



## The Hyrcanian Chickadee *Poecile hyrcanus* (Zarudnyj & Loudon, 1905), an endemic species of broadleaved forests of Talysh and Elburz mountains<sup>1</sup>

Vladimir Loskot

Department of Ornithology, Zoological Institute, Russian Academy of Sciences, St. Petersburg, RU-199034, Russia; e-mail: otus@zin.ru

**Abstract.** *Poecile hyrcanus* was found specifically distinct and more related to *Poecile songarus* and *Poecile montanus* than to *Poecile lugubris* as once believed. The history of its research was described; age and seasonal variation of plumage coloration were described in detail; measurements were given; the species' geographic and altitudinal distributions were defined. Its habitat, numbers and biology (phenology, vocalization, nests, clutch size, feeding behavior, and diet) were described, mainly on the basis of author's observations made in the Talysh Mountains in 1976.

**Key words.** *Poecile hyrcanus*, distribution, habitats, breeding and feeding behavior, diet, relatives.

### INTRODUCTION

This small *Poecile*<sup>2</sup> with chestnut-brown cap inhabits broadleaved forests in Talysh and Elburz mountains. It was described by Zarudnyj & Loudon (1905) as a subspecies of the Sombre Tit, *Poecile lugubris* (Temminck, 1820), *Parus lugubris hyrcanus*. The bird is very rare in collections and belongs to the least known representatives of its genus and family. In 1976, I was the first to study in detail its life history in the Talysh Mountains, where I collected 12 adult and two juvenile specimens (Loskot 1977, 1978). Plumage coloration, considering age and seasonal variation, and six dimensional characters of males were compared with *Poecile lugubris lugubris* (Temminck, 1820), *Poecile lugubris anatoliae* (Hartert, 1905), *Poecile lugubris dubius* (Hellmayr, 1901), *Poecile songarus songarus* (Severcov, 1873) and *Poecile montanus borealis* (Selys-Longchamps, 1843). It was found that *P. l. hyrcanus* is much smaller than the smallest subspecies of *P. lugubris* (*P. l. dubius* and *P. l. anatoliae*), and that it markedly differs from them in coloration, morphology, habitat, nest construction, song, alarm signal, feeding behavior and diet. The conclusion was made (Loskot 1977) that the Hyrcanian Chickadee, *Parus hyrcanus*, is a distinct species and that its closest relatives are *Poecile songarus* and *Poecile montanus*.

1 urn:lsid:zoobank.org:pub:94D3154F-8B90-485F-BC20-1A050D0D9B38

2 Until recently *Poecile* Kaup, 1829 was generally treated as a subgenus of the genus *Parus* Linnaeus, 1758.

Eck (1980, 1996) studied *Poecile* tits in the Zoological Institute, St. Petersburg (ZIN), but did not agree with my opinion. Based on the similarity of the “tail index” (tail/wing ratio) he downgraded to subspecies of *Poecile lugubris* not only *P. hyrcanus*, but even such a distant and isolated mountain bird as *Poecile davidi* (Berezovskij & Bianki, 1891) from China (Fig. 1). Eck’s opinion was followed in some important surveys and checklists (e.g. Wolters 1980, Cramp & Perrins 1993, Dickinson 2003, del Hoyo et al. 2007). My opinion was accepted by ornithologists in Russia (Stepanân 1990, 2003, Koblik et al. 2006) and also by Harrap & Quinn (1996), who referred to the English translation (Loskot 1982) of my original paper (Loskot 1977). Recently, a molecular study by Johansson et al. (2013) confirmed the species status of *P. hyrcanus* and its close relationships with *P. songarus* and *P. montanus*. The authors of this article referred only to the book by Harrap & Quinn (1996) and did not cite my original papers.

Because very few new data on this *P. hyrcanus* were added in the past 30 years and my relevant papers (Loskot 1977, 1978, 1982, 1987) were published in rare or little known periodicals or proceedings, mainly in Russian, this article summarizing previous and adding new data and illustrations will be of interest.

Museum acronyms: AMNH – American Museum of Natural History, New York, USA; BMNH – Natural History Museum at Tring, United Kingdom; FMNH – Field Museum of Natural History, Chicago, USA; NMNHS – National Museum of Natural History of the Bulgarian Academy of Sciences, Sofia, Bulgaria; NMW – Naturhistorisches Museum, Wien, Austria; TASU – Zoological Museum of the National University of Uzbekistan, Tashkent, Uzbekistan; ZFMK – Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn, Germany; ZIN – Zoological Institute of the Russian Academy of Sciences, St. Petersburg, Russia; ZMB – Museum für Naturkunde, Berlin, Germany; and ZMKU – Zoological Museum, Kiev University, Kiev, Ukraine.

## HISTORY OF THE RESEARCH

The first specimen of the Hyrcanian Chickadee was collected by Blanford (1876) on 13 August 1872 on the northern side of Elburz Mountains, in a forest near Anan, Mazendaran Province, at 1950 m a.s.l. It was a juvenile female in its first fresh autumn plumage, which he referred “with still greater doubt” to *P. lugubris*. The specimen was similar in plumage coloration to the European *P. lugubris*, except of having distinct rufous tint on its belly. In addition, it differed rather significantly from an adult male of *P. lugubris* from Greece<sup>3</sup> and a young male from Smyrna, western Turkey, in having shorter culmen, tarsus and tail, though it had the same wing length. Blanford (1876: 229) concluded: “If these differences be constant, the Caspian race should be separated under a different name; but I do not think it wise to propose one on the strength of a single specimen”. The further fate of this specimen is unknown.

The second specimen of this Chickadee was found by Seebohm (1884) among birds collected in vicinity of Lenkoran, Azerbaijan. Seebohm also determined this specimen as

---

<sup>3</sup> Greece is inhabited by small and pale birds, usually with chestnut-brown cap in summer plumage, often distinguished as a subspecies *Poecile lugubris lugens* (C.L. Brehm, 1855).



Fig. 1. Variation of size and plumage coloration of Chickadees which Eck (1980, 1996) treated as subspecies of *Poecile lugubris*: 1 – *P. l. lugubris*, 29 October 1958, Bulgaria, Vitosha Mountains near Sofia, S. Dončev leg.; 2 – *P. l. dubius*, 8 Juli 1914, Iran, Kurdistan, Germav, P. Nesterov leg.; 3 – *P. l. anatoliae*, 2 May 1974, southern Armenia, near Megri, V. Loskot leg.; 4 – *Poecile hyrcanus*, 24 April 1976, Azerbaijan, Talysh Mountains, 40th km of road Lenkoran – Lerik, V. Loskot leg.; 5 – *Poecile davidi*, October 1886, China, Gansu, Lotani village, M. Berezovskij leg. All skins are kept in ZISP. Photo: V. Loskot, 15 November 2013.





**Fig. 2. Hyrcanian Chickadee *Poecile hyrcanus* in worn, spring plumage., Iran, Mäzendarän Province, Elburz Mountains, Roodbarak village. Photo: B. Andersen, 16 April 2011.**

*P. lugubris* and noted that it agreed with *Poecile* chickadees from Europe and Asia Minor, but not with those described by Blanford (1876) from the vicinity of Shiraz<sup>4</sup>. Seebohm did not mention any rufous feathers on the underparts. I have studied this specimen in BMNH. It is a young male in breeding plumage. It was collected somewhere in the Talysh Mountains, but probably not at “Lankaran”, as inscribed on the label attached to the specimen, because the Hyrcanian Chickadee does not breed in the immediate vicinity of Lenkoran. Before 1966, when nesting of *P. l. anatoliae* was established in southern Armenia (Leonovič et al. 1970), this was the only record of “*Poecile lugubris*” from the territory of the former USSR.

On the basis of the third specimen, probably an adult male obtained by Nikolaj A. Zarudnyj on 19 May 1904 OS [= 1 June 1904 NS] in the vicinity of “Rustum Abad” [= Rostamabad, Gilan Province, Iran], Zarudnyj & Loudon (1905: 76) described a new subspecies *Parus lugubris hyrcanus*. They have indicated that the holotype very much resembles the male of *Poecile lugubris* from Bosnia, but markedly differs in having all belly and lower part of the breast not white, but distinctly rufous.

Hartert (1905: 369) probably did not have original material on *P. l. hyrcanus* at his disposal; he has just repeated the diagnosis by Zarudnyj & Loudon without any changes, but underlined that the subspecies was described already by Blanford.

<sup>4</sup> This is natural, because southwestern Iran is inhabited by another subspecies, *Poecile lugubris dubius* (Hellmayr, 1901).

