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HABITAT AND ALTITUDINAL DISTRIBUTION OF TWO LIZARD SPECIES OF GENUS *Takydromus* FROM THE NORTHEAST ASIA (FAR EAST OF RUSSIA, REPUBLIC OF KOREA)

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The paper discusses biotopical and altitudinal distribution of *Takydromus amurensis* Peters, 1881 and *Takydromus wolteri* Fischer, 1885 inhabiting the north-eastern Asia. These species demonstrate in this area the changes of biotopical preference. *T. amurensis* prefers to occupy the forest zone less actively than in the southern part of range, 46 vs. 91%, respectively. *T. wolteri* avoids open spaces and partially enters the forest zone (7%). Both *T. amurensis* and *T. wolteri* actively inhabit the light forest zone (15 and 17%, respectively) and anthropogenic region (39 and 76%, respectively), the zone being optimal for their inhabitancy. In the southern part of natural habitat (Republic of Korea), the light forest zone plays an important role in their biotopical distribution (9% *T. amurensis* and 36% *T. wolteri*), though it is less preferred when compared to north-eastern part of the range. Two sites in the forest zone with weakly anthropogenic disruption (one in Russia and the other in Republic of Korea) were revealed, where species symbiotopy was observed. In both cases, *T. wolteri* was a predominant species. For the first time the altitudinal distribution data for lizards of genus *Takydromus* has been presented, in particular, for Russia. *T. amurensis* was found in the range of 11 – 633 m a.s.l. and *T. wolteri* — 14 – 321 m a.s.l. Maximal amplitude of altitudinal distribution of studied species has been indicated for the light forest zone. On the territory of Korea, *T. wolteri* has been found to have wider range of vertical distribution 4 – 424 m a.s.l.

Keywords: *Takydromus wolteri*; *Takydromus amurensis*; biotopical preference; relative occurrence; vertical distribution; symbiotopy; anthropogenic impact.

INTRODUCTION

In the world fauna, biological diversity of lizards dominates over that of snakes as 1.7:1 (6399 lizard species against 3672 snake ones) (Uetz et al., 2017). However, Northeast Asia is characterized by relatively low lizards' diversity in comparison with snakes. Bannikov (1958) indicated lizards' diversity reduction and snakes' diversity increase from West to East in North-Eastern Asia that was further analyzed and proved by other authors (Borkin et al., 1990; Ananjeva et al., 1997). Domination of snakes' biodiversity over the lizards' one is also observed from South to North in North-East Asia. Republic of Korea shows the following correlation: 6 lizard species correspond to 12 snake species (Song, 2007); Primorsky Kray is known to have 3 species of lizards vs. 10 snake species (Maslova, 2016), while Khabarovsk Kray shows 1 lizard species vs. 8 snake ones (Adnagulov, 2017).

Two little known species have been chosen for our study: Amur grass lizard (*Takydromus amurensis* Peters, 1881) and Mountain grass lizard (*Takydromus wolteri* Fischer, 1885) from genus *Takydromus* Daudin, 1801. Territory of their habitat ranges from southern parts of the Russian Far East (Primorsky Kray) with its moderate monsoon climate to before the south of Republic of Korea with its subtropical monsoon climate, covering the northeastern part of China and DPRK (Schlüter, 2003; Ananjeva et al., 2006).

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The species distribution in Russian literature is covered rather poor (Emeljanov, 1923; Terentjev and Chernov, 1949; Korotkov, 1974, 1985; Bannikov et al., 1977; Strelkov, 1978). Altitudinal distribution data is entirely absent. Recently, some other Northeast Asian countries have done several studies of oriental grass lizards, most of which focused on genetic, morphometric and reproductive aspects (Tseng et al., 2014; Takehana et al., 2016; Luo et al., 2012; Sun et al., 2013). In 2010, Lee (2010) conducted a challenging research within the territory of Republic of Korea and reported on both morphological characteristics of Lacertidae family and lizard distribution of genus *Takydromus*. An attempt is made to figure out the importance of such key parameters as type of biotope, its altitude above sea level, and human impact on the biology and the distribution of two species of *Takydromus* genus.

MATERIAL AND METHODS

Biotopical and altitudinal distributions analysis of *T. amurensis* and *T. wolteri* was based on the data obtained during the expeditions, several field work, and was also complemented by using references and information from museum collections (Scientific museums of FEFU, FSCEATB FEB RAS, Russia; National Institute of Biological Resources, Republic of Korea). Research was carried out on the territory of two countries, Russia (Primorsky Kray) in 1990 – 1991, 1994 – 1998, 2000 – 2016, and Republic of Korea in 2011 (Fig. 1). In total the work embraced 125 days of field research in Russia, with 195 km covered en routes as well as 17 days with 17 km, respectively, in Republic of Korea. Relative richness accounting was conducted based on standard methods for linear transects 3 – 5 m wide and 1 – 5 km long (Dinesman and Kaletskaya, 1952).

