys scripta troostii*, *Mauremys caspica*, *Mauremys rivulata*, *Pelodiscus sinensis*, *Testudo horsfieldii*) and new records of subspecies *Trachemys scripta elegans* in Latvia

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Introduction, Hypotheses and Problems for Management

Anthropogenic spreading and invasion of allochthonous (Kabish 1990) species of reptiles is an issue of world importance for preserving natural biodiversity (Kraus 2009). Allochthonous species of reptile reproduce in new habitats (Cadi et al. 2004; Heeswijk-Dihter et al. 2006; Perez-Santigosa et al. 2008) competing with ecologically close local species of reptile for biotopes, trophic base, places of sun-basking, etc. (Cadi & Joly 2003, 2004).

Historically, only two species of turtles are registered in Latvia: *Emys orbicularis* (Linnaeus 1758) and *Caretta caretta* (Linnaeus 1758) (Siliņš & Lamsters 1934) caught in 1829. Only *Emys orbicularis* permanently inhabits Latvian territory, at the northern edge of its European area in Latvia (Meeske et al. 2006), all through its life cycle. This species is extremely rare and preserved in Latvia (Ministru kabinets 2000; Bērziņš 2003); it is sensitive to the influence of negative factors of anthropogenic nature (Pupiņš & Pupiņa 2007b). One of such factors may be

appearance of allochthonous species of turtles in the nature of Latvia (Pupiņš & Pupiņa 2007b).

Hypotheses of the research.

The main hypothesis of the research that has been carried out since 2004 is based on the assumption that there are also allochthonous turtles in the nature of Latvia besides autochthonous turtles. The following assumptions have been formulated as additional hypotheses: 1) allochthonous turtles are mainly represented by aquatic species in Latvia; 2) allochthonous turtles may appear in groups; 3) some species of allochthonous turtles may pass the winter in Latvia.

Problems for Management.

Management of allochthonous turtles in Latvia is necessary for preservation of autochthonous biodiversity. The main aim of the management is to prevent allochthonous turtles from appearance in the nature of Latvia. This aim may be achieved by the efficient removal of allochthonous species from the nature and preventing them from appearing in the nature.

Main problems of this management are connected with the peculiarities of biology and ecology of allochthonous species of turtles, presence of rare and protected autochthonous species *Emys orbicularis*, lack of knowledge of the population in the field of conservation of herpetofauna, with the peculiarities of legislation relating to nature conservation in Latvia. So allochthonous terrestrial and especially semi-aquatic turtles are difficult to spot and identify in the nature due to their ways of life; it is difficult to catch semi-aquatic turtles; population may misidentify allochthonous turtles with autochthonous species *Emys orbicularis*; uneducated animal lovers may set free exotic turtles which are not necessary for them in the wild; at the same time there is no special activity for the removal of allochthonous turtles from the nature in the Latvian nature conservation legislation.

Trachemys scripta elegans (Wied-Neuwied 1839) was first recorded in natural habitats of Latvia in 2006. The first group consisted of 6 animals and was found near the town of Nitaure (Pupins 2007). Allochthonous turtles can compete with autochthonous turtles for suitable biotopes (Arvy & Servan 1998; Cadi & Joly 2003, 2004). Apart from competition with *Emys orbicularis*, during the research into distribution of *Emys*

orbicularis in Latvia by the method of interrogating local population, allochthonous turtles can also be misidentified with *Emys orbicularis* (Pupiņš et al. 2010). The "Plan on protection of *Emys orbicularis* in Latvia", officially approved by the Latvian Ministry of Environment (Pupiņš & Pupina 2007a), recommends to investigate the presence of allochthonous species of turtles in natural ecosystems of Latvia, the eradication of its population, as well as campaigns for raising awareness of local people.

Since 2004, a research oriented to receive and evaluate people encounters with allochthonous turtles in Latvia has been carried out. Before this program only occasional information had been recorded. Since 2007, a study of encountering allochthonous turtles in Latvia has become part of the officially confirmed "Plan on protection of *Emys orbicularis* in Latvia" (Pupiņš & Pupina 2007a), which is being currently conducted, and will be carried out on the permanent basis.