The next pair, adult male and female, were collected by R. B. Woosnam on 1 May 1905 in an oak forest on the northern slopes of the central part of Elburz Mountains (north of Mount Demavend), at an elevation of 2100 m. Woosnam's collection came to BMNH, where it was studied by Witherby (1910). He identified these birds as *P. l. hyrcanus*, underlining that these specimens have shorter bills and tails than typical *P. lugubris*, and also [*what is very important* – VL] that “the rust-color of the stomach [indicated by the authors of original description of subspecies] is not present in these examples”.

Another young bird in autumnal plumage, which has just finished molting, was found by Zarudnyj & Bilkevič (1913) in a collection of birds made by S. A. Aleksandrov in the eastern parts of Astrabad [now Golestan] Province, Iran. The bird was collected on 24 July 1912 (NS) in the vicinity of “Akh-Imam” [= Ghizilja Agh Imam] on the Gyarm River, left tributary of the Gorgan, about 30 km from its mouth. The fate of this specimen is unknown; Dement'ev (1948) who studied Aleksandrov's collection in 1941-1942, already did not see it.

Walter Koelz collected on 22-23 July 1940 on the northern slopes of eastern Elburz (Dimalu village in the vicinity of Gorgan) five specimens: two adult males, one adult female, one juvenile male and one juvenile female. The Koelz's collection was studied by Vaurie (1950) who compared these birds with *P. lugubris* from Europe and Asia Minor and again noted that breast, belly and flanks were “distinctly tinged with rust, not white, dingy or creamy white” in adult and juvenile birds from Gorgan. He added that crown in adult birds is brown as in European forms (*lugubris* or *lugens*), but less sooty, warmer and richer brown. Vaurie (1959: 484) based his diagnosis of *P. l. hyrcanus* in his *Birds of the Palearctic Fauna* on this difference. It should be emphasized, that all specimens collected by Koelz were molting, and the peculiarities of feather coloration of the underparts mentioned by Vaurie, belonged not to worn summer, but to fresh autumn plumage. Now, one juvenile female of this series is kept in the AMNH, the other four specimens are in FMNH (Chicago).

Thus, among 11 birds of *Poecile lugubris hyrcanus* known before 1960, specimens (three adults and four juveniles) collected at the end of their molt or immediately after it (22 July – 13 August) predominated, i.e. specimens in very fresh autumn plumage. All birds in summer plumage (two adults and a juvenile), excluding the holotype of (sub)species, were kept in the same place, in BMNH.

On 31 January 1962, O.Z. Âcenâ from the ZMKU collected in the vicinity of Kosmol'ân [= Gosmalijion] village in Talysh a Hyrcanian Chickadee (young bird, unsexed). Probably it was a wandering individual, as it was met far from forest, in a small neglected garden (Âcenâ, personal communication). On 7-10 October 1963, Âcenâ collected three more Chickadees near 40<sup>th</sup> km of the road Lenkoran – Lerik at an elevation of 700-800 m; they included an adult male, a female and an unsexed bird. All these birds are kept in ZMKU. Stepanân (1974) studied them, emphasized the morphological distinctness of the form *hyrcanus*, and suggested that it may deserve a species status. However, he left the question open at that time, because of small material at his disposal. Stepanân (1974), considering the available descriptions of *P. l. hyrcanus* (Zarudnyj & Loudon 1905, Vaurie 1950,

1959), described a new subspecies *Parus lugubris talishensis*, which he said differs from *P. l. hyrcanus* in being smaller, in having no rufous color in the central part of breast and belly, and in having flanks less intensively rufous.

## MATERIAL AND METHODS

*Poecile hyrcanus* (21 specimens). Of the above-mentioned specimens I studied three specimens in BMNH, four specimens in ZMKU (including the holotypical female of *P. l. talishensis*; collected on 7 December 1963 at Vizezamin village) as well as birds collected by me: four males, five females, 24-26 April 1976, 40<sup>th</sup> km of road Lenkoran – Lerik<sup>5</sup>; one female, 28 April 1976, one male, one female, one juv. male and one juv. unsexed, 3 June 1976, vicinity of Lerik; all 14 skins in ZIN. Detailed description of young molting female collected by Koelz 22 July 1940 near Dimalu (kindly sent by J. Farrand, AMNH) was also used.

My field observations were made on 19-30 April and 1-3 June 1976 in two main localities: (1) vicinity of Lerik, 1100-1300 m a.s.l., and (2) 40<sup>th</sup> km and vicinity of Vizezamin village (450-800 m a.s.l.).

*Poecile lugubris* (183 specimens). The analysis was performed on bird skins from AMNH, BMNH, NMNHS, NMW, TASU, ZFMK, ZIN, and ZMB. Of the examined specimens 75 belonged to *P. l. lugubris*, 41 to *P. l. anatoliae*, and 4 to *P. l. kirmanensis*.

In addition, I used for comparison 45 *Poecile songarus songarus* and 120 *P. montanus borealis* in the ZIN.

I studied breeding biology of *P. l. anatoliae* on 12 April – 6 June 1974 and 26-27 April 1982 in southern Armenia, in the vicinity of Megri, natural boundary Kaladaš, 1100-1200 m a.s.l. Data on two nests of the Sombre Chickadee *P. l. anatoliae* found in vicinity of Megri on 27 April 1982 are also given.

My tape recordings of alarm calls of *P. hyrcanus* (Lerik, 27 April 1976) and *P. lugubris anatoliae* (Megri, 13 May 1974) were analyzed using an ABS 7029 sound spectrograph.

Transliteration of Cyrillic characters into Latin characters followed the rules of the International Organization for Standardization (ISO 9A: 1995).

## VARIATION IN PLUMAGE COLORATION

Limited number of specimens, which earlier researchers had at their disposal, resulted in mistakes and inaccuracies, especially regarding the rufous color of the underparts. The main source of misunderstandings was the description of *P. l. hyrcanus* by Zarudnyj & Loudoun (1905).

**Holotype of *P. l. hyrcanus*.** This subspecies was described on the basis of a single adult male collected by Zarudnyj on 1 June 1904 (OS) = 13 June 1904 (NS) in the western part of Elburz (Fig. 3, 2). Zarudnyj & Loudoun (1905) compared it with only one male of *P. lugubris lugubris* from Bosnia (coll. Tschusi; date of collection not given). The specimens from Elburz differed in having the posterior part of breast and belly not white, but “deu-

5 Further environs of 40<sup>th</sup> km of road Lenkoran – Lerik will be indicated as 40<sup>th</sup> km.

tlich rostfarbig”, and also in having less developed white edges of the outer webs of the secondaries. Surprisingly, in the diagnosis of the bird in worn summer plumage are given characters (rufous color on the posterior part of breast and belly), which are typical only for birds in very fresh autumnal plumage. This part of the original description resembles astonishingly the description of the color of a young female in very fresh plumage collected by Blanford (1876) on 13 August 1871 near Anan, central Elburz (Fig. 3, 5). In addition to the color of underparts, the data on wing length and tail length agree well with Blanford’s data (here recalculated from inches):

Author	Wing		Tail		Tarsus		Culmen	
	mm	inch	mm	inch	mm	inch	mm	inch
Blanford	71.1	2.8	55.9	2.2	17.8	0.7	10.7	0.42
Zarudnyj & Loudon	71		55		19.2		11.2	

The holotype was never revised; it is absent from TASU, where other types of Zarudnyj are kept; probably it is lost.

Hartert (1905), as mentioned above, paid special attention to the resemblance of the descriptions by Blanford (1876) and Zarudnyj & Loudon (1905) and underlined the priority of Blanford. But he has not paid attention to the descriptions of specimens in different plumages: worn summer and fresh autumn.

Also, systematists did not note that Witherby (1910) mentioned the absence of the rufous color on the underparts in two birds collected on 1 May 1907 (NS) in the central part of Elburz (Fig. 3, 5). Predominance of birds in the fresh autumnal plumage among specimens of *P. hyrcanus* available in museum collections before 1960 resulted in that rufous color on breast and belly was given as the main diagnostic character of birds in worn summer plumage in main surveys on Palearctic birds (Hartert 1905, Vaurie 1959).

The investigation of plumage in birds collected in different seasons of the year, particularly in autumn (7-10 October; 3 specimens), winter (31 January; 1), spring-summer time (22 April-3 June; 17), also descriptions of fresh autumn plumage (22 July-13 August, 6) shows that this species has a common for *Poecile* seasonal and age variation of plumage color (sexual dimorphism absent).

Below I give descriptions of the main plumages of *P. hyrcanus*.