The part of the southern territory of the Russian Far East within the distribution range of species studied is divided into 4 main zones (forest, light forest, meadow and anthropogenic landscapes). We also separated 13 biotopes according to geobotanic zoning of the Soviet Far East by V. G. Sochava (1968), namely, secondary broad-leaved forests of complex composition, flood plain secondary broad-leaved forests of complex composition, coniferous-broad-leaved forests, flood plain coniferous-broad-leaved forests, flood plain fine-leaved forests, oak grass-shrubby forests combined with low meadows, oak grass-shrubby forests with maple, ash and birch, oak light forest with shrub, sedge-reed, reed grass and mixed grass meadows, fields with reed, grass and willow stand, coniferous-broad-leaved forests on the border with residential facilities, secondary broad-leaved forests of complex

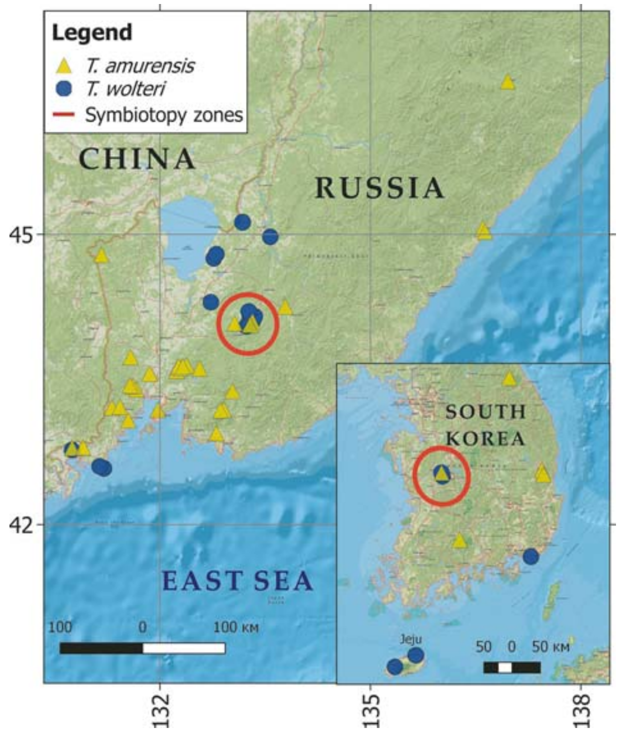

Fig. 1. Map showing the study sites of *T. amurensis* and *T. wolteri*.

composition on the border with clean felling with secondary shrub, and secondary broad-leaved forests of complex composition bordering with agricultural lands.

In Republic of Korea we identified biotope types according to vegetation map by Lautensach (1988) with adjusting to Sochava classification (1968). Eight types of biotopes were considered which showed lizards of genus *Takydromus*, namely: secondary broad-leaved forests of complex composition; coniferous-broad-leaved forests; oak light forest with shrubs; willow sparse mixed-herb thicket with meadows in estuary zone; gramineous-grassy meadows, gramineous-grassy meadows bordering the agricultural lands; coniferous-broad-leaved forest bordering the agricultural lands and coniferous-broad-leaved light forest bordering the clean felling with secondary shrub.

In our work we also applied the following division for anthropogenic regions with respect to human impact level, namely: relatively unchanged, weakly changed, disrupted (greatly changed), transformed or cultivated landscapes (Isachenko, 1980).

Geographical coordinates of localities including the elevation above sea level was identified by GPS-navigator Garmin e-Trex 10, mapping data to coordinate net from references and museum collections was carried out using interactive map Google Earth.

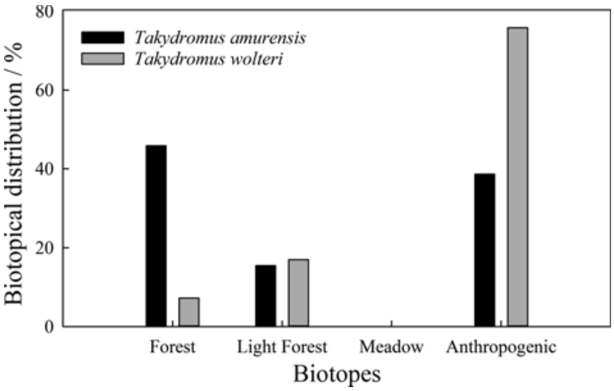

Fig. 2. Biotopical preference of *T. amurensis* and *T. wolteri* on the Russian territory (Primorsky Kray).

