

Northern border of the distribution of the red-bellied toad (*Bombina bombina*)

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Die nördliche Verbreitungsgrenze der Rotbauchunke (*Bombina bombina*)

Es werden die nördlichen Fundpunkte der Rotbauchunke (*Bombina bombina*) diskutiert. Die wenigen nordwestlichsten Punkte in Schweden und Dänemark sind zersplittert, die meisten davon resultieren auf Aussetzungen oder Wiederansiedlungen. Auf dem Kontinent verläuft die nördliche Verbreitungsgrenze von der Küste Nordostdeutschlands durch Polen und Russland, anschließend durch Nord-Litauen, Süd-Lettland, Weißrussland und Zentral-Russland zum Ural. Die nordöstlichsten Fundpunkte sind aus der Provinz Chelyabinskaya bekannt. Nordöstlichste Populationen erreichen 54–57° N und überlappen mit dem südlichen Teil der Waldzone der Sub-Taiga. Es wird eine Liste und eine Karte der nördlichsten Fundpunkte vorgelegt und diese mit Vegetation und Klimabedingungen diskutiert. Wir machen darüber hinaus Angaben zu Aussetzungen, zu ausgestorbenen Vorkommen und zu Lebensräumen.

Schlüsselbegriffe: Amphibia, Anura, *Bombina bombina*, Verbreitung, Nordgrenze.

Abstract

Northern records of the red-bellied toad (*Bombina bombina*) are discussed. The most north-western populations in Sweden and Denmark are fragmented and scarce, many of them are related to introductions or re-introductions. On the continent, the northern margin runs along the sea shore from north-eastern Germany through Poland and Russia. Then the margin comes to north of Lithuania, south of Latvia, then through Belarus and central Russia to the Urals. The most north-eastern records are known from Chelyabinskaya Province. Northernmost populations reach 54–57° N; the margin is overlapped with the southern part of the subtaiga forest zone. List and map of the northernmost localities of *B. bombina* are given. Correlates of this margin with vegetation and climate are briefly discussed. We provide also data on introductions, extinctions and habitats.

Key words: Amphibia, Anura, *Bombina bombina*, range, northern margin.

Introduction

The red-bellied toad (*Bombina bombina*) is one of widespread European amphibians. A large part of its distribution is positioned in East Europe with a few populations in Asia. The northern parts of the range belong to the Baltic region, northern Belarus and central Russia (GOLLMANN et al. 1997).

In the first half of the 20th century, FEDOROWICZ (1918) reported *B. bombina* as a not rare species in Lithuania though more rare than in Poland near Krakow. Later in the 1980s, this species was considered as a widespread but rare (GAIŽAUSKIENĖ 1981), or as patchy distributed, more scarce in the north and west of the country (GRUODIS 1987). However, these publications were restricted to reports on presence of the species at district level and general statements on status. More accurate data on distribution of *B. bombina*, covering the entire territory of Lithuania were summarized recently in a national atlas (BALČIAUSKAS et al. 1999). In the few years after this publication, new data on the distribution of this species have been collected (IVINSKIS et al. 2004, MALINAUSKAS 2000, NORKŪNAS 2000, OBELEVIČIUS 2000, SIDARAVIČIUS 2004).

In Latvia, *B. bombina* is a rare amphibian, which is protected according to officially approved Conservation Plan for this species (PUPINS & PUPINA 2006a). It was included in the list of protected animals in the Latvian Republic (MINISTRU KABINETS 2000). It has the conservation category 1 in the animal list of the Red Data Book of Latvia (BERZINS 2003). Its distribution remained unclear until recent time. There are several reports on *B. bombina* in Latvia, but all of them have been not confirmed, except for two records: in the area of Bauska Town, Islice Pagasts (»population Bauska«) and in the area of Daugavpils Town, Skrudaliena Pagasts (»population Ilgas«) (ZIRNIS 1980). Therefore, only two populations of this species were certainly known in Latvia until 2004: population Bauska and population Ilgas. These populations have been monitored during a long time (SILINS & LAMSTERS 1934, PUPINS & SKUTE 1992, BARSEVSKIS et al. 2002, PUPINA & PUPINS 2005a, PUPINA 2007). They are small, include about 20 calling males, and tend to decline in size and number of occupying habitats (PUPINA & PUPINS 2005b). This connected with overgrowth of the habitats (both populations) and dispersal of invasive fish species, *Percottus glenii* (population Ilgas).

There are many disjunctions in the range, especially in its Russian part, which are connected mainly with »insular« distribution in the forest-steppe and steppe zones. In general, the range margins in *B. bombina* are not well-known. This concerns especially the northern margin (e. g. GOLLMANN et al. 1997). In regard to this problem, we combined all data on *B. bombina* distribution at its northern limit, from the eastern coast of the Baltic Sea to the Urals.

Materials and Methods

Information for Lithuania was taken from minor faunistic publications, unpublished sources and our own observations. In Latvia, until 2004 there were only two confirmed records of *B. bombina*. To clarify the species distribution there, we conducted narration of local people using specially elaborated methods (see PUPINS & PUPINA 2006b, for details). Upon receiving a report on observation from a respondent, we verified the information in the form of oral interviews with questions on place, type of observation and characters allowed the respondent to identify the red-bellied toad. This verification allowed us to separate a part of erroneous informations. Other data were verified in field conditions. Each record was mapped and described with indication of main habitat parameters (type of water body, vegetation etc.). Data on the

distributions in Latvia and Lithuania were collected most intensively during the last 20 years. Older information, as well as all data for Belarus and Russia, were taken from the Database »Amphibians of the f. USSR« (@0229803415 Russian State Register of Databases). All data were standardized for maps, coordinates were determined with precision of one minute. So each place different from another for at least one minute was considered as a separate locality.