**Adult bird in autumnal (fresh) plumage.** Forehead, crown to lower rim of eye, and nape matt, dark brown, these parts of plumage form a cap with posterior edge noticeably extended on mantle and sharply demarcated from it. Back grey, with yellowish-rusty tint on feather tips; on rump and uppertail-coverts rufous color more intensive. Sides of head and neck white. Chin and throat dull black, forming bib, the posterior third of which is completely covered with white feather tips. In the middle part of bib the white feather tips are rarer and form white specks. Sides of breast brown with rufous tips; flanks and sides of belly intensively rufous; on mid-breast, and mid-belly rufous color is much lighter; under tail-coverts light brown, with rufous tips. Remiges dark brown, with white edge on inner webs; primaries with very narrow whitish, secondaries and their great coverts with wider greyish rufous fringe on outer webs. Underwing-coverts white, with light rufous

Tab. 1. Dimensions of *Poecile tits* (mm).

Species/subspecies	Sex	N	Wing length			Tail length			Tarsus length			Tail/wing ratio				
			M	SD	V	Range	M	SD	V	Range	M	SD	M	SD		
<i>P. hyrcanus</i>	M	10	69.43	0.36	1.6	67.5-71.0	56.73	0.50	2.8	54.9-59.9	17.77	0.09	1.6	17.3-18.1	82.0	0.7
<i>P. lugubris lugubris</i>	M	54	73.92	0.22	2.2	70.2-70.5	64.95	0.31	3.4	60.9-69.8	19.95	0.07	2.7	19.3-21.2	88.0	0.3
<i>P. lugubris anatoliae</i>	M	29	70.99	0.37	2.8	67.5-74.9	61.75	0.39	3.4	57.9-65.8	18.98	0.10	3.0	17.9-20.0	87.0	0.4
<i>P. lugubris dubius</i>	M	25	73.25	0.21	1.4	71.6-75.8	60.39	0.28	2.3	57.8-63.6	19.55	0.12	3.1	18.6-20.8	82.4	0.3
<i>P. songarus songarus</i>	M	25	69.40	0.28	2.0	66.1-71.8	60.02	0.39	3.2	57.1-64.2	18.51	0.09	2.5	17.7-19.3	86.5	0.5
<i>P. montanus borealis</i>	M	70	64.29	0.21	2.8	60.9-69.3	59.45	0.23	3.3	55.6-65.2	16.20	0.05	2.8	15.4-17.9	92.5	0.3
<i>P. hyrcanus</i>	F	10	67.15	0.50	2.3	64.7-69.2	54.41	0.48	2.8	52.9-56.7	17.36	0.15	2.8	16.6-18.3	81.2	0.6
<i>P. lugubris lugubris</i>	F	17	72.29	0.54	3.1	68.8-75.6	62.73	0.67	4.4	57.8-66.2	19.95	0.18	3.8	18.4-20.8	86.8	0.7
<i>P. lugubris anatoliae</i>	F	12	68.87	0.48	2.4	67.2-71.8	61.39	0.54	3.0	58.7-64.8	18.43	0.14	2.6	17.6-19.1	89.1	0.8
<i>P. lugubris dubius</i>	F	16	72.95	0.29	1.6	69.0-73.0	59.74	0.37	2.5	56.1-61.0	19.39	0.11	2.3	18.8-20.0	82.9	0.5
<i>P. songarus songarus</i>	F	20	67.55	0.28	1.9	65.4-69.8	59.15	0.35	2.6	55.6-61.8	17.83	0.10	2.4	17.2-19.0	87.5	0.6
<i>P. montanus borealis</i>	F	50	62.67	0.23	2.6	60.1-67.7	57.77	0.23	2.9	54.3-61.8	15.91	0.07	3.1	15.0-17.2	92.2	0.3

Species/subspecies	Sex	N	Bill length			Bill width				
			M	SD	V	Range	M	SD	V	Range
<i>P. hyrcanus</i>	M	10	8.22	0.16	6.3	7.4-9.1	3.34	0.07	6.3	3.0-3.7
<i>P. lugubris lugubris</i>	M	54	9.77	0.05	3.9	9.0-10.9	4.59	0.04	6.3	4.0-5.3
<i>P. lugubris anatoliae</i>	M	29	9.45	0.12	6.7	8.3-10.7	4.00	0.05	6.7	3.4-4.6
<i>P. lugubris dubius</i>	M	25	9.59	0.07	3.5	8.9-10.4	4.02	0.04	5.2	3.8-4.6
<i>P. songarus songarus</i>	M	25	9.94	0.08	3.9	9.3-10.7	3.27	0.03	5.2	3.0-3.6
<i>P. montanus borealis</i>	M	70	8.12	0.06	5.9	7.2-9.3	3.21	0.03	6.5	2.8-3.8
<i>P. hyrcanus</i>	F	10	7.90	0.07	2.7	7.4-8.1	3.43	0.01	6.4	3.1-3.8
<i>P. lugubris lugubris</i>	F	17	9.76	0.11	4.6	9.2-10.8	4.49	0.08	7.8	3.9-5.1
<i>P. lugubris anatoliae</i>	F	12	9.61	0.16	5.8	8.5-10.3	3.88	0.07	6.4	3.5-4.2
<i>P. lugubris dubius</i>	F	16	9.59	0.11	4.5	8.8-10.4	3.95	0.07	7.1	3.4-4.4
<i>P. songarus songarus</i>	F	20	9.77	0.07	3.3	9.2-10.5	3.21	0.04	6.2	2.9-3.6
<i>P. montanus borealis</i>	F	50	8.20	0.07	6.3	7.0-9.6	3.34	0.03	7.2	2.9-3.8



**Tab. 2. Significance of differences between the dimensions of *Poecile hyrcanus* and other *Poecile* tits. T-test, \*\*\* P < 0.001; \*\* P < 0.01; \* P < 0.05. For primary data see Tab. 1.**

Species/subspecies	Sex	Wing	Tail	Tarsus	Bill		Tail/wing
		Length	Length	Length	Length (nostrils)	Width (feathers)	
<i>P. lugubris lugubris</i>	M	8.31***	11.11***	12.60***	11.15***	13.02***	8.96***
<i>P. lugubris anatoliae</i>	M	2.32*	6.89***	3.84***	5.57***	7.02***	5.68***
<i>P. lugubris dubius</i>	M	9.57***	6.74***	8.86***	9.26***	8.50***	0.61
<i>P. songarus songarus</i>	M	0.06	4.76***	4.71***	10.62***	1.03	5.17***
<i>P. montanus borealis</i>	M	8.92***	4.20***	10.54***	0.61	1.78	13.53***
<i>P. lugubris lugubris</i>	F	6.44***	8.75***	9.81***	12.32***	8.69***	5.60***
<i>P. lugubris anatoliae</i>	F	2.49*	9.48***	5.22***	9.05***	4.39***	7.52***
<i>P. lugubris dubius</i>	F	10.80***	8.85***	11.03***	11.58***	4.91***	2.05
<i>P. songarus songarus</i>	F	0.76	7.90***	2.72*	16.85***	2.72*	6.92***
<i>P. montanus borealis</i>	F	7.85***	5.83***	8.63***	1.79	1.07	14.51***

**Tab. 3. Body mass of *Poecile* tits (g). For t-test see Tab. 2.**

Species/subspecies	sex	N	Mean	SD	Range	t
<i>P. hyrcanus</i>	M	5	14.7	0.36	13.35-15.45	4.88***
<i>P. lugubris anatoliae</i>	M	10	16.53	0.35	14.70-19.00	
<i>P. hyrcanus</i>	F	7	14.64	0.24	13.68-15.75	4.32**
<i>P. lugubris anatoliae</i>	F	4	16.07	0.09	15.92-16.26	

tips. Rectrices dark brown, with narrow, grayish rufous fringe on outer webs; on two outer pairs this fringe lighter, whitish.

Birds have such color in August, soon after the end of autumnal molt. Henceforth abrasion and fading of plumage lead to gradual change of color, first of all, to paling or disappearance of rufous color. Already in the beginning of October it nearly disappeared on mid-breast and mid-belly, which became white. A bird collected in January had plumage intermediate between autumn and spring-summer: cap lighter than in autumn; mantle and back more grey; in central part of breast and belly a great white patch, but their sides still rufous, although intensity of color distinctly decreased.

**Adult bird in spring-summer (worn) plumage** (Figs. 1, 2). In spring (April-May) cap warm chestnut-brown, mantle and back grey, with faint yellowish tint, but ramp is colored brighter, with remnants of rufous color; bib blackish-brown, white specks preserved in its hind third only; breast and belly white, only on sides of breast appeared brown color, and on flanks and sides of belly very pale rufous tint is noticeable; under tail-coverts white or white with brownish tips; remiges with white edges, excluding 2-3 inner secondaries and their great coverts, where they are light grey. Edges are white on outer webs of 2-3 outer pairs of rectrices; on the rest of tail feathers they are narrower and dull, grayish white.

Till molt which begins probably in second half of July plumage color does not change significantly, excluding cap which became light chestnut brown.