RESULTS

In Russia the highest *T. amurensis* occurrence was found for the forest zone, reaching 46% of the total number of individuals all over the zones (Fig. 2). The occurrence ranges from 0.2 to 23.3 ind./km (Table 1), with the maximal variance corresponding to secondary broad-leaved forests of complex composition (from 0.2 to 23.3 ind./km) and the minimal one to flood plain fine-leaved forests (from 0.6 to 3.5 ind./km). Single individuals of *T. wolteri* were found in the forest zone, contributing 7% to the overall occurrence (Fig. 2). They are related to two biotopes as secondary broad-leaved forests and flood plain secondary broad-leaved forests of complex composition (Table 1). Regarding the altitudinal distribution, for *T. amurensis* we observed a considerable range of inhabited altitudes from 46 to 497 m a.s.l., with occasional individuals of *T. wolteri* for this zone collected at 123 to 226 m a.s.l. (Table 2).

The light forests demonstrate occurrence of *T. amurensis* at 15% from total amount, while the amount for *T. wolteri* here constitutes 17% (Fig. 2), which demonstrates nearly equal preference of light forest zone by both species. *T. amurensis* ranges from 0.2 to 3 ind./km and *T. wolteri* — from 0.5 to 11.6 ind./km (Table 1). *T. amurensis* inhabits rather uniformly all types of biotopes in this zone, avoiding only the oak light forests with shrubs. *T. wolteri* shows maximal occurrence variance in oak grass-shrubby forest combined with low meadows (0.7 – 11.6 ind./km, Table 1). However, not a single species under review was registered in the oak grass-shrubby forest with maple, ash and birch. For the light forest zone, the maximal amplitude of altitudinal distribution of the studied lizards is observed. *T. amurensis* was collected in the range 11 – 633 m a.s.l. (Table 2), while altitude association of *T. wolteri* ranges from 14 to 140 m a.s.l.

For the meadows' zone with no trees at all, only single *T. wolteri* was recorded in April 2006, a local citizen found a subadult dead *T. wolteri* on the bank of a channel on rice paddy in Spassk rayon (Maslova, 2006b). Our research in the open spaces (meadows, agricultural lands, wastelands and swampy fragments) revealed neither *T. wolteri* nor *T. amurensis* individuals.

Anthropogenic zone showed 39% of *T. amurensis* from the total amount of the lizard species all over the zones. *T. wolteri* occurrences indicated maximal number

TABLE 1. Occurrence of *T. amurensis* and *T. wolteri* Lizards with Respect to Various Types of Biotopes on the Southern Territory of Russian Far East

Zones	Main types of biotopes	Occurrence (min – max) of *T. amurensis*, ind./km
Forest	Secondary broad-leaved forest of complex composition	0.2 – 23.3
	Coniferous-broad-leaved forest	0.3 – 6.6
	Flood plain Secondary broad-leaved forest of complex composition	0.6 – 3.5
	Flood plain Coniferous-broad-leaved forest	0.5 – 4.5
	Flood fine-leaved forest	0.6
Light forest	Oak grass-shrubby forest combined with low meadows	2.0 – 3.0
	Oak grass-shrubby forest with maple, ash and birch	0.2 – 2
	Oak light forest with shrub	—
Meadow	Sedge-reed, mixed grass	—
Anthropogenic region	Fields with reed, grass and willow stand	—
	Coniferous-broad-leaved forests on the border with residential facilities	1.3 – 5.0
	Secondary broad-leaved forest of complex composition on the border with clean felling with secondary shrub	1.2 – 11.6
	Secondary broad-leaved forest of complex composition on the border with agricultural lands	—

Note. —, the species is absent.

compared to other habitats, reaching 76% (Fig. 2). In anthropogenic region, *T. amurensis* occurrence ranges in the interval of 1.2 – 11.6 ind./km, while *T. wolteri* occurs about 1.2 – 30 ind./km (Table 1).

T. amurensis failed to occur in secondary broad-leaved forests of complex composition bordering the agricultural lands and fields with fragments of reed, grass and willow stand, while *T. wolteri* was not found in coniferous-broad-leaved forest on the border with residential facilities. Altitudinal distribution of studied species in this zone is much the same: *T. amurensis*‘ habitat ranges between 138 – 321 m a.s.l., while *T. wolteri* — 137 – 321 m a.s.l. (Table 2).