Results and Discussion

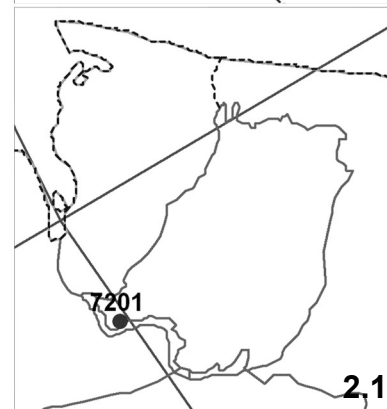
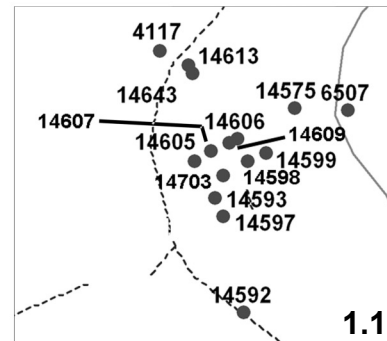
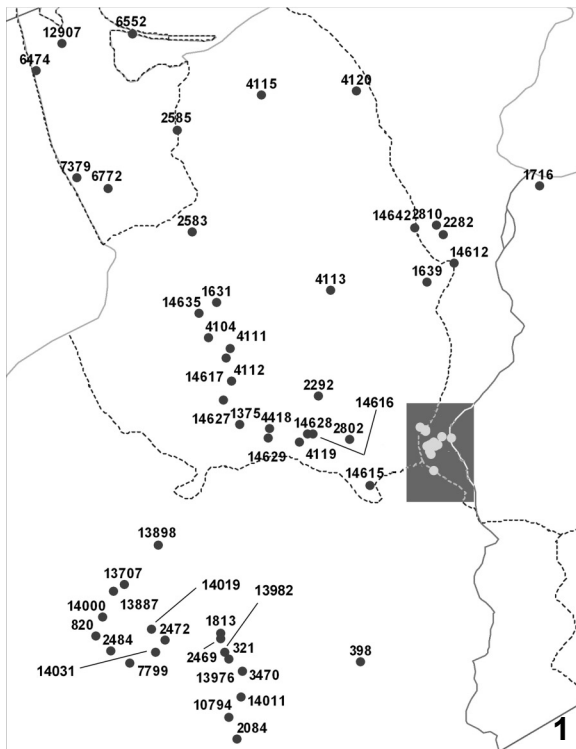
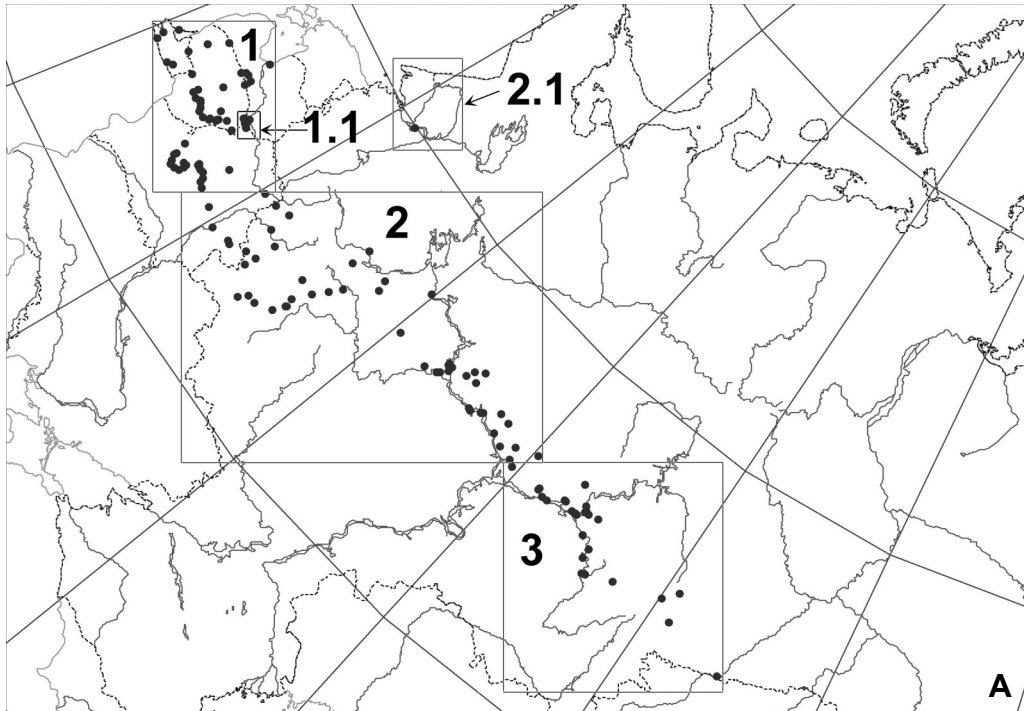
In general, *B. bombina* is known from 1504 localities in the former Soviet Union (data for February 2008). Among them, 146 constitute the northern margin, understood as a line connecting consecutive northernmost known localities (tab. 1). Among all territories, related to the northern part of *B. bombina* distribution, the two Baltic states (Lithuania and Latvia), Belarus and some areas in Russia (Kaluzhskaya, Moskovskaya, Nizhegorodskaya and Chelyabinskaya provinces, Mariy-El, Tatarstan, Udmurtia and Bashkortostan republics) have been explored at the best extent. Other areas are known relatively poorly, and this may cause scarcity of localities. Nevertheless, very large gaps in these areas may be likely explained in terms of real absence of this species, because other amphibian species are known to be more widespread there. General pattern of the northern distribution of *B. bombina* displays relatively dense spatial arrangement of most localities with a few ones distant from others (fig. 1). This is in agreement with general tendency of this species to form isolated populations in northern areas.