**Juvenile bird in nesting plumage** is similar to adult bird in autumn plumage, but feathers of body short and loose; cap dull, brownish black; back darker, grayish-brown with scarcely visible rufous tint. Underparts as in adult bird in spring plumage, but bib is not so black (brownish), hind part of breast and belly white with faint light rufous tint which is more noticeable on flanks and hind part of belly. Remiges and rectrices as in adult bird in autumn, but tops of tail feathers more sharply pointed.

Fledglings which have recently left the nest are similar, though their primaries and rectrices are not fully grown. Probably, color of some parts of plumage changes in them faster than in adult birds. So, in a bird in complete nesting plumage from Seeböhm's collection the cap is already not brownish-black, but dark brown, back and bib less dark, more brownish.

After autumnal molt of small feathers young birds differ from adults only in greater degree of abrasion of tips of remiges and rectrices which did not change in the first autumn.

**Geographical variation** of plumage color was not detected: adult birds in summer plumage from Talysh and Elburz mountains have the same color. The alleged differences in plumage coloration of specimens from Talysh and Elburz are due to seasonal variation. The bird collected in October in Talysh (the holotype of *P. l. talishensis*) was in partly worn plumage, while the birds from Elburz were in fresh autumn plumage. For this reason, *Parus lugubris talishensis* Stepanân, 1974 is junior synonym of *P. lugubris hyrcanus* Zarudnyj & Loudon, 1905 (Loskot 1977).

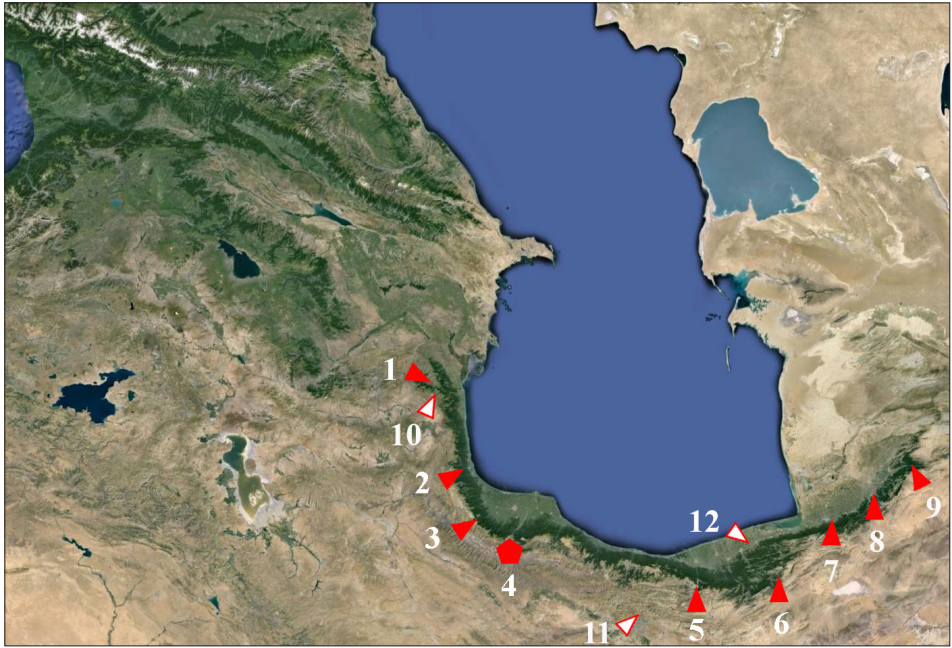
**Dimensions.** Variation of the four traditional linear measurements (length of wing, tail, tarsus, bill from the front edge of the nostril, width of bill at the level of the front edge of the nostril) and "tail index" – the ratio of tail length to wing length was studied. The measurements of four species of *Poecile* are given in Table 1. On the whole, *P. hyrcanus* is evidently smaller than birds from the three subspecies of *P. lugubris* considered. Most distinctly it differs from the nominotypical *P. l. lugubris* (Table 2, for males and females  $P < 0.001$  in all traits), which is most similar in plumage coloration.

The Penrose method (Penrose 1954) for the evaluation of complex traits shows that *P. hyrcanus* differs from the three subspecies of *P. lugubris* more than they differ between each other (for details see Table in Loskot 1977, 1982).

The most suitable trait for identifying of *P. hyrcanus* is the tail length (Table 1). Differences in this trait between *P. hyrcanus* and the larger *P. lugubris*, as well as smaller *P. songarus* and *P. montanus* are highly significant (Table 2).

In spite of small sample the significant differences ( $0.001 < P < 0.01$ ) between *P. hyrcanus* and the smallest subspecies of *P. lugubris*, *P. l. anatoliae*, are established also on the mass of birds collected at the same time of nesting cycle (Table 3).

No significant differences in size between the birds from Talysh (15 specimens) and Elburz (5 specimens) were found (*contra* Stepanân 1974).



**Fig. 3. Distribution of the Hyrcanian Chickadee:**

**Azerbaijan, Talysh Mountains:** 1 – vicinity of Lerik [38°47' N, 48°25' E, 1100 m a.s.l.]; Vizezamin village and 40th km of the road Lenkoran – Lerik [38°47' N, 48°31' E, 500 m a.s.l.] (Loskot 1977, 1978, 1987); 10 – Gosmal'ân village [38° 40' N, 48° 22' E, 1400 m a.s.l.], Diabar Depression (Loskot 1978).

**Iran, Elburz Mountains:** 2 – west of Asalem [37° 47' N, 48° 50' E, about 500 m a.s.l.], Gilän Province; 3 – Masuleh Valley [37° 09' N, 49° 01' E 37, 800-900 m a.s.l.], Gilän Province (Scott 2008); 4 – near Rostamabad, Gilän Province [36°54' N, 49°29' E], type locality (Zarudnyj & Loudon 1905); 5 – Anan, northern slopes of the central part of Elburz [36°06' N, 52°20' E, 1950-2100 m a.s.l.] (Blanford 1876, Witherby 1910); 6 – Roodbarak, Mäzendarän Province [36°03' N, 53°33' E] (B. Andersen, personal communication); 7 – Dimalu, vicinity of Gorgan, Golestän Province [36°48' N, 54°28' E] (Vaurie 1950); 8 – Ghizilja Agh Imam, Golestän Province [37°08' N, 55°12' E] (Zarudnyj & Bilkevič 1913); 9 – Golestän National Park [37° 23' N, 55° 51' E, about 500-1100 m a.s.l.], border between Golestän and Northern Khorosan provinces (Érard & Etchécopar 1970, Scott 2008); 11 – Manzarieh Scout Camp in northern part of Tehran [35° 49' N, 51° 28' E], Tehran Prov.; 12 – Dasht-e Naz Wildlife Refuge [36° 39' N, 53° 12' E], Mäzendarän Province (Scott 2008).

#### DISTRIBUTION

The range of *Poecile hyrcanus* is typical hyrcanian (Fig. 3). Though there is little information on the distribution of the species (see the history of investigation), it all suggests that Hyrcanian Chickadee has not been met beyond borders of Talysh (Azerbaijan) and of Elburz (Iran), inhabiting only middle and upper belts of mountain forests of the Hyrcanian type. The westernmost record is from the Lerik District (Talysh), the easternmost from Golestän National Park, Golestän Province, Iran. The altitudinal limits of nesting

are between 500-2100 m a.s.l. In total, the species area is situated between 36°–39° N and 48°–56° E, in a narrow belt along the southern coast of Caspian Sea with humid subtropical climate.

### HABITAT AND NUMBERS

In 1976, I studied different regions of Talysh; lowland and foothill forests (near Lenkoran); vast area from 37<sup>th</sup> km of road Lenkoran - Lerik (450 m a.s.l.) to the surroundings of Lerik (1300 m); Diabar depression (1300-2100 m); treeline (1500 m) near the Džoni village. Hyrcanian Chickadee was found only in two localities: in the surroundings of 40<sup>th</sup> km and near Lerik, in forests of middle and upper mountain belt. Its nesting here was confirmed at the elevation from 550 m (near the lower border of middle forest mountain belt) to 1250 m (in upper forest belt). In forests of lower mountain belt of Talysh and in the Lenkoran lowlands, the bird was not nesting and has not been recorded even in winter time.