Republic of Korea forest zone shows the *T. amurensis* occurrence as equal to 91% against total amount recorded all over the zones (Fig. 3), with the value of this indicator ranging from 1 to 9 ind./km (Table 3). Two forest biotope types, secondary broad-leaved forests of complex composition (1 – 8 ind./km) and coniferous-broad-leaved forests (9 ind./km), have shown similar occurrence values. Altitudinal distribution of *T. amurensis* ranges from 337 to 732 m a.s.l. (Table 2). No species was observed in the light forest region. *T. amurensis* was found in neither meadow zone biotopes. *T. wolteri* showed maximal occurrence of 64% (Fig. 3). The indicator values for *T. wolteri* in the meadow zone ranged from 12 to 16 ind./km (Table 3). The species revealed similar occurrence for two meadow biotopes, willow sparse mixed-herb thicket with meadows in estuarial zone (12 ind./km) and for gramineous-grass meadows (16 ind./km). Vertical distribution of *T. wolteri* in meadow zone is characterized by the range from 4 to 424 m a.s.l. (Table 2). *T. amurensis*‘ occurrence constituted 9% in the anthropogenic zone against total amount of records all over the zones. It was singularly found only for coniferous-broad-leaved light forest bordering clearcuts with secondary shrubs at the altitude of 118 m a.s.l. For *T. wolteri* this indicator reached 36% (Fig. 3). *T. wolteri* occurrence level in the anthropogenic zone was much the same: from

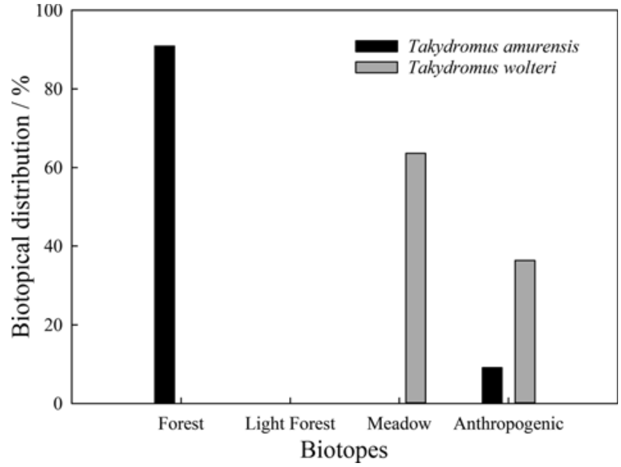

Fig. 3. Biotopical preference of *T. amurensis* and *T. wolteri* on the territory of Republic of Korea.

TABLE 2. Altitudinal Occurrence of *T. amurensis* and *T. wolteri* (in m a.s.l.) on the Southern Territory of Russian Far East (Primorsky Kray) and on the Territory of Republic of Korea

Zones	*T. amurensis*				*T. wolteri*		
	Forest	Light forest	Meadow	Anthropogenic region	Forest	Light forest	Meadow
Russia	46 – 497	11 – 633	—	138 – 321	123 – 226	14 – 140	—
Republic of Korea	337 – 732	—	—	118	—	—	4 – 424

TABLE 3. Occurrence of *T. amurensis* and *T. wolteri* lizards with respect to various types of biotopes on the territory of Republic of Korea.

Zones	Main types of biotopes	Occurrence (min – max), ind./km	
		T. amurensis	*T. wolteri*
Forest	Secondary broad-leaved forest of complex composition	1 – 8	—
	Coniferous-broad-leaved	9	—
Light forest	Oak light forest with shrub	—	—
Meadow	Willow sparse mixed-herb thicket with meadows in estuary zone	—	12
	Gramineous-grass meadows	—	16
Anthropogenic region	Gramineous-grass meadows on the border with agricultural lands	—	4
	Coniferous-broad-leaved forest on the border with agricultural lands	—	6
	Coniferous-broad-leaved light forest on the border with clean felling with secondary shrub	2	6

Note. —, the species is absent

Fig. 4. *Takydromus amurensis* (male). Photo by I. V. Maslova.

4 to 6 ind./km (Table 3). *T. wolteri* altitudinal distribution in the anthropogenic region ranged from 35 to 146 m a.s.l. (Table 2).

Two sites of *T. amurensis* (Fig. 4) and *T. wolteri* (Fig. 5) symbiotopy were also found: one in Russia, and the other in Republic of Korea. The first one was recorded in 2004, in the vicinity of Arseniev City on the territory of Primorsky Kray, while the other was discovered on-site during the expedition work in Gyeryongsan National Park, Chungcheongnam-do province in Republic of Korea. The first site is an open space in the secondary broad-leaved forest of complex composition formed due to partial wood cutting, and complemented with the road crossing it along the south-western slope of Obzornaya Mountain (44°06′54.51″ N 133°20′29.34″ E), with a.s.l. being 321 m (Fig. 6). Isachenko (1980) classified it as related to a weakly changed landscape. The other site is located in the coniferous-broad-leaved light forest, with partial wood cutting and a road passing through it on the north-western slope of mount Gyeryongsan in Gyeryongsan National Park (36°23′37.9″ N 127°14′30.4″ E), being 118 m a.s.l. (Fig. 7). Isachenko (1980) classified it as a weakly changed landscape.