Tab. 1: Northernmost localities of *Bombina bombina*.
Die nördlichsten Fundunkte der Rotbauchunke.

| Code in database | Localities | Large administrative-territorial subdivisions | Republic | Last year of observation | Lat., deg. | Lat., min. | Long., deg. | Long., min. | Sources |
|------------------|--|---|-----------|--------------------------|------------|------------|-------------|-------------|-----------------------|
| 9926 | 1 km E of Gorbunovo | Nizhegorodskaya | Russia | 2000 | 56 | 37 | 43 | 34 | PESTOV et al. 2001 |
| 9961 | 2.5 km SE of Deyanovo | Nizhegorodskaya | Russia | 2000 | 56 | 46 | 44 | 28 | PESTOV et al. 2001 |
| 14019 | 3 km E of Zasulie | Minskaya | Belarus | | 53 | 34 | 26 | 53 | DROBENKOV et al. 2006 |
| 10570 | 3 km NW of Vysokaya Gora | Tatarstan | Russia | 2001 | 55 | 56 | 49 | 17 | PAVLOV et al. 2001 |
| 13887 | 3 km W of Radun | Grodnenskaya | Belarus | | 53 | 27 | 26 | 19 | DROBENKOV et al. 2006 |
| 10567 | 4 km E of Tagashur | Tatarstan | Russia | 2001 | 56 | 35 | 50 | 18 | PAVLOV et al. 2001 |
| 9925 | 6 km SE of Gorodets | Nizhegorodskaya | Russia | 2000 | 56 | 37 | 43 | 36 | PESTOV et al. 2001 |
| 10818 | 7 km SW of Gorodets | Nizhegorodskaya | Russia | 2000 | 56 | 35 | 43 | 23 | PESTOV et al. 2002 |
| 14575 | Ainavas | Daugavpils District | Latvia | 2007 | 55 | 50 | 26 | 29 | PUPINA & PUPINS 2007 |
| 14000 | Alba | Minskaya | Belarus | 1984 | 53 | 19 | 26 | 31 | PIKULIK 1985B |
| 9173 | Amzya | Bashkortostan | Russia | 1975 | 56 | 12 | 54 | 23 | GARANIN 2000 |
| 11660 | Angasyak | Bashkortostan | Russia | 2001 | 55 | 38 | 54 | 48 | ZISP 6774 |
| 14628 | Arnionys | Utena County | Lithuania | 2001 | 55 | 3 | 25 | 44 | Our data |
| 14629 | Arvydai | Vilnius County | Lithuania | 2001 | 54 | 49 | 25 | 34 | Our data |
| 6474 | Bagratiyonovsk | Kaliningradskaya | Russia | 1980 | 54 | 26 | 20 | 39 | LITVINCHUK 1996 |
| 826 | Bakov | Mogilevskaya | Belarus | 1984 | 53 | 32 | 31 | 34 | PIKULIK 1985B |
| 2810 | Bauska District not far from border with Lithuania | | Latvia | 1992 | 56 | 25 | 24 | 12 | VILNITIS 1996 |
| 14593 | Behova | Daugavpils District | Latvia | 2007 | 55 | 43 | 26 | 34 | Our data |
| 6937 | Beloberezhskoe Forestry | Bryanskaya | Russia | 1926 | 53 | 14 | 34 | 39 | MELANDER 1937 |
| 398 | Berezinskii Nature Reserve | Vitebskaya | Belarus | 1983 | 54 | 40 | 28 | 20 | PIKULIK 1985A |
| 6319 | Between Eremino and Khomyakovo | Moskovskaya | Russia | 1994 | 56 | 24 | 37 | 58 | KUZMIN et al. 1996 |
| 927 | Birsk | Bashkortostan | Russia | | 55 | 24 | 55 | 31 | TOPORKOVA 1973 |
| 1639 | Biržai | Panevėžys County | Lithuania | | 56 | 12 | 24 | 46 | GAIŽAUSKIENĖ 1970 |
| 6693 | Bolshaya Kokshaga Nature Reserve | Mariy-El | Russia | | 56 | 43 | 47 | 16 | ZABIYAKIN 1998 |
| 11182 | Boltachevo | Tatarstan | Russia | 2001 | 56 | 5 | 52 | 54 | GALEEVA et al. 2002 |
| 14606 | Brivuli | Daugavpils District | Latvia | 2007 | 55 | 46 | 26 | 29 | Our data |