Forests of the middle mountain belt are more light than those of the lower belt; lianas are absent, there is rich undergrowth and a herb layer (Grossheim 1926). Their canopy is dominated by beech (*Fagus orientalis*), hornbeam (*Carpinus betulus*), oak (*Quercus castaneifolia*), and majestic maple (*Acer hyrcanum*). In undergrowth are numerous hawthorn (*Crataegus monogyna*), medlar (*Mespilus caucasica*), quince (*Cydonia oblonga*), dogrose (*Rosa* sp.), also present is holly and on forest glades there are bracken of ferns. Here birds are nesting in more open parts, such as glades, edges or road sides (Fig. 4). The glade may be small, only 0.1-0.2 h, but its presence is an obligatory condition for nesting. Due to this, pairs were distributed unevenly. Distance between them varied from 0.5 to 2.0 km; only in one case, on the forest edge near a hilltop it did not exceed 300 m. Overall, I counted 5 pairs along a 9 km long line near the 40<sup>th</sup> km.

The following species were commonly found breeding near Hyrcanian Chickadees: Coal Tit (*Parus ater gaddi*), Chaffinch (*Fringilla coelebs caucasica*), Great Tit (*Parus major major*), Nuthatch (*Sitta europaea rubiginosa*), and also Red-breasted Flycatcher (*Ficedula parva parva*), Blackbird (*Turdus merula aterrimus*), Song Thrush (*Turdus philomelos philomelos*), Great Spotted Woodpecker (*Dendrocopos major poelzami*) and Green Woodpecker (*Picus viridis viridis*).

In the upper mountain belt, near Lerik, *P. hyrcanus* were found on the northern and eastern slopes, which are intensively grazed with sparse and stunted beech, hornbeam and separate oaks. Between trees whose tops and side branches have usually been lopped for firewood and on the glades there are thickets of hornbeam (*Carpinus schuschaensis*), hawthorn, medlar, cherry-plum (*Prunus cerasifera*), quince, honeysuckle (*Lonicera caucasica*), dogrose and curtains of *Ilex* (Fig. 5). Birds were more numerous here than in middle mountain belt: seven pairs were nesting in a stripe 300 m × 3.0 km, four of which were concentrated near a glade on the territory of 20 h, where the distance between nests was 140, 90, and 230 m, respectively. It seems likely, that the Hyrcanian Chickadee found optimal conditions for nesting in the upper mountain forest near the treeline, where trees are stunted and sparse and bushy thickets alternate with glades.

Common neighbors of the Hyrcanian Chickadee are here as in the middle belt Coal Tit, Chaffinch, Great Tit and Great Spotted Woodpecker, to which Redstart (*Phoenicurus phoenicurus samamisticus*), Dunnock (*Prunella modularis obscura*), and Tree Pipit (*Anthus trivialis trivialis*) are added.

In central Elburz this bird was recorded up to higher altitudes than in Talysh: in autumn and in breeding time birds were collected on the altitude of 2000-2100 m (Blanford 1876, Witherby 1910). Bjorn Andersen (in litt.) has met a nesting pair in the eastern part of Central Elburz also near treeline (Fig. 6).

Eastern subspecies of *P. lugubris* (*anatoliae*, *dubius* and *kirmanensis*) inhabit quite different habitats, mainly arid open forests with *Juniperus*, most xerophilous type of the mountain light woodlands in eastern Turkey, southern Armenia (Fig. 7) and western Iran.

## NESTING

In Talysh, in the twenties of April, the females from all pairs found in the middle mountain belt (550-800 m) were already hatching fresh clutches, whereas in the upper belt (1150-1250 m) the birds were excavating holes (three pairs), building nests (two pairs) or females were laying eggs (two pairs). Thus, the difference in height in 300-500 m causes a shift of the nesting time by two or three weeks. Breeding apparently begins in mid-March in the middle mountain belt, and in the beginning of April in the upper belt.

All 11 nests were situated in holes excavated by birds themselves (Fig. 8). In this respect, *P. hyrcanus* differs markedly from *P. lugubris*, for which nesting is known only in natural holes or in crevices between rocks, and makes it similar to other representatives of the genus *Poecile*, first of all, to *P. songarus* (Kovšar 1976) and *P. montanus*, which are nesting chiefly in holes constructed by birds themselves.

Rotted parts of stem and branches of a dry (four nests) or live (three) trees often with a top broken off or cut off (five), and also stumps (four) were used for nesting. The most suitable parts were those, where the wood was already soft enough, but still did not disintegrate to dust when excavated. Species of tree is evidently of secondary importance: four nests were situated in beeches and hornbeams, two in oaks, and one in a maple. Most nests were built in apical part of the stem or stump (nine), and the entrance was situated 18.8 cm (7.5-37.5 mm) from their upper edge; in one case in the butt-end part of a cut reclined branch. Only two nests were built in the lower third of trees; those exemptions were situated 11 m above ground in a 35-meters tall maple and 3.6 m above ground in a 14-meters high hornbeam. In total (11 nests) the entrance was situated at a height of 4.5 m (0.73 – 11 m), and thickness of stem or stump on the level of nest varied from 18 to 100 cm (mean 43.6 cm). During the repeated nesting (from two pairs a ready nest and a fresh clutch were taken) the height of nesting has increased from 0.8 m to 5.5 m above ground, and from 3 m to 11.0 m above ground. The northern orientation of the entrance prevailed (six nests), two entrances were oriented to the south, and one each to the east, north-east and south-east, respectively. All found nests, including repeated ones, were situated in new holes. Excavation of hole was made by male and female, continuously replacing each other. If the flying in bird found in hole its partner, it waited for him or her



near the entrance. The birds took out from the hole in bill pieces of wood (up to 1.5 cm<sup>3</sup>), set with on a tree 7-12 m, sometimes 25 m far from nest. Here the bird pressed the piece to a branch and crushed it by 2-3 blows of bill. In this manner no trace of building remained near the hole. Birds excavated mainly in the first half of day; in cold or rainy days the building stopped. Observations made on 22 April from 10 to 11 o'clock showed that during this hour the pair was feeding three times (for 5, 7, and 7 minutes, respectively); 34 minutes (5, 10, 8, and 11 min.) were spent excavating the hole, and 118-times (10, 30, 38, and 40-times per series) they took out wood pieces. Two times male was flying to feed a bit earlier than the female, and she alone took out wood pieces 9-times; the remaining seven minutes were spent for clearing plumage and for flights to feeding places.

Excavating a hole took five and seven days in two pairs, by a third pair which was nesting in a beech stump with dense wood needed over two weeks to make the hole; in cases of repeated nesting it took probably not more than three-four days to excavate the hole.

The finished hole has a retort-like shape typical for *Poecile* chickadees: a widening passage comes from the entrance, at the beginning (3-5 cm) nearly horizontal, then steeply going down to the nest chamber (Fig. 9). Depending on the disposition of soft layers of the wood the nest chamber sometimes is found to be not directly under entrance but on the side of it. The entrance is round or oval; in the former case (n = 7) its diameter = 3.3 cm (3.0-3.8), in the second case: 2.9 x 3.2 cm, 2.5 x 4.3 cm, 3.8 x 4.2 cm. Dimensions of the holes (n = 7): overall depth = 21.6 cm (14.5-27.5), height of nest chamber = 12.7 cm (8.7-16.5), its diameter (equal to diameter of the nest) = 7.3 cm (6.8-8.2), in one case 6.4 x 7.5 cm.

In both pairs which were under observation, nests were built by females only; one of them finished the building in six days, the other one needed more than one week to do this. The nest is cup-shaped. Its base it composed of wide (3.0-4.0, sometimes 6.0-7.5 mm) and coarse strips of wood-lime torn away by birds themselves interweaved with wool and down of rodents or domestic animals (cows, sheep), and also plant down (leaflets of Asteraceae are common). Nearer to the cup strips become thinner and more tender; the cup is covered with thread-like plant fibers, plant and animal down. Sometimes, several (3-5) small feathers of the Chickadees themselves are present on its edges. Despite of general similarity of building materials, all three nests examined in the upper mountain belt looked more heated owing to cover of down and wool of animals by comparison with the three nests from the middle mountain belt, in which plant materials sharply predominate (Fig. 10, 1,2). It should be noted that all nests of *P. hyrcanus* were built without green moss typical of nests of many tit species, including those of *P. lugubris* (Baedeker 1858, Leonovič et al. 1970, Loskot unpublished data). Nests of *P. lugubris* differ sharply in complete absence of wood-lime strips (Fig. 10, 3).

Dimensions of nests (n = 6) are as follows: diameter of nest is equal to diameter of nest-hole (see dimensions of holes); diameter of cup 5.2 cm (4.6-6.0 cm); depth of cup 3.6 cm (3.0-4.3 cm); height of nest 5.6 cm (4.8-6.3 cm); minimum thickness of walls 0.9 cm (0.4-1.2 cm); maximum thickness of walls 2.2 cm (1.8-3.2 cm).