Besides these two sites, we found one more on the Russian territory in Khasan rayon, with both species accessible to observation in close proximity to each other (about 3 km). *T. wolteri* was observed in the secondary broad-leaved forest zone with partial wood cutting (118 m a.s.l.), while *T. amurensis* was found in the secondary broad-leaved forest of complex composition (306 m a.s.l.).

DISCUSSION

Historically, *T. amurensis* and *T. wolteri* possess rather permanent biotopical preference, which makes it possible to refer them to stenotopic reptile species. *T. amurensis* is believed to inhabit only the forest zone, in particular broad-leaved and coniferous-broad-leaved forests, while *T. wolteri* prefers to inhabit forest-free areas, such as meadows, steep river valleys, swamps (Terentjev

Fig. 5. *Takydromus wolteri* (male). Photo by E. Yu. Portnyagina.

and Chernov, 1949; Dixon, 1956; Shannon, 1956; Korotkov, 1974; Bannikov et al., 1977; Laptev et al., 1995; Schlüter, 2003; Lee, 2010). Our investigations in the Korean Republic have shown that *T. amurensis* and *T. wolteri* distribution over open and forest types of biotopes entirely meets the historical presentations on the subject (Dixon, 1956; Shannon, 1956; Lee, 2010). With our field research in the Republic of Korea being limited to one season, the data collected do not enable us to produce reliable assessment of the oriental grass lizards making use of the light forest zone.

When conducting research in the northeastern part of the species habitat under study on the Russian Territory, we duly noted that *T. amurensis* occurs twice less than in Korea. In Russia, this specie prefers light forests. Historically, researchers while studying biotopical preference of oriental grass lizards did not regarded light forests as a separate zone (Terentjev and Chernov, 1949; Bannikov et al., 1977; Korotkov, 1974, 1985; Laptev et al., 1995). We believe such classification is necessary. For territories with rather severe climate light forests are optimal with their convenient places for insolation, hibernation food supply, and plenty of places to hide. Unexpectedly, high percent of *T. amurensis* occurrence was obtained for anthropogenic biotopes (weakly changed and disrupted). Northern border of *T. wolteri* distribution was admitted to provide a wider spectrum of various biotopes than in Korea, including forest ones. *T. wolteri* forest zone occurrence reached 7% (Fig. 2). Previously, isolated *T. wolteri* findings were observed in the forest (Emeljanov, 1923; Strelkov, 1978). Under "forest" Emeljanov (1923) understood oak light forests in Posiet rayon (now Khasan rayon). In his 1978 work, D. G. Strelkov describes *T. wolteri* findings as occurring both in meadow communities, and in broad-leaved forests situated in the Kievka River (Lazo rayon).

Hypothetically, *T. wolteri* demonstrate gradual settlement in the forest biotopes, which is not characteristic of this species, though it takes place. The process can be caused by various factors of anthropogenic and abiotic origin: swamping, annual spring-autumn fires, pesticide treatment, etc., occurring on the territory of meadows, light forests, and other flood plain territories (Maslova, 2006a). Such events can cause migration of *T. wolteri* from its traditional locations such as lowland landscapes to highlands with their rare sparse tree vegetation. The literature provides description of such migration events for other lizard species which were due to abrupt changes of conditions as a result of regular habitats' swamping (Baranov et al., 1976).

In the light forest zone, *T. wolteri* occurrence turned out to be similar to that of *T. amurensis* (Fig. 2). Every species finds optimum zone there, with enough sun light, shelters, hibernation sites, etc. Our research has shown that open spaces where *T. wolteri* was found such as Prikhankaiskaia Lowland, valleys of the rivers Sungacha, Arsenyevka, and Ussuri, are represented not by meadows, but by light forests on hills at 69 – 140 m a.s.l., among open spaces or on their border.

Fig. 6. Symbiotopy zone in Russia. Photo by I. V. Maslova.