| Code in data-base | Localities | Large administrative-territorial subdivisions | Republic | Last year of observation | Lat, deg. | Lat, min. | Long, deg. | Long, min. | Sources |
|-------------------|--|---|-----------|--------------------------|-----------|-----------|------------|------------|--|
| 3661 | Butysh | Udmurtiya | Russia | 1975 | 56 | 23 | 54 | 0 | GARANIN 2000 |
| 2512 | Cherikov | Mogilevskaya | Belarus | 1984 | 53 | 34 | 31 | 23 | PIKULIK 1985B |
| 2084 | Chervenskii District | Minskaya | Belarus | 1986 | 53 | 42 | 28 | 25 | BAKHAREV et al. 1995 |
| 11123 | Chucha River mouth | Vladimirskaya | Russia | 2001 | 56 | 2 | 42 | 33 | MURGRAF et al. 2002 |
| 6507 | Daugavpils | | Latvia | | 55 | 53 | 26 | 32 | PUPIN & PUPIN 1990 |
| 14643 | Daugavpils District few km from border with Belarus | | Latvia | 1992 | 55 | 45 | 26 | 19 | VILNITIS 1996 |
| 14011 | Dekhan | Minskaya | Belarus | | 53 | 52 | 28 | 1 | DROBENKOV et al. 2006 |
| 14576 | Demenes | | Latvia | 2007 | 55 | 44 | 26 | 32 | PUPINA 2007 |
| 14599 | Dervaniski | Daugavpils District | Latvia | 2007 | 55 | 47 | 26 | 32 | Our data |
| 9610 | Dmitrievskoe | Nizhegorodskaya | Russia | 1999 | 57 | 12 | 45 | 6 | PESTOV et al. 2000 |
| 6935 | Dobrun | Bryanskaya | Russia | 1933 | 53 | 11 | 34 | 13 | MELANDER 1937 |
| 6938 | Dubovitsa | Smolenskaya | Russia | 1925 | 53 | 50 | 32 | 17 | MELANDER 1937 |
| 8303 | Dzerzhinsk | Nizhegorodskaya | Russia | 1999 | 56 | 15 | 43 | 24 | PESTOV et al. 2000 |
| 9958 | Fokino | Nizhegorodskaya | Russia | 2000 | 56 | 10 | 45 | 49 | PESTOV et al. 2001 |
| 1716 | Gauja National Park | | Latvia | | 57 | 8 | 24 | 19 | GRUODIS et al. 1987 |
| 6501 | Glinka | Smolenskaya | Russia | 2004 | 54 | 39 | 32 | 53 | PASTUKHOV V. M. pers. comm. |
| 6772 | Gusev (Gumbinnen, Herzogkirch) | Kaliningradskaya | Russia | 1932 | 54 | 34 | 22 | 12 | PAGAST 1941 |
| 14592 | Ilgas | Daugavpils District | Latvia | 2007 | 55 | 41 | 26 | 47 | Our data |
| 14635 | Išlaužas | Kaunas County | Lithuania | 2001 | 54 | 46 | 23 | 56 | Our data |
| 9261 | Isleitarskoe Forestry, Ilet | Tatarstan | Russia | 1965 | 56 | 17 | 49 | 6 | GARANIN 2000 |
| 924 | Izhevsk | Udmurtia | Russia | 1999 | 56 | 50 | 53 | 12 | BORISOVSKII 1997 |
| 4111 | Kaišiadorys District | Kaunas County | Lithuania | | 54 | 51 | 24 | 27 | GAJŽAUSKIENĖ 1970 |
| 9949 | Kalinikha | Nizhegorodskaya | Russia | 1999 | 56 | 10 | 43 | 16 | PESTOV et al. 2000 |
| 6542 | Kaluzhskie Zaseki Nature Reserve | Kaluzhskaya | Russia | 1997 | 53 | 31 | 35 | 28 | ZAVGORODNII et al. 2001 |
| 925 | Kamarskii District | Udmurtia | Russia | | 56 | 16 | 54 | 11 | TOPORKOVA, 1973 |
| 11661 | Kanly | Bashkortostan | Russia | 2001 | 55 | 6 | 55 | 33 | ZISP 6775 |
| 6997 | Karakulino | Udmurtia | Russia | | 56 | 0 | 53 | 46 | BORISOVSKII 2000 |
| 6932 | Karytino and Iput | Smolenskaya | Russia | | 53 | 36 | 32 | 50 | MELANDER 1937 |
| 914 | Kasinskii Urals | Chelyabinskaya | Russia | | 55 | 55 | 60 | 45 | SABANEEV 1874 |
| 1631 | Kaunas | Kaunas County | Lithuania | | 54 | 54 | 23 | 55 | GAJŽAUSKIENĖ 1981 |