Study Area

The research of the allochthonous turtles was carried out all over the territory of the Republic of Latvia. Latvia is a country in the Baltic region of Northern Europe, placed between Estonia and Lithuania. Geographic

Resumen

El objetivo del estudio fue investigar la presencia de especies alóctonas de tortugas en la naturaleza en Letonia, así como retirarlas de la naturaleza, según el "Plan de protección de *Emys orbicularis* en Letonia", declarada oficialmente por el Ministerio de Medio Ambiente de Letonia (Pupiņš y Pupina 2007a). Los métodos de investigación fueron: 1) campaña de información y estudio; 2) entrevistas con los habitantes; 3) expediciones de campo, y 4) un estudio de laboratorio sobre la viabilidad de las tortugas encontradas. En el curso de la investigación fueron registradas por primera vez cinco nuevas especies alóctonas y subespecies de las tortugas; los nuevos datos se obtuvieron en la búsqueda de *Trachemys scripta elegans* en la naturaleza. La mayoría de los animales registrados (80%) fueron retirados de la naturaleza. La educación de la población se considera de gran importancia ya que las tortugas alóctonas llegan como resultado de la fuga de los amantes de las mascotas y por su introducción ilegal en la naturaleza.

Palabras clave

Alóctona, reptiles, gestión, Norte de Europa

coordinates of Latvia is 57°00' N, 25° 00' E. The total area of the Republic of Latvia is 64,589 sq km, 62,249 sq km of land and 2,340 sq km of water. The total length of land boundaries is 1,382 km. Latvia has common borders with such countries as Belarus, 171 km long, Estonia, 343 km long, Lithuania, 576 km, and Russia, 292 km long. The climate is maritime, temperate seasonal, and wet, with moderate winters. The prevailing terrain is low plain; the lowest point is the Baltic Sea 0 m, the highest point is the Gaizina Kalns, 312 m high (CIA 2011). Examination of the allochthonous turtles that had been caught was carried out in the laboratories of the Latgale Zoo in Daugavpils, South-East Latvia.

Materials and Methods

The main idea of the present research and management of allochthonous turtles in Latvia is an active involvement of specially educated population. In order to cover the whole territory of Latvia, and due to the small number of allochthonous turtles in Latvia and difficulty searching for some water species of turtles, we have purposefully prepared (work with mass media) and used local population of Latvia for receiving information on turtles and capturing them. Herewith, almost all mentioned cases (except for 2) of encountering and capturing of

allochthonous turtles were realized with citizens.

The research consisted of the following stages:

Stage 1. Information campaign and survey. Questioning of local population was the primary research method. Questioning was carried out in course of extensive information campaigns that were conducted through the mass media (press, radio, television, and specially designed topic-related page of the internet site), a brochure published particularly for this event (Līdaka et al. 2005), corresponding sections in a general interest publication (Pupiņš & Pupiņa 2007b), and teaching material designed for students (Pupiņš et al. 2010). These sources informed the population about the existing problem, importance of searching for autochthonous and allochthonous turtles in Latvia and about the recommended actions in case of encounter with a turtle anywhere in the nature of Latvia or in case of hearing about such encounters. The total number of those questioned with the help of materials published in the mass media is unavailable and might be equal to the circulation numbers of these editions. Besides, target audiences were interviewed, among them students of the Daugavpils University Bachelor and Masters Programmes, "Biology" and

"Environmental science", respectively (n=264), participants of the scientific biological conferences held in the University of Latvia and in Daugavpils University (n=187), visitors of the Latgale Zoo (n=26,500 per year), professional biologists (n=23), employees of Latvian zoos (n=9) and pet shops (n=8). All respondents were requested to share information about turtles, addressing their e-mails, SMS, and telephone calls to the researchers whose contact details were published in mass media, at any time.

Stage 2. Interviews. On receiving information about finding a turtle, a 7-10 minute interview was held with the respondent over the telephone or in person; the aim of these interviews was to check if the information was valid, to clarify the place and time where and when the turtle was caught, and to get accompanying information of ecological nature. If the encounter with a turtle had taken place immediately before the conversation, the interview included a request to catch the animal and instructions on how to keep it until the arrival of a researcher.

Stage 3. Field expeditions. After the interview, an expedition would go to the place where a turtle was caught. The turtle would be withdrawn and the following information gathered: conditions in

which the turtle was caught, coordinates of catching (in Results, coordinates are specified up to minutes). The place of catching was closely examined; the biotope in which the turtle had been caught was described and photographed. Additional interviews with other locals were held.

Stage 4. Laboratory study.