Primarily, biotopical shift of *T. wolteri* from meadow zone to light forest in the northern part of its habitat is considered to be related to complicated hibernation in the open spaces under moderate monsoon climate conditions with average annual temperatures ranging from –1°C in the northern part of Primorsky Kray to +7°C in the south (Starozhilov, 2013). In winter, low temperatures and poor snow cover on the plain regions lead to significant and lasting frost into the upper soil levels down to 1 – 1.8 m, while in South Korea average annual temperatures range from +11°C in the northern part to +15°C in the south (Climatebase.ru, 2018), thus creating more convenient habitat for lizards. Next, open meadow spaces in the Russian Far East southern areas have excess wetness and lasting soil cover swamping in summer, when 75% of annual precipitation occurs (Ivanov, 1976; Roslikova et al., 2010). Thus, optimal habitat for *T. wolteri* along the northern range borders is represented by flood-free hills with light forests. For example, such small hills could be found on Prikhankaiskaya Lowland (Gaivoronskaya Hill,

Fig. 7. Symbiotopy zone in Republic of Korea. Photo by E. Yu. Portnyagina.

Orlinaya Hill along the Sungacha River, etc.), which are composed of granite rocks and xerophytic oakery with forming brown soils on them. As a rule, brown soil surface is rather loose, light loamy, highly aggregated, and richly perforated with plant roots (Roslikova et al., 2010), which makes highlands with such soils suitable enough to be inhabited by the studied lizard species.

T. wolteri high occurrence is observed in anthropogenic biotopes (weakly changed and disrupted) both in Russia and in Korea (Figs. 2 and 3). Not unlike *T. amurensis*, this species actively uses forest clearcuts and roads, ETL, rural population centers, and farmlands as habitats. This can be possibly explained by the fact that such biotopes provide a number of advantages to lizards such as open spaces for insolation, new places optimal for wintering, plenty of covers and ample food supply. For example, the work of Theisinger et al. (2015) indicated a population increase of genus Trachylepis lizard which is non-specific to forest in the open spaces emerging due to deforestation. Similar trends with respect to finding species in non-specific habitats are given in other works (Jackson and Teleford, 1975; Lazareva, 2009). For both lizards under study, the above mentioned parameters are of great importance the northeastern part of range with more severe climate their habitat.

In the slightly disrupted landscapes two regions of symbiotopy of *T. amurensis* and *T. wolteri* were found (one in Russia and the other in Republic of Korea). The first site was found in 2004 on the Primorsky territory and had been repeatedly studied for 5 years (Maslova, 2005; Semenishcheva and Maslova, 2013); the second one was revealed in 2011, during our expedition to Republic of Korea. It should be noted that both sites were characterized by similar pattern of weak anthropogenic disruption: partial wood cutting. Mathematical data processing has shown that *T. wolteri* dominated in both zones of mutual coexistence. In Russia, occurrence proportion of *T. amurensis* vs. *T. wolteri* was equal to 2.11

vs. 6.31 (number of counts equals 13) (Semenishcheva and Maslova, 2013). Similar data was obtained for Republic of Korea: 2.0 vs. 6.0 (number of counts equals 1).

Hopefully, further study will make it possible to find other symbiotopy zones of lizards of genus *Takydromus*, e.g., in the foothills of the southern part of Khasan rayon (Russia). To reveal mechanisms of conflict-free coexistence of *T. amurensis* and *T. wolteri* requires further research. Some factors seem to be of importance here, such as a larger number of shelters and richer food supply than can be usually found in natural environment due to heterogeneity of the space transformed by human. The absence of interspecies competition for lizards of genus *Trachylepis* in biotopes impacted by human was highlighted in the work of Theisinger et al. (2015).

T. wolteri is believed to be more ecologically flexible species towards its habitat type. The field research we undertook showed that in Russia both species inhabited lower heights compared with those in Republic of Korea, which could be definitely accounted for by more severe climate in the northeastern part of their area (Fig. 8). Given the comparison with the cited information, the upper limit of *T. amurensis*‘ vertical distribution is significantly higher than the values we had found for both studied territories; nevertheless, the minimal altitude for this lizard was obtained in Russia. Altitudinal range of *T. wolteri* inhabitancy found in Republic of Korea turned out to be wider than that identified in literature and obtained in Russia.

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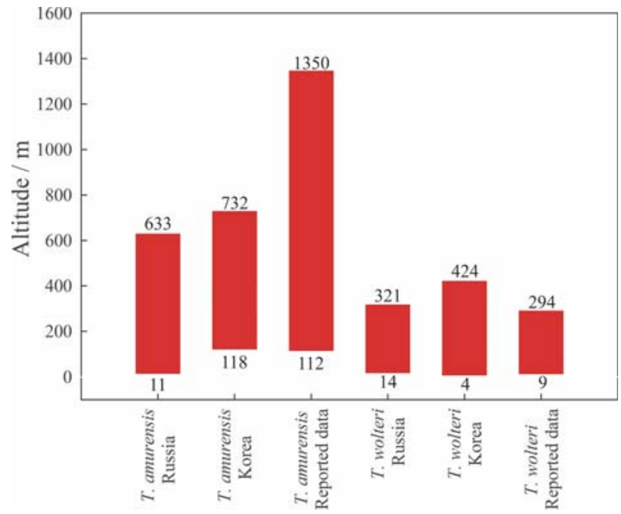

Fig. 8. Comparison of altitudinal distribution of *T. amurensis* and *T. wolteri* on the territory of Russian Far East and Republic of Korea according to our data and the reported one.