**Tab. 4. Dimensions and mass of fresh eggs of *Poecile* tits.**

Species/subspecies	N	Dimensions (mm)			Mass (g)	
		Mean	Max.	Min.	Mean	Range
<i>P. hyrcanus</i>	30 (5 clutches)	16.9 x 12.8	18.1 x 12.4 17.0 x 13.3	16.0 x 12.8 17.0 x 12.2	1.40	1.21–1.53
<i>P. lugubris anatoliae</i>	19 (3 clutches)	18.0 x 13.8	19.0 x 13.6 18.2 x 14.2	17.1 x 13.8 18.3 x 13.0	1.77	1.64–1.93

Many hours of observations in the upper mountain belt showed that male and female almost always stuck close together in the course of nest building and egg laying. Most part of time they moved slowly through their territory, being 2-3 m, rarely 5 m from each other, inspecting shrubs and lower branches of trees in the search of food. Birds usually kept on small height (up to 1.5-2 m) and often flew down to the ground, where they collected insects in the low grass. In dense shrubs they often produced quiet call signal sounding as “*tsi-tsi*” or “*tsi-tsi-tsi*”. In addition, female gave often quiet begging-calls (“*che-ka-di*”), (“*che-ka-di-tsi-tsi*”) and shivered by wings cadging food from male and he usually fed the female in response. But sometimes the feeding close by birds during 5-7 min. did not produce a sound.

When partners lost each other or were worried, a very distinctive contact-alarm signal was heard sounding as an abrupt, several times repeated “*chev*” (Fig. 11, A). This signal of *P. hyrcanus* differs sharply from a deep, chattering “*tâerrerr*” alarm call of *P. l. anatoliae* (Fig. 11, B). In condition of extreme excitement (Cuckoo in the nesting territory, observer near nest) frequency of signals sharply increased, and sometimes a new brief element “*tiv*” appeared: “*chev*”- “*chev*” - “*tiv*”, “*chev*”- “*chev*” - “*tiv*”- “*tiv*”. When a Sparrowhawk (*Accipiter nisus*) flew nearby, the female has hidden herself deep in a shrub and reacted with quiet attenuated “*tsiiii*”.

As a whole, vocal communication plays a very important role in the life of this species, as in other tits and chickadees, but *P. hyrcanus* belongs undoubtedly to the most silent representatives of these genera. Even in the first stages of the nesting cycle loud demonstrative song of the male sounded very rarely, less than one-times per hour. The male usually went to the top of a shrub or tree, where he sung for 1-2 min., with brief (3-7 sec.) pauses between songs. Sometimes, neighbor males sung in answer, but soon all birds stopped singing for a long time. The song of *P. hyrcanus* consists of clear, slightly attenuated “*tiu*”, which is repeated 3-5 times. As was already mentioned (Loskot 1977, 1978), it is very similar to the song of *P. songarus* and *P. montanus*, but differs well from the song of *P. l. lugubris* (Löhrl 1966) and *P. l. anatoliae* (my observations).

In addition to the common demonstrative song, I once succeeded to hear a very peculiar song by a male caused by short territorial conflict with a neighboring pair. All four chickadees were very excited for approximately two minutes and flattered quickly one after another in shrubs, often producing alarm call (“*chev-chev*”). After that, the neighboring pair flew away, and the remaining male went to the top of a shrub and sung hastily

about 10 times a song, of which the first two overflowing elements are difficult to describe and the third was like a nasal “vzhiii” of a Greenfinch (*Carduelis chloris*).

In spite of that chickadees were moving widely through their territories in search of food and nest material, the described conflict was the sole recorded during my observations. Pairs nesting in neighborhood probably know the borders of their territories well and cross them rarely. Near Lerik, where four nests were situated nearly on the straight line, only the two inner territories had a distinctly limited width (90 and 110 m, respectively), but not depth (birds were observed up to 350 m far from their nests). But in all cases, including isolated nesting events, chickadees spent most of the time near their nests, usually not going more than 120-150 m from it. No single birds were recorded in the territories with breeding pairs.

Copulation was observed once, on 28 April at 12:30, about three days before nest building was finished. Shortly before it, the male was sitting on a horizontal branch of a hawthorn, 1.8 m above ground. The female was 5 m from him; she continuously shivered with wings and produced quiet sounds (“*tsi- tsi- tsi*”). Suddenly, the male spread his tail and wings and trembling with them so fast that their tips formed a complete washed away aureola around his body, began to jump on the branch. This dance lasted for about 1.5 min. and was accompanied by very high and frequent calls (“*tsi- tsi- tsi*”). Thereafter the female flew to the male and assumed a horizontal pose, continuing to produce the same calls and shivering with wings. Movements of the male even accelerated, and after 0.5 min. a single copulation occurred, after which the birds flew away.

After beginning of nest weaving (in one case, at the second day) female stayed in the hole for a night. She did not fly out of the hole even when one tapped on the stem, and when disturbed, she hissed menacingly.

Two females laid the first egg one day after the nest construction was finished; one female several times brought down in the hole even after she started laying. In the middle mountain belt, the first egg was laid on 14, 15 and 17 April in three nests (calculated data), in the upper mountain belt on 22, 25 and 30 April and twice in the early May in five nests.

Complete clutches consisted of five (2 nests), six (1 nest) or seven (2 nests) eggs; a repeated clutch consisted of four eggs. The shape and color of 30 eggs (from 5 clutches) was rather variable. The shape was usually sharp-oval or shortened sharp-oval, but shortened oval (three), elliptical (one) and elongated elliptical (three) eggs were also found. The color pattern was similar to that in other tits: white with sparse or very sparse superficial reddish-brown small specks and spots (up to 2.5 mm<sup>2</sup>) which were concentrated on the broad (rarely on the sharp) pole, where they sometimes formed illegible aureola. Egg-shell is not glossy (Fig. 10). The eggs (Tab. 4) are considerably smaller than those *P. lugubris anatoliae*.

Female spent only nights in the hole until the last egg was laid; then they began to hatch. From this moment, males ceased to sing; they spent most of the time far from the nest, but every 25-40 min. (interval increased as the hatch advanced) they appeared at the hole with food in bill (usually 2-4 caterpillars) and produced several (3-7) times the common contact-alarm signal, which was in this situation contact call (“*chev*”). Female flew

out of the hole, quite often produced two-three times the same signal (“*chev*”), consumed the food, and then both birds flew away to feed in tree crowns or shrub thickets. In one case, when female did not leave the nest for a long time, the male flew to the entrance of the hole and produced special signal (high “*tsi-tsi-tsi*”), after which the female flew out of the hole. Birds usually returned from the feeding excursion after 5-7 min., the female sat again on the eggs, and male flew away. All females collected during the first week of hatch had visible reserves of fat on the neck, shoulders, body sides, rump and thighs, and also at the base of feathers of dorsal and ventral pterilae; all four males collected during this time were gaunt.

The hatching time was not established exactly, but it probably does not exceed 13-14 days, because I found four nestlings about 8-9 old 33 days after a repeated nesting started in a new hole.

Nestlings are fed by both adult birds; on 3 June, in the environs of Lerik, the parents brought to the above-mentioned four nestlings food 21-times in an hour. In doing so, chickadees did not pay attention to Redstarts and Rosefinches (*Carpodacus erythrinus kubanensis*), who often sung on the top of a dry tree 1.5 m from the hole entrance. But when a Great Tit which was nesting nearby sat on the same tree top, the male who arrived with food decided not to go in the hole, although he did not show other signs of worry. The appearance of Great Spotted Woodpeckers or Jays (*Garrulus glandarius hyrcanus*) caused great alarm of the partners.

On the same day in an adjacent territory a brood of six fledglings which have recently left the hole (their primaries and rectrices were 5-6 mm shorter than in adult birds) was met. The juveniles kept on the distance 80 m from nest in cherry-plum and hawthorn thickets near a large glade and moved in shrubs as quickly as adult birds. They nearly continuously produced silent food call (“*che-ka-di*”), whereby they maintained the communication with their parents and among themselves.

Other data on post-breeding life of this chickadee are absent. Adult birds are probably sedentary. Âcenâ (personal comm.) has met them in October in the same localities near the village of Vizezamin as the author. Young chickadees are more mobile: as mentioned above, a single bird was collected by Âcenâ in Diabar Depression, far from the nearest forest.

## FOOD

In tall broadleaved forests of the middle mountain belt chickadees fed mainly in canopies of trees; closer to the ground they could be seen only in shrubs on forest edges and in glades. In sparse forests of the upper mountain belt the birds usually searched for prey in numerous shrubberies and only rarely went to the canopies of trees. Ways for searching for the food were similar to those of the Coal Tit or Blue Tit (*Parus coeruleus*). The chickadees carefully inspected mainly thin branches of trees and shrubs, without giving much attention to thick branches and stems. In the glades they readily went down to the ground, but after catching a prey, they flew with it to the nearest branch, where they ate it in small pieces pressing it to the branch with a leg.