Laboratory study included identification of the caught individual with the help of reference books (Terentyev & Chernov 1949; Bannikov et al. 1977; Obst 1983) and in consultation with specialists (C.Ayres, pers.com.); morphometric measurement for approximate determination of the individual's stage of development (juvenile, subadultus, young adultus, adultus, old adultus), and assessment of viability of the caught allochthonous turtles. In the present research, the definition of D.C. Wareham: "Viable - capable of normal growth and development; capable of living, as in viable eggs" (Wareham 2005) was used as a basis. Viability was defined as sufficient if during the 2 weeks of being kept in the laboratory under standard conditions of zoo-culture the turtle remained mobile and actively fed.

Results

In course of the research, five new allochthonous species and subspecies of the turtles were

recorded for the first time, and new data were obtained about finding *Trachemys scripta elegans* in the nature of Latvia (Table 1).

FINDINGS OF TURTLES

1. *Trachemys scripta* (Thunberg 1792; Schoepff 1792) (Testudines: Emydidae: Deirochelyinae).

1.1. *Trachemys scripta elegans*.

In addition to the 7 reports received earlier (Pupins 2007), 8 new ones (Figure 1) were received from different parts of Latvia, two of which were about the new groups of *Trachemys scripta elegans* with 2-3 individuals. The biotopes of these findings are ponds of natural and artificial origin, overgrown with water plants (Figure 2), small rivers and their banks. In all cases young adult and adult animals were found,

both males and females.

Hibernation in nature. The research has for the first time obtained information about a possible hibernation of *Trachemys scripta elegans* in the nature of Latvia; minimum in two cases, the found animals might have successfully spent winter. For instance, Case # TrScEI0010 is a report about a group of *Trachemys scripta elegans* consisting of minimum 3 adult turtles, which had been observed for 2-3 years and very likely to have spent winter locally. A turtle (# TrScEI0011) that had escaped from the person who kept it in September was caught in April of the following year.

Death in nature. For the first time in the nature of Latvia, a shell of a dead turtle of the species *Trachemys scripta elegans* (#



Figure 1. *Trachemys scripta elegans* (# TrScEI0014) adult female that was registered in 2011.

Species and subspecies	Registration #	District/ region/place	Year	Coordinates	Quantity	Removing status
<i>Trachemys scripta</i>						
<i>T.s.elegans</i>	TrScEI0008	Sigulda, Kipari	2009	57°09'N; 24°53'E	1	dead/removed
	TrScEI0009	Ventspils novads, Vecventa, Zuras	2009	57°15'N; 21°36'E	1	removed
	TrScEI0010	Valmieras novads, Murmuiza	2009	57°28'N; 25°29'E	3	2 removed
	TrScEI0011	Ludzas novads, Zilupe	2008	56°23'N; 28°07'E	1	removed
	TrScEI0012	Ogres novads, Kaibala river	2010	56°42'N; 25°13'E	2	not removed
	TrScEI0013	Daugavpils city	2011	55°52'N; 26°30'E	1	removed
	TrScEI0014	Pavilostes novads, Vergale	2011	56°41'N; 21°10'E	1	removed
	TrScEI0015	Ventspils city	2011	57°23'N; 21°34'E	1	removed
<i>T.s.troostii</i>	TrScTr0001	Rigas novads, Marupe	2008	56°53'N; 24°04'E	1	removed
<i>Mauremys caspica</i>	MaCa0001	Liepaja novads	2010	56°25'N; 21°15'E	1	removed
<i>Mauremys rivulata</i>	MaRi0001	Riga	2010	56°55'N; 24°16'E	1	removed
<i>Pelodiscus sinensis</i>	PeSi0001*	Rigas novads, Olaine	2008	56°46'N; 23°55'E	1	removed
	PeSi0002**	Madonas novads, Racenu lake	2010	56°49'N; 26°13'E	1	not removed
<i>Testudo horsfieldii</i>	TeHo0001	Daugavpils novads, Medumi	1969	55°47'N; 26°21'E	1	removed
	TeHo0002	Ventspils	1960	57°21'N; 21°35'E	1	not removed
	TeHo0003	Daugavpils	1977	55°51'N; 26°29'E	1	removed
	TeHo0004	Jekabpils	2005	56°31'N; 25°52'E	1	removed
	TeHo0005	Daugavpils	2007	55°52'N; 26°34'E	1	removed
	TeHo0006	Madonas novads, Lubana	2008	56°53'N; 26°43'E	1	removed
	TeHo0007	Cesu novads, Vecpiebalga	2008	57°03'N; 25°48'E	1	removed
	TeHo0008	Jurmala	2009	56°58'N; 23°46'E	1	removed
	TeHo0009	Jelgava	2010	56°38'N; 23°42'E	1	removed
Total:					25 animals	20 removed (80 %)

Table 1. New findings of allochthonous species and subspecies of turtles in Latvia.