REFERENCES

Adnagulov E. V. (2017), “Annotated list of Amphibian and Reptile species of Far East Russia,” *Curr. Stud. Herpetol.*, **17**(3/4), 95 – 123 [in Russian]

Ananjeva N. B., Munkhbayar Kh., Orlov N. L, Orlova V. F., Semenov D. V., and Terbish Kh. (1997), *Amphibians and reptiles of Mongolia. Reptiles of Mongolia. Ser. The Vertebrates of Mongolia*, KMK, Moscow [in Russian].

Ananjeva N. B., Orlov N. L., Khalikov R. G., Darevsky I. S., Ryabov S. A., and Barabanov A. V. (2006), *The reptiles of Northern Eurasia. Faunistica Pensoft Series. No. 47*, Pensoft, Sofia.

Bannikov A. G. (1958), “Data on the fauna and biology of amphibians and reptiles of Mongolia,” *Byull. Mosk. Obshch. Ispyt. Prirody Otd. Biol.*, **68**(2), 71 – 91 [in Russian].

Bannikov A. G., Darevskiy I. S., Ishchenko V. G., Rustamov A. K., and Shcherbak N. N. (1977), *Guide to the amphibians and reptiles of USSR*, Prosveshchenie, Moscow [in Russian].

Borkin L. Ja., Munkhbayar Kh., Orlov N. L., Semenov D. V., and Terbish Kh. (1990), “Distribution of reptiles in Mongolia,” *Tr. Zool. Inst. AN SSSR*, **207**, 22 – 138 [in Russian].

Baranov A. S., Yablokov A. V., Valetskiy A. V., Bakradze M. A., Zharkova V. K., Lukina G. P., Tertyshnikov M. F., and Garanin V. I. (1976), “Population and its dynamics,” in: A. V. Yablokov (ed.), *Sand lizard. Monograph description of the species*, Nauka, Moscow, pp. 303 – 321 [in Russian].

Climatebase.ru (2012), Archive of climatic data, http://climatebase.ru/stations/South_Korea (accessed on January 26, 2018).

Dinesman L. G. and Kaletskaya M. L. (1952), “Methods for quantitative measurements of amphibians and reptiles,” in: A. N. Formozov (ed.), *Methods for Measuring Population and Geographical Distribution of Terrestrial Vertebrates*, Izd. AN SSSR, Moscow, pp. 329 – 341 [in Russian].

Dixon J. R. (1956), “A collection of Amphibians and Reptiles from West Central Korea,” *Herpetologica*, **12**, 50 – 56.

Emeljanov A. A. (1923), “Reptiles and amphibians of Primorye,” in: *Primorye*: *Its nature and economy*, Dal’nevostochnaya goskniga, Vladivostok [in Russian].

Isachenko A. G. (1980), *Optimization of Natural Medium* (*Geographical Aspect*), Nauka, Moscow [in Russian].

Ivanov G. I. (1976), *Soil Formation on the South of Far East*, Nauka, Moscow [in Russian].

Jackson D. R. and Teleford S. R. (1975), “Food habits and predatory role of the japanese Lacertid *Takydromus tachydromoides*,” *Copeia*, **1975**(2), 343 – 351.

Korotkov Yu. M. (1974), “Materials on the ecology of *Tachydromus amurensis* Peters,” *Tr. Inst. Biol. Pedol. DVNTs AN SSSR*, **17**(120), 167 – 171 [in Russian].

Korotkov Yu. M. (1985), *Terrestrial Reptiles of Far East*, Dal’nevostochnoe knizhnoe izd., Vladivostok [in Russian].

Laptev A. A., Makovkin L. I., Medvedev V. N., Sal’kina G. P., and Sundukov Yu. N. (1995), *Cadastral Registry of Terrestrial Vertebrates of Lazo Nature Reserve*, Dal’nauka, Vladivostok [in Russian].

Lautensach H., Dege E., and Dege K. (1988), *Korea*, Springer-Verlag, Berlin.

Lazareva O. G. (2009), “Ecology of viviparous lizard *Lacerta vivipara* of ‘Komsomol’skiy; State Nature Reserve,” *Samar. Luka. Probl. Reg. Glob. Ékol.*, **18**(1), 78 – 85 [in Russian].

Lee S. C. (2010), *Systematic and Ecological Studies of the Suborder Sauria (Reptilia, Squamata) in Korea. Doctoral Thesis*, Graduate School University of Incheon, p. 167 [in Korean].