| 9204 | Kokshamary | Mariy-El | Russia | | 56 | 10 | 47 | 46 | GARANIN 2000 |
| 6992 | Kolesnikovo | Udmurtia | Russia | 1999 | 55 | 59 | 53 | 35 | BORISOVSKII 1997 |
| 3470 | Kolodishchi | Minskaya | Belarus | | 53 | 57 | 27 | 47 | DROBENKOV et al. 2006 |
| 4104 | Kruonis | Kaunas County | Lithuania | | 54 | 45 | 24 | 14 | GAJŽAUSKIENĖ 1970 |
| 6552 | Kurshskaya Kosa National park | Kalningradskaya | Russia | | 55 | 7 | 20 | 41 | RYLKOVA O. in litt. |
| 14597 | Laivnieki | Daugavpils District | Latvia | 2007 | 55 | 43 | 26 | 36 | Our data |
| 9206 | Lenino-Kokushkino | Tatarstan | Russia | 1959 | 55 | 49 | 49 | 39 | GARANIN 2000 |
| 2802 | Lithuanian National Park | Utena County | Lithuania | | 55 | 17 | 26 | 0 | BALEVIČIUS 1991 |
| 14031 | Litvyany | Minskaya | Belarus | | 53 | 31 | 27 | 8 | DROBENKOV et al. 2006 |
| 9643 | Lukino | Nizhegorodskaya | Russia | 1999 | 56 | 27 | 43 | 37 | PESTOV et al. 2002 |
| 14692 | Luzhki | Smolenskaya | Russia | 1984 | 55 | 19 | 31 | 10 | KRUGLOV N.D. & PASTUKHOV V.M. in litt. |
| 13898 | Malvi Chapun | Grodnenskaya | Belarus | | 53 | 51 | 26 | 5 | DROBENKOV et al. 2006 |
| 4120 | Mažeikiai | Telšiai County | Lithuania | | 56 | 19 | 22 | 21 | GAJŽAUSKIENĖ 1970 |
| 14616 | Meškerinė | Vilnius County | Lithuania | 2001 | 55 | 5 | 25 | 46 | IVINSKIS et al. 2004 |
| 321 | Minsk | Minskaya | Belarus | 1998 | 53 | 55 | 27 | 35 | NOVITSKII 1999 |
| 4942 | Minyar, Vorobyinye Gory | Chelyabinskaya | Russia | 2003 | 55 | 5 | 57 | 33 | CHIBILEV 2005; http://www.steppe.ru/art/icle329.html |
| 2292 | Molėtai | Vilnius County | Lithuania | 1964 | 55 | 14 | 25 | 24 | GAJŽAUSKIENĖ 1970 |
| 14598 | Morani | Daugavpils District | Latvia | 2007 | 55 | 46 | 26 | 32 | Our data |
| 5182 | Narskie ponds | Moskovskaya | Russia | 1987 | 55 | 35 | 36 | 44 | KUZMIN et al. 1996 |
| 2472 | Negoreloe | Minskaya | Belarus | 1984 | 53 | 36 | 27 | 4 | PIKULIK 1985B |
| 4418 | Nemenčinė | Vilnius County | Lithuania | | 54 | 51 | 25 | 29 | GAJŽAUSKIENĖ 1970 |
| 820 | Nesvizh | Minskaya | Belarus | 1977 | 53 | 13 | 26 | 40 | ZISP 4825 |
| 4820 | Nizhnyaya Kama National Park | Tatarstan | Russia | | 55 | 46 | 52 | 12 | LEONTYEV 2001 |
| 5181 | Osheikino | Moskovskaya | Russia | 1982 | 56 | 15 | 35 | 54 | KUZMIN et al. 1996 |
| 12957 | Otrada | Kaluzhskaya | Russia | 1995 | 53 | 56 | 35 | 46 | ALEKSEEV S. K. pers. comm. |
| 14613 | Ozolaine | Daugavpils District | Latvia | 2007 | 55 | 45 | 26 | 20 | Our data |
| 4119 | Pabradė | Vilnius County | Lithuania | | 54 | 59 | 25 | 46 | GAJŽAUSKIENĖ 1970 |
| 2585 | Pagėgiai (Kr. Pogegen; Berginswalde (früher Wittgirren) 10 km nördlich Tilsit) | | Lithuania | 1938 | 55 | 8 | 21 | 55 | PAGAST 1941 |
| 4113 | Panevėžys District | Panevėžys County | Lithuania | | 55 | 37 | 24 | 21 | GAJŽAUSKIENĖ 1970 |
| 12907 | Penkovoje Lake, Kalinin-grad | Kaliningradskaya | Russia | | 54 | 40 | 20 | 29 | ALEKSANDROVA 2003 |
| 7799 | Pesochnoe | Minskaya | Belarus | 1984 | 53 | 20 | 27 | 6 | PIKULIK M. M. in litt. |