*data concerning this finding were presented at the conference in University of Latvia in 2009 and published in the conference abstracts,

** this species was determined following the description of the respondent.

TrScEI0008) was found. Traces of predator teeth or traumas inflicted by transport were not observed on the shell. In 2009, (# TrScEI0010) one turtle from registered group was killed by school children, another caught by the locals.

1.2. *Trachemys scripta troostii* (Holbrook 1836).

In 2008, for the first time in Latvia, 1 sample of a young adultus male (Figure 3) was found not far from the city of Riga (Figure 3), in the outskirts of the settlement Marupe. The settlement is surrounded by marshy meadows grown with reed and bushes, cut with melioration canals filled with water.

2. *Mauremys caspica* (Gray 1869). (Testudines: Cryptodira: Testudinoidea: Geoemydidae: Geoemydinae).

One individual, adultus, a big female was for the first time in Latvia caught in 2008 near the town of Liepaja.



Figure 2. *Trachemys scripta elegans* (# TrScEl0010) sun-basking animal from registered group in the nature of Latvia (Photo: Agita Knutova, 2011).



Figure 3. The first *Trachemys scripta troostii* (# TrScTr0001) found in Latvia.

3. *Mauremys rivulata* (Valenciennes 1833). (Testudines: Cryptodira: Testudinoidea: Geoemydidae: Geoemydinae).

For the first time in Latvia, 1 individual, a male subadultus, was

caught in November 2010 in the central part of the country, in the forest road not far from a stream overgrown with bushes and grass.

4. *Pelodiscus sinensis* (Wiegmann, 1835) (Testudines: Cryptodira:

Trionychoidea: Trionychidae).

Two findings were recorded in the central part of Latvia; one animal (# PeSi0001) was identified as a male adultus (Figure 4) (Pupins et al. 2009). *Pelodiscus sinensis* was caught by a net while fishing in an anonymous artificial lake that had appeared when the melioration system canals got flooded near the place of their connection with the river Misa. The maximal length of the lake is 121 m, and the width is 64 m. The coast line is 361 m, the banks are poorly structured. The maximal depth of the lake is 2-3 m, the bottom is slimy. Such fish species as *Carassius carassius*, *Tinca tinca*, *Esox lucius* are found in the lake which is used for recreation and fishing.

In the second case (# PeSi0002), the respondent, a teacher of biology, watched a juvenile turtle in the lake Racenu, near the bank; according to the description (it was described as a swimming light-coloured turtle not more than 10 cm in length with a carapax devoid of individual scutes), it possible have been a case of *Pelodiscus sinensis* which we failed to acquire. The lake is 931 m long and 717 m wide; its coast line is 3,716 m; the banks grown with forest and bushes. Average depth is 4.6 m (Ezeri.lv 2011). The lake is rich with fish and is used for recreation.

5. *Testudo horsfieldii* (Gray 1844)
(Testudines: Cryptodira:
Testudinidae).

Nine individuals are recorded in Latvia, only single male and female subadults, young adults, and adults. The earliest finding of *Testudo horsfieldii* (# TeHo0002), photographed by the respondent's relative, dates back to 1960. The first *Testudo horsfieldii* in Latvia was caught by the author in 1969. *Testudo horsfieldii* were found in different biotopes in Latvia, for example, in kitchen gardens, meadows around settlements, forest border, and river banks.

Hibernation in nature. There is no information about hibernation of this species. In one case (# TeHo0003), a *Testudo horsfieldii* was buried by the owner as dead at the depth of ~10 cm at the beginning of March and was then caught in May.

Damage to carapax. In case of two turtles, the horny layer of their carapax was damaged. One had characteristic traces of teeth of a big predator (Figure 5), the other had a grated shell, which might have been a result of running over by transport.

Evaluation of viability of the found turtles. Nearly all turtles that were caught, with the exception of one individual of *Trachemys scripta elegans* (# TrScEl0011), that had

spent winter in the nature of Latvia, were active and looked well-fed at the moment of being caught; they were trying to escape, did not have any visible signs of disease or vitally significant damages. As later when they were kept in laboratory

conditions, the turtles remained mobile and actively consumed the food corresponding to the needs of the species, viability of all caught animals was evaluated as good.



Figure 4. The first *Pelodiscus sinensis* (# PeSi0001) caught in Latvia.