Luo L., Wu Y., Zhang Z., and Xu X. (2012), “Sexual size dimorphism and female reproduction in the white-striped grass lizard *Takydromus wolteri*,” *Curr. Zool.*, **58**(2), 236 – 243.

Maslova I. V. (2005), “New data on distribution of Mountain grass lizard (*Tachydromus wolteri* Fischer, 1885) in Primorsky Kray and its protection issues,” in: *Proc. of VII Far Eastern Conf. on National Reserve Management*, IVEP FEB RAS, Khabarovsk, pp. 171 – 174 [in Russian].

Maslova I. V. (2006a), “Problems of reservation of rare amphibian and reptile species of Primorsky Kray,” in: *Nature without Borders. Proc. of the I Int. Ecol. Forum. Part 1*, Vladivostok, pp. 113 – 118 [in Russian].

Maslova I. V. (2006b), “Mountain grass lizard — *Tachydromus wolteri* Fischer, 1885. Mountain grass lizard,” in: A. A. Nazarenko (ed.), *Vertebrates of* “*Khankayskiy*” *Nature Reserve and Prikhankaiskaya Lowland*, RIZ Ideya, p. 74 [in Russian].

Maslova I. V. (2016), “The protection of amphibians and reptiles in the Russian Far East,” *Nat. Conserv. Res.*, **1**(3), 26 – 35.

Roslikova V. I., Rybachuk N. A., and Korotkii A. M. (2010), *Soil Atlas of the Russian Far East* (*Prikhankaiskaya lowland*), Dal’nauka, Vladivostok [in Russian].

Schlüter U. (2003), *Die Langschwanzeidechsen der Gattung* Takydromus, *Pflege*, *Zucht und Lebensweise*, Kirschner & Seufer Verlag, Keltern-Weiler.

Semenishcheva E. Yu. and Maslova I. V. (2013), “Biotopical distribution of two species of lizards of genus *Takydromus* in Arseniev neighborhood,” Modern Herpetology: *Problems and Pathways to Their Solutions. Proc. of the First Int. Young Researchers Conf. of Herpetologists of Russia and Neighboring Countries*, 25 – 27 November, St. Petersburg, Zool. Inst. RAS, St. Petersburg, pp. 134 – 136 [in Russian].

Shannon F. A. (1956), “The reptiles and amphibians of Korea,” *Herpetologica*, **12**(1), 22 – 49.

Sochava V. G. (1968), *Vegetation Map of the Amur River Basin*, Main Department of Geodesics and mapping of USSR [in Russian].

Song J.-Y. (2007), “Current Status and Distribution of Reptiles in the Republic of Korea,” *Korean J. Environ. Biol.*, **25**(2), 124 – 138 [in Korean].

Starozhilov V. T. (2013), *Landscape Geography of Primorye* (*Regional-Component Specifics and Space Analysis of Geosystems*), Izd. DVFU, Vladivostok [in Russian].

Strelkov D. G. (1978), “Amphibians and reptiles of Lazo Nature Reserve,” in: *Herpetofauna of Far East and Siberia*, Vladivostok, pp. 27 – 29 [in Russian].

Sun B.-J., Li S.-R., Xu X.-F., Zhao W.-G., Luo L.-G., Ji X., and Du W.-G. (2013), “Different mechanisms lead to convergence of reproductive strategies in two lacertid lizards (*Takydromus wolteri* and *Eremias argus*),” *Oecologia*, **172**, 645 – 652.

Takehana Y., Matsuda Y., Ikuta J., Kryukov A. P., and Sakaizumi M. (2016), “Genetic population structure of the Japanese grass lizard, *Takydromus tachydromoides* (Reptilia: Squamata), inferred from mitochondrial Cytochrome b variations,” *Curr. Herpetol.*, **35**(1), 22 – 32.

Terentjev P. V. and Chernov S. A. (1949), *Guide on Reptiles and Amphibians*, Sovetskaya Nauka, Moscow [in Russian].

Theisinger O. and Ratianarivo M. C. (2015), “Patterns of reptile diversity loss in response to degradation in the spiny forest of southern Madagascar,” *Herpetol. Conserv. Biol.*, **10**, 273 – 283.

Tseng S.-P., Li S.-H., Hsieh C.-H., Wang H.-Y., and Lin S.-M. (2014), “Influence of gene flow on divergence dating — implications for the speciation history of *Takydromus* grass lizards,” *Mol. Ecol.*, **23**, 4770 – 4784.

Uetz P. et al. (2017), *The Reptile Database*, http://www.reptile-database.org (accessed on July 08, 2018).