| Code in database | Localities | Large administrative-territorial subdivisions | Republic | Last year of observation | Lat., deg. | Lat., min. | Long., deg. | Long., min. | Sources |
|------------------|--|---|-----------|--------------------------|------------|------------|-------------|-------------|---------------------------------|
| 12916 | Polotnyanyi Zavod | Kaluzhskaya | Russia | 2001 | 54 | 44 | 35 | 59 | ALEKSEEV & ROGULENKO 2003 |
| 6342 | Pripushchaevo | Moskovskaya | Russia | 1990 | 56 | 42 | 37 | 41 | KUZMIN et al. 1996 |
| 14607 | Purmali | Daugavpils District | Latvia | 2007 | 55 | 44 | 26 | 29 | Our data |
| 9681 | Pustynskii Sanctuary | Nizhegorodskaya | Russia | 1999 | 57 | 0 | 44 | 37 | MALAFEEVA & KUZNETSOV 2001 |
| 2469 | Ratomka | Minskaya | Belarus | 1977 | 53 | 56 | 27 | 20 | ZISP 6812 |
| 9661 | Reshetikha | Nizhegorodskaya | Russia | 1999 | 56 | 13 | 43 | 17 | PESTOV et al. 2000 |
| 4115 | Rietavas | Telšiai County | Lithuania | | 55 | 44 | 21 | 56 | GAŽAUSKIENĖ 1970 |
| 2764 | Roslavskii District | Smolenskaya | Russia | | 53 | 58 | 32 | 52 | MELANDER 1935 |
| 14693 | Rudnya | Smolenskaya | Russia | 1984 | 55 | 30 | 31 | 55 | PASTUKHOV & YURCHINSKII 2007 |
| 2583 | Sakiai | Marijampolė County | Lithuania | | 54 | 57 | 23 | 4 | GAŽAUSKIENĖ 1970 |
| 758 | Satino | Kaluzhskaya | Russia | 1998 | 55 | 12 | 36 | 23 | LEONTYEVA O. A. pers. comm. |
| 4239 | Sauzbash | Bashkortostan | Russia | | 56 | 0 | 53 | 52 | BORISOVSKII A. G. in litt. |
| 2497 | Selets | Mogilevskaya | Belarus | 1984 | 53 | 23 | 30 | 24 | PIKULIK 1985B |
| 7201 | Shaldikha, Schlisselburg County | Leningradskaya | Russia | 1879 | 59 | 53 | 31 | 28 | DOROWATOWSKY 1913 |
| 4230 | Sharshada | Tatarstan | Russia | | 56 | 7 | 53 | 0 | BORISOVSKII A. G. in litt. |
| 7025 | Shchedrino | Yaroslavskaia | Russia | | 57 | 33 | 39 | 49 | SHESTAKOV 1926 |
| 9210 | Shiya River mouth | Tatarstan | Russia | | 55 | 50 | 51 | 28 | GARANIN 2000 |
| 1189 | Smolensk | Smolenskaya | Russia | | 54 | 48 | 32 | 2 | EMELIANOV & SHMIDT 1951 |
| 1204 | Sokolnaya Gora | Mariy-El | Russia | 1975 | 56 | 22 | 46 | 32 | GARANIN 2000 |
| 8351 | Southern part of former Chelyabinskii County | Kurganskaya | Russia | | 54 | 25 | 64 | 39 | ZARUDNOI 1896 |
| 14612 | Spulgas | Aizkraukle District | Latvia | 2007 | 56 | 25 | 24 | 42 | Our data |
| 9191 | Starvi Cherkas | Tatarstan | Russia | 1992 | 55 | 53 | 51 | 28 | GARANIN 2000 |
| 14617 | Strošiūnai | Kaunas County | Lithuania | 2001 | 54 | 48 | 24 | 32 | IVINSKIS et al. 2004 |
| 12925 | Sukovka | Kaluzhskaya | Russia | 2002 | 54 | 45 | 35 | 7 | ALEKSEEV & ROGULENKO 2003 |
| 839 | Susha | Mogilevskaya | Belarus | 1925 | 53 | 35 | 29 | 25 | FYADZUSHIN 1928 |
| 9632 | Svetloyar | Nizhegorodskaya | Russia | 1999 | 56 | 49 | 45 | 5 | PESTOV et al. 2000 |
| 14615 | Svirikai | Utena County | Lithuania | 2001 | 55 | 16 | 26 | 35 | IVINSKIS et al. 2004 |
| 7719 | Tanaika | Tatarstan | Russia | | 55 | 44 | 51 | 54 | KHOTKO & GANEEV 1993 |
| 12926 | Techa River mouth and Ugra | Kaluzhskaya | Russia | 1976 | 54 | 40 | 35 | 35 | ALEKSEEV & ROGULENKO 2003 |
| 14500 | Tulovo, Vitebsk | Vitebskaya | Belarus | 2003 | 55 | 12 | 30 | 18 | ZISP 7253 |
| 14642 | Turaidas | Bauska District | Latvia | 2007 | 56 | 17 | 24 | 7 | DEICMANE M. pers. com. |
| 13707 | Turets | Grodnenskaya | Belarus | | 53 | 32 | 26 | 18 | DROBENKOV et al. 2006 |
| 681 | Tver | Tverskaya | Russia | | 56 | 52 | 35 | 55 | GEORGI 1802 |
| 403 | Ufa | Bashkortostan | Russia | 1975 | 54 | 44 | 55 | 58 | GARANIN 2000 |
| 406 | Ufimka River area | Bashkortostan | Russia | | 54 | 47 | 56 | 11 | POLOZHENTSEV & KHANISLAMOV 1942 |
| 929 | Ufimskoe Lake | Chelyabinskaya | Russia | 1967 | 55 | 31 | 60 | 8 | TOPORKOVA 1973 |
| 12911 | Ugra National Park, Zhizdra | Kaluzhskaya | Russia | 1995 | 53 | 55 | 35 | 44 | ZAVGORODNII 1996 |
| 6934 | Uruchie | Bryanskaya | Russia | 1933 | 52 | 55 | 33 | 58 | MELANDER 1937 |
| 1813 | Uruchie, Minsk | Minskaya | Belarus | 1998 | 53 | 57 | 27 | 41 | KHANDOGII 1999 |
| 14627 | Užutrakis | Vilnius County | Lithuania | 2003 | 54 | 40 | 24 | 57 | Our data |
| 9519 | Vasilsursk | Nizhegorodskaya | Russia | 1979 | 56 | 8 | 46 | 0 | PESTOV et al. 2000 |
| 2282 | Vecsaule (Alt-Raden, Kurland) | Bauska District | Latvia | 1893 | 56 | 26 | 24 | 20 | SCHWEDER 1894 |
| 13982 | Vesnyanka, Minsk | Minskaya | Belarus | 1998 | 53 | 55 | 27 | 30 | KHANDOGII 1999 |
| 9202 | Vetluga lower current | Mariy-El | Russia | 1975 | 56 | 19 | 46 | 26 | GARANIN 2000 |
| 4112 | Vievis | Vilnius County | Lithuania | | 54 | 46 | 24 | 48 | GAŽAUSKIENĖ 1970 |
| 1375 | Vilnius | Vilnius County | Lithuania | | 54 | 41 | 25 | 17 | FEDOROWICZ 1918 |
| 2163 | Vladimir | Vladimirskaya | Russia | | 56 | 8 | 40 | 23 | KRASAVTSEV 1938 |
| 10794 | Volma | Minskaya | Belarus | 1999 | 53 | 44 | 28 | 9 | NOVITSKII et al. 2001 |
| 6818 | Western part of Chelyabinskii County | Chelyabinskaya | Russia | | 55 | 2 | 61 | 6 | ZARUDNOY 1896 |
| 950 | Yanaukskii District | Bashkortostan | Russia | | 56 | 17 | 54 | 56 | TOPORKOVA 1973 |
| 1205 | Yoshkar-Ola | Mariy-El | Russia | 1924 | 56 | 39 | 47 | 53 | VESNA 1926 |
| 2484 | Yushevichi | Minskaya | Belarus | 1984 | 53 | 15 | 26 | 53 | PIKULIK 1985B |
| 4117 | Zarasai | Utena County | Lithuania | | 55 | 44 | 26 | 16 | GAŽAUSKIENĖ 1970 |
| 9639 | Zavolzhe | Nizhegorodskaya | Russia | 2000 | 56 | 38 | 43 | 23 | PESTOV et al. 2001 |
| 14605 | Zemgale, Ergli and Lakstīgalas | Daugavpils District | Latvia | 2007 | 55 | 43 | 26 | 29 | Our data |
| 14609 | Zemuri | Daugavpils District | Latvia | 2007 | 55 | 45 | 26 | 29 | Our data |
| 4396 | Bui River mouth | Bashkortostan | Russia | 1962 | 56 | 12 | 54 | 12 | GARANIN 1965 |
| 7379 | Lvovskoe | Kaliningradskaya | Russia | 1955 | 54 | 24 | 21 | 57 | GOLIKOVA 1960 |
| 1201 | Yalchik | Mariy-El | Russia | | 56 | 1 | 48 | 26 | EFREMOV et al. 1984 |