Figure 5. *Testudo horsfieldii* (# TeHo0006) with traces of teeth of a predator on the carapax.

Discussion

Reasons for getting in the nature.

The reason for the allochthonous turtles to get into the nature of Latvia, as stated in the research, was escape from their owners when the latter walked them over. Since groups of allochthonous turtles were also encountered in the nature of Latvia, illegal introduction of unwanted animals that had become boring to their owners into the nature might be assumed. For people in Latvia who love pets, a source of acquiring turtles is their legal sail in zoo-shops both in Latvia (DinoZoo Centre 2011) and other EU countries (Drews 2005; Kitowski & Pachol 2009), as well as private legal and illegal trading business (SS.LV 2011). It is well known that in other countries restaurant visitors choose among living turtles, that is why restaurant owners might import living *Pelodiscus sinensis* (Webb et al. 2008) and other species part of which animals can consequently get free. Illegal catching of turtles in their natural habitats or in the territories with developed technology of breeding turtles by tourists, who then smuggle these animals in their home countries, is also possible. Turtles are often smuggled, even in pockets, because detectors cannot identify them (Shepherd & Nijman 2008). Taking into account a long lifetime of turtles and the fact that the found animals were big adults, it is

possible to assume that three species (*Testudo horsfieldii*, *Mauremys caspica*, *Pelodiscus sinensis*) could get into Latvia legally or illegally from the territory of the former USSR which included areas of natural habitats of these three species (Terentyev & Chernov 1949); they could have been kept in captivity for years and get into nature only recently.

Consequences and prospects.

While evaluating prospects of allochthonous turtles appearing in Latvia, it is important to take into account climate conditions of their natural habitats, on the one hand, and a long lifetime of turtles and general warming of climate in Northern Europe, on the other. We do not have any data on true naturalizations or reproduction of registered allochthonous turtles in Latvia, the possibilities of having invasive populations of these species seem be low because of relatively cold climate of Latvia. It seems that the recorded by the research allochthonous species of turtles were casual individuals and groups coming from citizen release and these turtles will not be able to reproduce and spend winter in the nature of Latvia, because the nearest to the country northern borders of their natural habitats are too far to the south of Latvia (Terentyev & Chernov 1949; Bannikov et al. 1977; Gasc et al. 1997; Obst 1983). A relatively cold

north-European climate of Latvia, and cold winters with quite common low, up to -30°C , in particular (LVGMA 2011), are main negative obstacles for survival, incubation of eggs and successful hibernation of allochthonous species of turtles.

Alongside with this, minimum two cases were found of *Trachemys scripta elegans* spending winter in the nature of Latvia (# TrScEI0010; # TrScEI0011). It is quite possible that *Pelodiscus sinensis* from northern populations (Russia), among the other species found out in the present research in Latvia, are able to survive here both in the active warm part of the year because they live in the north of their natural habitat, in the Russian Far East (Bannikov et al. 1977), with the frostless period lasting 150-155 days (Knystautas & Sibnev 1987, cited in: Kirschey 2000), and during hibernation because they are capable of staying in water for up to 7 months during the winter time (Baker 2011). At the same time, in the south-eastern part of Latvia, Latgale, the average minimal temperatures in January are $-6-7^{\circ}\text{C}$, and the average air temperature in July $+17^{\circ}\text{C}$, with the duration of a frostless season for 150-160 days (Turlajs 2007). When evaluating the ability of *Pelodiscus sinensis* for adaptation to the life in Latvia, it is worth taking into consideration its relatively long lifetime (up to 25 years) and short egg incubation

period (30-50 days) (Knystautas, Sibnev 1987, cited in: Kirschey 2000), as well as the tendency of climate in Latvia to become warmer (LVGMA 2011).

Interaction with local species. *Pelodiscus sinensis* and *Trachemys scripta elegans* are invasive species in the places of anthropogenic settlements and compete with autochthonous species of turtles for habitats, trophic bases and places of sun-basking (Thirakhupt & Van Dijk 1994; Cadi & Joly 2003; Welcomme & Vidthayanom 2003; Cadi & Joly 2004; Tibor 2007). When they are kept together in laboratory, *Trachemys scripta elegans* attack equally-sized *Emys orbicularis*, bite off the tails of the latter and do not let them regenerate (Pupins, Pupina, pers.observ.). This competition might be potentially dangerous for the autochthonous *Emys orbicularis* at the extreme north of their European habitat in Latvia due to the small size of their population (Meeske et al. 2006) and very high demands for the optimality of biotopes (illumination and temperature of air and water) in the north of their habitats. *Pelodiscus sinensis* is a typical predator species and can potentially negatively influence the local water fauna (Somma 2008); it is considered a potentially invasive species in Germany (Kirschey 2000).