The results of analysis of contents of 14 stomachs of the *P. hyrcanus* collected in April and June are as follows: Insecta (159<sup>6</sup>; 100.0<sup>7</sup>); Odonata, Coenagrionidae (1; 7.1); Homoptera, Diaspididae (20; 42.9); Heteroptera, Pentatomidae, eggs (4; 7.1); Coleoptera (31; 92.9); Scarabaeidae (22; 85.7); Rhizotroginae (20; 85.7), *Hoplia* sp. (2; 14.3); Curculionidae (9; 50.0), *Otiorynchus* sp. (2; 14.3), *Phyllobius* sp. (4; 14.3), *Sitona* sp. (2; 14.3), *Apion* sp. (1; 7.1); Neuroptera, Myrmeleontidae, imagines (3; 21.4); Hymenoptera (3; 14.3), Formicidae (1; 7.1), Siricidae (2; 7.1); Diptera, Tipulidae (6; 21.4); Lepidoptera, caterpillars (91; 85.7), Yponomeutidae (40; 71.5), Geometridae (4; 21.4), Lasiocampidae (7; 7.1), Lymantriidae (4; 14.3), Noctuidae (4; 14.3), Arctiidae (1; 7.1), Nymphalidae (3; 14.3), Pieridae (28; 71.5); Mollusca, Gastropoda, Helicellidae, *Helicella* sp. (2; 14.3); seeds of Fabaceae (10; 7.1); anthers of Rosaceae (> 600; 35.7); gastroliths (4; 7.1).

The diet of the birds was predominantly formed by insects in this period, seldom also mollusks and seeds were eaten. Among insects, caterpillars, especially those of Yponomeutidae and Pieridae, prevailed both in absolute numbers and in volume; also beetles were commonly eaten. Three-quarters of a stomach were full of seeds of the Fabaceae; many anthers of Rosaceae were found in five others stomachs, but they apparently got into stomachs together with insects caught by the birds on flowers. In the beginning of June, during mass flights of crane-flies (Tipulidae), chickadees brought them to nestlings.

The following prey items were found in 11 stomachs of *P. l. anatoliae* collected in southern Transcaucasia in April-June: Crustacea, Isopoda, Oniscidae (1; 9.1); Arachnoidea, Aranei (3; 27.3), Gnaphosidae (2; 18.2), Araneidae (1; 9.1); Insecta (178; 100.0); Orthoptera (4; 27.3), Gryllidae (1; 9.1), Gryllotalpidae, *Gryllotalpa unispina* Sauss. (1; 9.1), Acrididae (2; 18.2); Homoptera (36; 27.3), Aphididae (32; 18.2), Coccidae (4; 9.1); Hemiptera (4; 36.4); Reduviidae (1; 9.1); Coleoptera (16; 27.2), larva (1; 9.1), Trogidae, *Trox* sp. (1; 9.1), Scarabaeidae (9; 63.6), larvae (2; 18.2), *Onthophagus* sp. (1; 9.1), *Onitis* sp. (2; 9.1), *Amphicoma arctos* Pall. (4; 36.4), Elateridae (2, 18.2), larva (1; 9.1), Chrysomelidae *Chrysomela staphylea* L. (1; 9.1), Attelabidae, *Rhynchites auratus* Scop. (1; 9.1), Curculionidae, *Sitona* sp. (1; 9.1); Neuroptera, Myrmeleontidae, *Palpares libelluloides* L. (3; 27.3); Hymenoptera (57; 72.7), Ichneumonidae (4; 9.1), Tenthredinidae (4; 36.4), Formicidae (43; 45.4), pupae (31; 27.3), imagos (12; 36.4), Vespidae (1; 9.1); Diptera (7; 27.3), Limoniidae (5; 9.1), Muscidae (1; 9.1), Sarcophagidae (1; 9.1); Lepidoptera, caterpillars (51; 90.9), Geometridae (36; 63.6), Noctuidae (1; 9.1), Arctiidae (2; 9.1), Pieridae (3; 9.1), Lycaenidae (9; 18.2); Mollusca, Gastropoda, Helicellidae, *Helicella* sp. (5; 18.2).

The given data show that in contrast to *P. hyrcanus*, in spring-summer ration of *P. l. anatoliae*, besides caterpillars, considerable part was occupied by ants (pupae and imagines) and aphids, also larvae of beetles, orthopterans, and wood-lice could be met. These differences, first of all, are associated with that Sombre Chickadee considerably more often than Hyrcanian Chickadee is feeding on the earth.

6 Number of food items identified by the late A.A. Petrusenko.

7 Occurrence (number of stomachs where the given object of food was found, %).



## CONCLUDING REMARKS

This study of the variation of morphological characters and of details of the life history shows that the Hyrcanian Chickadee is a full species, *Poecile hyrcanus*, more closely related to *P. songarus* and *P. montanus* than to *P. lugubris*. This data set allows making correct taxonomic conclusions, coinciding with, and even anticipating the results of modern molecular studies.

The name Hyrcanian Chickadee (or Hyrcanian Tit) is more adequate for this bird of relict endemic Hyrcanian forest than the name Caspian Tit or Elburz Tit.

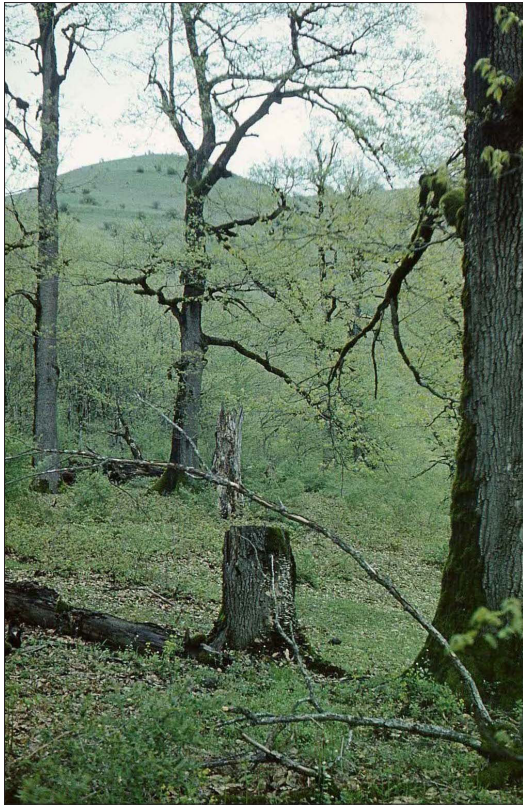
## ACKNOWLEDGMENTS

I am deeply thankful to all curators of museum collections for sending on loan skins of *Poecile lugubris* including *P. hyrcanus*, to Bjorn Andersen for permission to publish his excellent photos of *P. hyrcanus* in Elburz Mountains, to A.G. Kozincev for assistance with the statistical analysis, to M.V. Pukinskaâ for preparing sonograms, and to P.V. Kiâško and I.S. Smirnov for help with computer drawing of illustrations. I am also very grateful to J. Mlíkovský who read the manuscript of the article.

## REFERENCES

- Baedeker F.W.J. von, 1858: Die Eier der europäischen Vögel nach der Natur gemalt, mit einer Beschreibung des Nestbaues gemeinschaftlich bearbeitet mit L. Brehm und W. Pässler. Vol. 2. Oscines. – Leipzig: J. Baedeker, 142 pp.
- Blanford W.T., 1876: Journeys of the Persian Boundary Commission 1870-71-72. Vol. 2. Zoology and geology of Eastern Persia. – London: Macmillan & Co., viii + 516 pp.
- Cramp S. & Perrins C.M., eds., 1993: The birds of the Western Palearctic. Vol. 7. – Oxford: Oxford University Press, 577 pp., 2 egg plates.
- Dement'ev G.P., 1948: Materialy po ornitologii severnogo Irana [Materials on the ornithology of northern Iran] – Trudy Central'nogo Büro Kol'cevaniâ [Proceedings of Central Bureau of Ringing] 7: 177-194. [In Russian.]
- Dickinson E.C., ed., 2003: The Howard and Moore complete checklist of the birds of the world. 3<sup>rd</sup> rev. ed. – London: Christopher Helm, 1029 pp.
- Eck S., 1980: Intraspezifische Evolution bei Graumeisen (Aves, Paridae: *Parus*, Subgenus *Poecile*). – Zoologische Abhandlungen (Dresden) 36: 135-219.
- Eck S., 1996: Die palaearktischen Vögel – Geospezies und Biospecies. – Zoologische Abhandlungen (Dresden) 49, Supplement: 1-103.
- Grossheim A.A., 1926: Flora Talyša. [Flora of Talysh]. – Tiflis: Narkomzem, 273 pp. [In Russian.]
- Harrap S. & Quinn D., 1996: Tits, nuthatches and treecreepers. – London: Helm, 464 pp.
- Hartert E., 1905: Die Vögel der paläarktischen fauna. Vol. 1 (Heft 3). – Berlin: R. Friedländer und Sohn, pp. 241-384. (*Parus lugubris hyrcanus* S. 369).
- del Hoyo J., Elliott A. & Christie D.A., eds, 2007: Handbook of the birds of the world. Vol. 12 (Picathartes to tits and chickadees). – Barcelona: Lynx Edicion, 815 pp.
- ISO 9A: 1995 – Information and documentation – Transliteration of Cyrillic characters into Latin characters. – Geneva: International Organization for Standardization.
- Johansson U.S., Ekman J., Bowie R.C.K., Halvarsson P., Ohlson J.I., Price T.D. & Ericson P.G.P., 2013: A complete multilocus species phylogeny of the tits and chickadees (Aves: Paridae). – Molecular Phylogenetics and Evolution 69: 852-860.