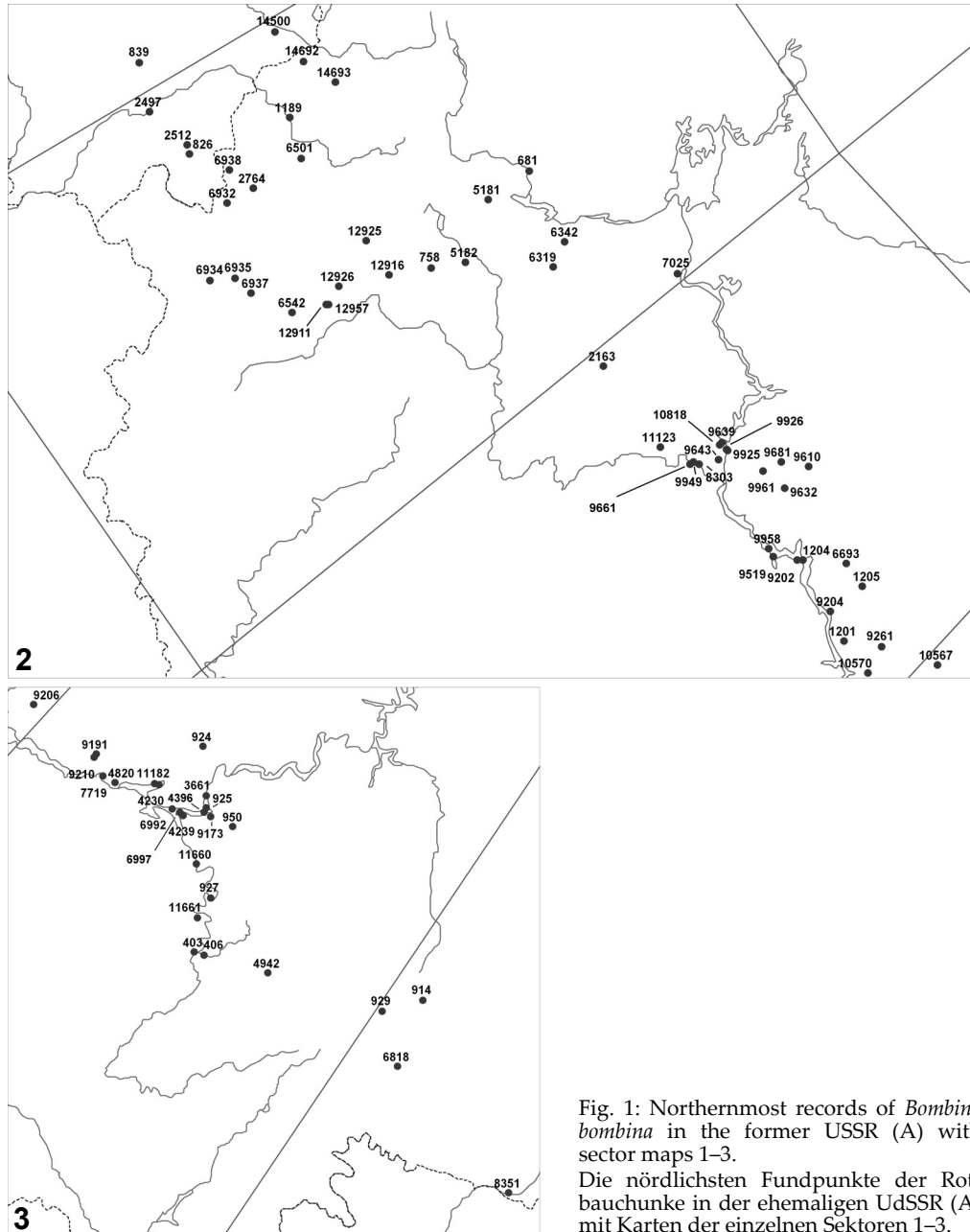


Fig. 1: Northernmost records of *Bombina bombina* in the former USSR (A) with sector maps 1-3.

Die nördlichsten Fundpunkte der Rotbauchunke in der ehemaligen UdSSR (A) mit Karten der einzelnen Sektoren 1-3.

There are some old records of *B. bombina* not confirmed by later surveys. Majority of them are positioned within known range margins (e. g. in Moskovskaya Province of Russia and in Lithuania). In most cases these are connected with anthropogenic factors: alteration of landscape, drainage and pollution of water bodies etc. At the same time, some data may be explained in terms of the species range constriction. In old

works this toad was indicated in some northern localities. In Latvia and Lithuania, these are Gauja National Park (GRUODIS et al. 1987), Vecsaule Settlement (= Alt-Raden im Kurland: SCHWEDER 1894), Pagėgiai District (= Bergenswalde, 10 km N Tilsit, Kr. Pogege: Pagast, 1941). In European Russia, these are Tver Town (GEORGI 1802) and former Schlisselburg County not far from St. Petersburg (DOROWATOWSKY 1913). The last locality is positioned much northwards from all documented records. Nevertheless, it is based on a museum specimen. Much earlier, the red-bellied toad was included in the list of amphibians of Ingria (CEDERHJELM 1793), now a part of St. Petersburg Province of Russia. At present, this species does not live there. Most probably, these were old introductions, rather than catastrophic range constriction (more than 400 km southwards during 100–150 years). Unsuccessful introductions of this species in the area of St. Petersburg were conducted in 1930s (Sergievka Park of Peterhof: MILTO 2007). Since GEORGI'S (1802) time, red-bellied toad was never recorded in Tver or Tverskaya Province, even during recent batrachological survey of its southern districts (E. A. DUNAEV pers. comm.). Thus, the species does not exist there, and the old record belongs either to extinct population, or to mistake. The same concerns an old record from Smolensk Town (EMELIANOV & SHMIDT 1951).

Records on distribution of *B. bombina* in the west of Lithuania (e. g. Mažeikiai, Rietavas: GAIŽAUSKIENĖ 1970) were not confirmed by later studies. In 1999–2000, during the amphibian surveys in Mažeikiai district this species was not found (see MALINAUSKAS 2001). Rietavas *B. bombina* locality has not been confirmed too (see BALČIAUSKAS et al. 1999).

There is a significant gap between the most north-eastern localities in Moskovskaya Province and those in the south of Vladimirskaya and the west of Nizhegorodskaya provinces. This large (more than 250 km) gap contains only two localities (nos. 2163 and 7025), one in Vladimirskaya and one in Yaroslavskaya provinces. These both territories are poorly known in regard to amphibians. Nevertheless, we believe that populations of *B. bombina* there are really scarce: just north to Vladimirskaya, in Ivanovskaya Province, this species is absent, which was demonstrated by detailed batrachological survey (GUSEVA & OKULOVA 1998).

There were indications on *B. bombina* west of the Urals (Permskaya Province: Vorontsov 1949) and east of it (Kaslinskii Urals: SABANEEV 1874, Chelyabinsk County: ZARUDNOI 1896). Recent surveys in Permskaya Province did not provide any specimens (YUSHKOV & VORONOV 1994). All northern records east of the Urals belong to Chelyabinskaya and Kurganskaya provinces of Russia. Data from SABANEEV and ZARUDNOI have not been confirmed. Recent informations are limited by only two specimens caught in the northern part of Chelyabinskaya Province (one specimen per locality: nos. 929 and 4942 in tab. 1). All these data may indicate the current presence of isolated populations and the continuing range constriction at the eastern limit of the species distribution.