Possible co-invasion of parasitic species. It appears particularly important that allochthonous turtles caught in Latvia can be hosts of parasite species dangerous for autochthonous turtles (Soccini & Ferri 2004). For instance, *Cotylaspis parasinensis*, *Coeuritrema oschmarini*, *Leurosoma moemsis*, *Phyllodistomum sp.*, *Cephalogonimus emydalis*, *Astiotrema reniferum*, *Astiotrema oldneri*, *Neopolystoma palpebrae*, and *Spiroxys transversalata* were discovered in *Pelodiscus sinensis* in the nature in Russia (Strelkov 1950, cited in: Platt 2000; Sharpilo 1976, cited in: Kuzmin 2002). The turtles that are bred in specialised farms in zoo-culture and then exported on a large scale can also host parasites. Taiwan, for example, is the world largest producer of *Pelodiscus sinensis*; it produced 2,237,000 kg of *Pelodiscus sinensis* in 1998 and exported 3,308,000 kg of *Pelodiscus sinensis* from 1996 to 1998, as well as 500,000 kg of juvenile animals and 95,000 eggs (Chen et al. 2002, cited in: Webb et al. 2008). Dharmananda (2005) reports that Taiwan produces 6,000,000 juvenile *Pelodiscus sinensis* every year. In spite of the apparently highly developed zoo-culture technologies, *Vibrio fluvialis* (26.04%), *V. anguillarum* (21.23%), *V. furnissii* (18.49%), *V. parahaemolyticus* (18.49%), *Vibrio spp.* (6.85%), *V. damsela* (5.48%), and *V.*

metschnikovii (3.42%) were discovered in the cloacal analysis in 83% of *Pelodiscus sinensis* kept in Taiwan (Channarong et al. 2001). In 1999, China was forced to regulate export of *Pelodiscus sinensis* reproduced in specialised farms because of mass contamination with *Salmonella sp.* (Dharmananda 2005). If infected with exotic parasites, allochthonous turtles can introduce them into the populations of north-European species of herpetofauna. Possibly, appearance on only one infectious individual in the nature must be enough for this. Some of parasites may be new for the herpetofauna in Latvia and Northern Europe and potentially dangerous for autochthonous reptile species. Such parasites, new to autochthonous herpetofauna, may cause uncontrollable mass reduction of autochthonous populations of herpetofauna as was the case with *Batrachochytrium dendrobatidis* (Longcore, Pessier & Nichols 1999) (Voyles et al. 2010). This danger might be particularly urgent for autochthonous *Emys orbicularis* in north of their European area because of a small number of their northern populations.

Conclusions

Prevention of illegal penetration of allochthonous species of turtles in the nature of Latvia conforms both to the aims of preserving North-

European species of herpetofauna and those of protecting turtles all over the world. Thus two of the species of allochthonous turtles found in Latvia are protected ones: *Testudo horsfieldii* and *Pelodiscus sinensis* are included in the list of protected animals of IUCN (only autochthonous populations) (IUCN 2011). In Latgales Zoo we have been implementing practical measures aimed at managing allochthonous turtles in Latvia since 2004. We are regularly educating population concerning this issue and searching for allochthonous turtles; an asylum for exotic turtles (Figure 6) was established. This practical activity is effective, as nearly all allochthonous turtles (80%) reported by the population were extracted from nature. This is why these measures of managing are recommended in the officially approved Plans for protecting *Emys orbicularis* and *Bombina bombina* in Latvia (Pupiņš & Pupiņa 2006; Pupiņš & Pupiņa 2007a); they are close to the management of allochthonous turtles in other European countries (Ferri & Di Cerbo 1995; Ottonello et al. 2005) and will be implemented in Latvia on the permanent base.

Such legal measures as a much stricter control of bringing in and legitimate selling of turtles, laying down responsibility for letting allochthonous turtles into the nature might help preventing appearance of allochthonous turtles



Figure 6. Group of *Trachemys scripta elegans* in an asylum for exotic turtles in Latgale Zoo.

in the nature of Latvia. Since allochthonous turtles get there in the result of escape from pet-lovers and, apparently, illegal introduction into nature by their owners, education of population is of great importance.

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Bio-sketch

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