- Koblik E.A., Red'kin A.A. & Arhipov V.Û., 2006: Spisok ptic Rossijskoj federacii [A synopsis of the birds of the Russian Federation]. – Moskva: Tovarišestvo naučnyh izdanij KMK, 281 pp. [In Russian.]
- Kovšar A.F., 1976: Ob èkologii džungarskoj gaički [On the ecology of the Dzhungarian Tit]. – Vestnik Zoologii 3: 34-39. [In Russian.]
- Leonovič V.V., Žuravlev M.N. & Adamân M.S., 1970: Rasprostranenie i biologiiã sredizemnomorskoj gaički v užnom Zakavkaz'e [Distribution and biology of Sombre Tit in southern Transcaucasia]. – Biologičeskij Žurnal Armenii 23 (8): 71-78. [In Russian.]
- Löhrl H., 1966: Zur Biologie der Trauermeise (*Parus lugubris*). – Journal für Ornithologie 107: 167-186.
- Loskot V.M., 1977: O vidovoj samostoâtel'nosti girkanskoj gaički *Parus hyrcanus* (Sar. et Loud.) [On the species status of the Hyrcanian Tit *Parus hyrcanus* (Sar. et Loud.)] – Vestnik Zoologii 4: 28-31. [In Russian.]
- Loskot V.M., 1978: Girkanskaâ gaička, *Parus hyrcanus* (Sarudny et Loudon) [The Hyrcanian Chickadee, *Parus hyrcanus* (Sarudny et Loudon)]. – In: Loskot V.M. (ed.): Sistematika i biologiiã redkih i maloizučennyh ptic [Systematics and biology of rare and less studied birds]. – Akademiã Nauk SSSR, Trudy Zoologičeskogo Instituta 76: 46-60. [In Russian.]
- Loskot V.M., 1982: *Parus hyrcanus* (Sarudny et Loudon) – a distinct species. – In: Gavrilov V.M. & Potapov R.L. (eds.): Ornithological studies in the USSR. Vol. 1: 24-30. Moscow [= Moskva]: Nauka Publishers.
- Loskot V.M. [Loskot W.M.], 1987: *Parus hyrcanus* (Sar. et Loud.). – In: Dathe H. & Nejfel'dt I.A. [Neufeld I.A.] (eds.): Atlas der Verbreitung palaearktischer Vögel. Lief. 14. Berlin: Akademie-Verlag, unpaginated.
- Penrose L.S., 1954: Distance, size and shape. – Annals of Eugenics 18: 337-343.
- Scott D.A., 2008: Rare birds in Iran in the late 1960s and 1970s. – Podoces 3: 1-30.
- Seebohm H., 1884: Notes on a collection of birds from Lenkoran. – Ibis 26: 425-429.
- Steinfatt O., 1954: Vogelkundliche Beobachtungen in Attica. – Journal für Ornithologie 95: 245-262.
- Stepanân L.S., 1974: Novyj podvid *Parus lugubris talishensis* Stepanyan ssp. n. iz Talyša [A new subspecies *Parus lugubris talishensis* Stepanyan ssp. n. from Talysh]. – Bulletin' Moskovskogo Obšestva Ispytatelej Prirody, Otdel Biologii 79 (6): 143-145. [In Russian.]
- Stepanân L.S., 1990: Konspekt ornitologičeskoj fauny SSSR [Synopsis of the ornithological fauna of the USSR]. – Moskva: Nauka, 727 pp. [In Russian.]
- Stepanân L.S., 2003: Konspekt ornitologičeskoj fauny Rossii i sopredel'nyh territorij (v granicah SSSR kak istoričeskoj oblasti [Synopsis of the ornithological fauna of Russia and adjacent territories (within the borders of the USSR as a historic region)]. – Moskva: Akademkniga, 808 pp. [In Russian.]
- Vaurie C., 1950: Notes on some Asiatic Titmice. – American Museum Novitates 1459: 1-66.
- Vaurie C., 1959: The birds of the Palearctic fauna. Passeriformes. – London: H.F. & Witherby, xii + 762 pp.
- Witherby H.F., 1910: On a collection of birds from the south coast of the Caspian Sea and Elburz Mountains. – Ibis 52: 491-517 (*Parus lugubris hyrcanus* pp. 505-506).
- Wolters H.E., 1980: Die Vogelarten der Erde. Lieferung 5. – Berlin: Paul Parey, pp. 321-400.
- Zarudnyj N.A. [Zarudny N.] & Bil'kevič C.I., 1913: K ornitofaune Zakaspijskoj oblasti i sosednih s nej častej Persii [On the avifauna of the Transcaspiian Province and adjacent parts of Persia] – Ornitologičeskij Věstnik 4: 20-23. [In Russian.]
- Zarudnyj N.A. [Zarudny N.] & Loudon H., 1905: Vorläufige Beschreibung zweier ornithologischen Neuheiten aus West-Persien. – Ornithologische Monatsberichte 13: 76.



**Fig. 4.** Habitat of the Hyrcanian Chickadee, middle oak-beech forest belt, vicinity of Vizezamin village, 500 m a.s.l. Photo: V. Loskot, 24 April 1976.

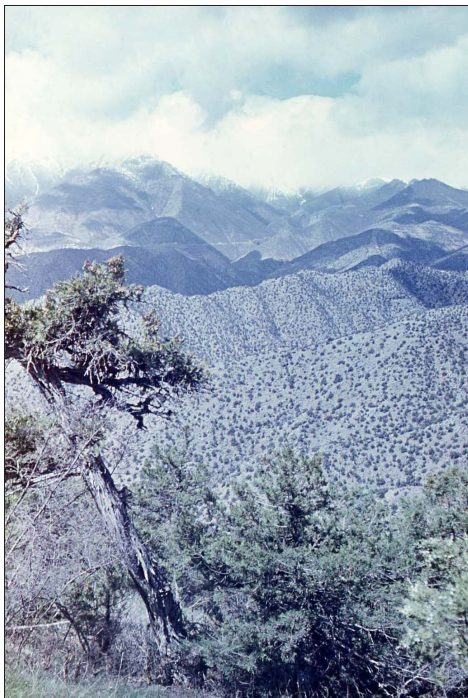
**Fig. 5.** Habitat of the Hyrcanian Chickadee, upper forest belt in the vicinity of Lerik, 1240 m a.s.l. Photo: V. Loskot, 26 April 1976.







**Fig. 6. Habitat of the Hyrcanian Chickadee near Roodbarak, treeline of broadleaved forest. Photo: B. Andersen, 16 April 2011.**



**Fig. 7. Habitat of the Sombre Chickadee *Poecile lugubris anatoliae* in Southern Armenia, vicinity of Megri, Kaladaš, 1200 m a.s.l., *Juniperus foetidissima* light woodland. Photo: V. Richter, April 1974.**



**Fig. 8.** Hyrcanian Chickadee near the entrance of its nest hole; Elburz Mountains, Roodbarak village. Photo: B. Andersen, 17 April 2011.



**Fig. 9.** Nest hole construction of the Hyrcanian Chickadee in an old beech stump; Talysh Mountains, near Vizezamin village. Photo: V. Loskot, 24 April 1976.





Fig. 10. Nests and eggs of chickadees. 1 – *P. hyrcanus*, 30 April 1976, Lerik, upper forest belt, 1240 m a.s.l.; 2 – *P. hyrcanus*, 24 April 1976, Vizezamin village, middle forest belt, 500 m a.s.l.; 3 – *P. lugubris anatoliae*, 27 April 1982, Megri, Kaladaš. All nests are deposited in the ZISP. Photo: V. Loskot, 15 November 2013.

Fig. 11. Sonograms of the alarm call of Hyrcanian Chickadee (A) and Sombre Chickadee *P. lugubris anatoliae* (B).