What are the correspondences between the northern margin of *B. bombina* and the geographical features? Superposition of the northernmost localities of *B. bombina* on the generally accepted geobotanic map (BELOV et al. 1990) provided following results. Large majority of these localities are positioned southwards outside or in southern part of the subtaiga forest zone: dark-coniferous forests with admixture of broad-leaved



Fig. 2: Habitat of *Bombina bombina* in Ainavas, Latvia. Syntopic species: *Lissotriton vulgaris*, *Rana temporaria*, *R. arvalis*, *Rana esculenta* complex, *Pelobates fuscus*, *Bufo bufo* and *B. viridis*. Photo: M. PUPINS, A. PUPINA.

Lebensraum von *Bombina bombina* in Ainavas, Lettland. Syntop vorkommende Amphibienarten: *Lissotriton vulgaris*, *Rana temporaria*, *R. arvalis*, *Rana esculenta*-Komplex, *Pelobates fuscus*, *Bufo bufo* und *B. viridis*.



Fig. 3: Habitat of *Bombina bombina* in Demenes, Latvia. Syntopic species: *Triturus cristatus*, *Lissotriton vulgaris*, *Rana temporaria*, *R. arvalis*, *Rana esculenta* complex, *Pelobates fuscus*, *Bufo bufo* and *B. viridis*. Photo: M. PUPINS, A. PUPINA.

Lebensraum von *Bombina bombina* in Demenes, Lettland. Syntop vorkommende Amphibienarten: *Triturus cristatus*, *Lissotriton vulgaris*, *Rana temporaria*, *R. arvalis*, *Rana esculenta*-Komplex, *Pelobates fuscus*, *Bufo bufo* und *B. viridis*.

trees (undergrowth and cover of nemorose species) and broad-leaved coniferous forests. Penetration into the forests of these types occurs mainly by open landscapes: agricultural areas and river valleys. The occurrence in the forests with significant representation of coniferous trees seems to be more typical for the northern part of the species range. Southwards, where the toad is more widespread and numerous, it inhabits mainly deciduous forests of different types and herb-grass meadow steppe with fragmented forests and shrub (forest steppe).

In general, the northern margin of *B. bombina* distribution runs between the air isotherms 10 and 12 °C of May (GERASIMOV 1964). This corresponds with the beginning of the reproductive period in northern populations. This period seems to be critical for the species distribution: the toad inhabits shallow, open, usually overgrown water bodies with herbaceous vegetation, well-warmed but not drying ponds.

These features of the geographic distribution correspond to the species abundance. Northern populations of *B. bombina* are small and isolated (PESTOV et al. 2001, MURGRAF et al. 2002, our data). In Latvia and Lithuania, the number of calling males per pond is usually less than ten. Singular specimens per pond are recorded usually in the northernmost populations in Russia. The abundance increases significantly to the south: in some places in Lithuania, this value reaches 100 and more (up to 743); in Belarus this is not a rare species (PIKULIK 1985b); also in the south of Moskovskaya Province, Volga-Kama region etc.

The north-western margin of *B. bombina* distribution is now poorly explicable in terms of natural landscapes and vegetation. Population declines and range constriction was well-documented in these areas: southern Sweden, Denmark and north-eastern Germany (GOLLMANN et al. 1997). These phenomena were superimposed onto natural limitation of the range. The most north-western populations have artificial origin: by introduction (one colony in Surrey, United Kingdom) and reintroduction (south-western Sweden) (KUZMIN et al. 2004). There are 8 natural populations in the eastern and south-eastern part of Denmark. Existence of *B. bombina* in that country has always been limited to the islands east of Jutland (BRIGGS & DAMM 2004). There it inhabits mainly open, grassy, frequently agricultural areas with numerous small ponds. The most north-western population in Germany lives on the Danish Wöhl (A. DREWS in litt.). From there, the western range margin runs southwards over the Elbe river valley (see Bundesamt für Naturschutz/BfN 2007, for map). Then the margin runs along the sea to Lithuania, then to Latvia, then eastwards. Habitats and abundance of *B. bombina* at the north-western limit of distribution are similar with those in other northern areas: small marl pond on open landscapes; populations are small and isolated (A. DREWS in litt.).

Conclusion

The most north-western populations of *B. bombina* occur in southern Sweden and Denmark. They are related mainly to introductions or re-introductions. On the continent, the northern margin of range runs along the sea shore from the Danish Wöhl in north-eastern Germany through Poland and Russia (Kaliningradskaya Province).

Then it runs to north Lithuania (northernmost locality is in Biržai District: ca. 56° 12' N, 24° 46' E, see GAIŽAUSKIENĖ 1970) and Latvia (northernmost locality is Spulgas: 56° 25' N, 24° 42' E) and Belarus (up to Tulovo: 55° 13' N, 30° 20' E). Then the margin runs in Russia: north and center of Smolenskaya (northernmost locality is Rudnya: 55° 30' N, 31° 55' E) and east of Bryanskaya provinces to the center and east of Kaluzhskaya Province (northernmost locality is Sukovka: 54° 35' N, 45° 07' E). Then the margin runs north-eastwards and eastwards to the provinces Moskovskaya (up to Osheikino: 56° 15' N, 35° 54' E), Vladimirskaya, Yaroslavskaya (probably), Nizhegoroskaya (up to Dmitrievskoe: 57° 12' N, 45° 06' E), republics of Mariy-El (up to Bolshaya Kokshaga Nature Reserve: 56° 43' N, 47° 16' E), Tatarstan (4 km E of Tagashur: 56° 35' N, 55° 18' E), Udmurtia (up to Izhevsk: 56° 50' N, 53° 12' E), Bashkortostan (up to Yanaulskii District: 56° 17' N, 54° 56' E), then to Chelyabinskaya Province (Ufimskoe Lake: 55° 31' N, 60° 08' E). The last place is north-easternmost documented locality of *B. bombina*. The northernmost locality is Shchedrino in Yaroslavskaya Province (57° 33' N, 39° 49' E), but the record is old (before year 1926), known by personal communication from E. F. WIGEL (the author: SHESTAKOV 1926, himself did not find *B. bombina* there), and needs verification. The northernmost old records in the area of St. Petersburg most probably belonged to introduced animals.

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