

## Current population status of yellow-throated marten *Martes (Charronia) flavigula* in Russia

Aleksey Yu. Oleynikov\*, Victor G. Yudin, Galina P. Salkina & Gleb A. Sedash

**ABSTRACT.** We introduce data on the past and current status of yellow-throated marten *Martes (Charronia) flavigula* in Russia. We examine distribution and abundance of the species based on camera trap data from protected areas of the Russian Far East. Over the past 40 years, the number of yellow-throated marten decreased two-fold, from 3000 to 1500 individuals, and the geographic range decreased by a quarter. Reduction and fragmentation of the species' habitat was most noticeable in the Amur River region, while in the southern Primorsky Krai the population status is favourable. The yellow-throated marten has disappeared in three of 11 protected natural areas in the south of the Russian Far East. The relative abundance index according to a study using camera traps for the yellow-throated marten ranged from 0.14 to 0.25, and the average group size was 1.4 individuals. Population harvest and other potential threats are discussed, recommendations for species conservation in Russia are provided.

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## Состояние популяций харзы *Martes (Charronia) flavigula* в России

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**РЕЗЮМЕ.** В работе дана оценка современного состояния харзы *Martes (Charronia) flavigula* в России. Получены данные о распространении и численности вида с использованием автоматических камер, установленных на охраняемых территориях юга Дальнего Востока России. За последние 40 лет численность харзы сократилась в два раза — с 3000 до 1500 особей, а площадь распространения уменьшилась на четверть. Сокращение и фрагментация ареала вида в России наиболее значительна у северной границы распространения, в то время как на юге Приморского края состояние популяции благоприятное. Харза исчезла в трех из 11 охраняемых природных территорий на юге Дальнего Востока России. Индекс относительной численности по данным исследования с использованием автоматических камер для вида варьировал от 0.14 до 0.25, а средний размер группы составлял 1.4 особи. Обсуждаются вопросы плотности населения и потенциальных угроз для благополучного существования харзы. Даны рекомендации по сохранению вида в России.

**КЛЮЧЕВЫЕ СЛОВА:** харза, состояние популяции, охрана, Дальний Восток России.

### Introduction

In Russia, yellow-throated marten *Martes (Charronia) flavigula* Boddaert, 1785 (Fig. 1) occurs only in the southern Far East. This species is included

in the Red Data Books of two Russian regions as well as the Red Data Books of Korea and China (Wang & Xie, 2004; Kim, 2014; Oleynikov, 2019). The northernmost limit of the global range of this species of the subgenus is found in this area (Heptner *et al.*, 1967; Chutipong *et al.*, 2016). Little is known about the distribution and status of yellow-throated marten population in Russia.

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**Fig. 1.** *Martes (Charronia) flavigula aterrima* in the Lazovsky Nature Reserve.

Most of existing data are published in Russian scientific literature (Bromley, 1956; Heptner *et al.*, 1967; Yudin, 1984; Matyushkin, 1993; Poddubnaya, 1995) and, thus, not available for international scientific community.

Despite the wide distribution, the ecology and behavior of yellow-throated marten are poorly studied comparing to other species of the subfamily Guloninae (Carnivora, Mustelidae). Here we reviewed previously published data on the status of this species and added our current data on the current distribution and relative abundance of yellow-throated martens.

In the Russian Federation, yellow-throated martens occur at the northern border of the habitat with the middle latitudes and monsoon climate. In this region the cold season (with negative average monthly temperature falls below 0°C) lasts 5–6 months from November to April (Gerasimov, 1969). Currently, the population size and habitat of yellow-throated martens along its northern border are decreasing (Oleynikov & Tkachenko, 2013; Golub' *et al.*, 2018).

### Population estimates

Up to the beginning of the 1960s, yellow-throated martens were considered as a typical representative of the fauna of the Primorsky Krai and Amur River Region (Bromley, 1956; Astafiev, 2006). It was included in the

list of Carnivora harmful for game management and was systematically shot even in the reserved areas. Starting from the 1960s, the number of yellow-throated martens in the south of the Russian Far East began decreasing (Kucherenko, 1974; Yudin, 1984). The total number of this species in the USSR in the 1970s and early 1980s was estimated as 2500–3500 individuals (Kucherenko, 1974; Yudin, 1984). Nowadays, this number does not exceed 1500 animals. Most of the population is found in Primorsky Region (90%) and Khabarovsk Krai (7%). About 5–10 animals are illegally hunted every year (Tumanov, 2009; Dunishenko *et al.*, 2014). The most significant decline of yellow-throated marten population is observed in Khabarovsk Krai. Last 20 years, presence of this species was not documented in some regions of the Amur River Region (Nanaisky, Komsomolsky, and Sovetsko-Gavansky districts). About 20–25 individuals occur in the Jewish Autonomous Oblast, and 5–7 animals were estimated in Khabarovsk Krai of the left bank of the Amur River (Golub' *et al.*, 2018). Single not breeding individuals are visiting the Amur Region (Gonta, 2019).

As no specific methods for the analysis of yellow-throated marten population has been developed, all the data are based on the opinion of experts. In the Table 1 we present the data on the relative abundance of these animals in certain protected natural areas of Primorsky Krai registered by camera traps.

In accordance to the Table 1, the percent of areas, where yellow-throated marten was registered, was similar in the protected natural areas of the south of the Primorsky Krai, but was twice lower in the north of the Primorsky Krai (Bikin National Park). The lowest relative abundance index was observed in the Land of the Leopard National Park, but we propose that it was understated due to specific distribution of camera traps. Camera traps were set on the ridges most often here.

### Characterization and conditions of habitats

The habitat of yellow-throated martens is represented by the climax forests. Animals use trees for moving, hunting, escaping danger, and as shelters, particularly for nesting. Yellow-throated martens avoid open treeless areas. They prefer untouched mixed coniferous-broadleaved forests of mountain regions (mostly Korean pine-broadleaved forests). Yellow-throated martens have also been reported in the broadleaved forest (oak and mixed forests) in the southern Primorsky Krai including coastal areas. Low numbers of yellow-throated martens occur in coniferous (Korean pine-spruce, spruce-fir), and secondary forests, and mostly prefer high mature and overmature forests with dry hollow trees. They often inhabit mountainous areas of medium and low altitudes and use watersheds and valleys of upland and half-upland rivers for their movements. In the mountains, animals occur up to the height of 1200 m above sea level to the belt of upland spruce and spruce-fir forests (Matyushkin, 1987). In general, range of yellow-throated martens is related to the temperate forests of Far East of Russia.

### Habitat conditions

The main reason of marten population decline is the loss of Korean pine-broadleaved forests as well as

ongoing losses in this forest type productivity. The area of Korean pine-broadleaved forests in the Russian Far East had been reduced from 68 000 km<sup>2</sup> to 20 000 km<sup>2</sup> over the last century due to timber harvest and wildfires (Koryakin, 2007). The catastrophic decrease in Korean pine-dominated forests occurred in Primorsky Krai from 1920s till 1990s. About two thirds of pine forests have disappeared (Gaponov, 2005). Currently, only 6% of the Far East territory consists of non- and low-disturbed forests.

### Distribution

Single observations of yellow-throated martens were documented in the north-west of the Amur Region up to the Ol'doi River (Heptner *et al.*, 1967). Later, the habitat was limited by the Arkhara River basin (Kucherenko, 1974; Yudin, 1984). Nowadays, yellow-throated marten is seldom observed in this area (the species is included in the Red Data Book of the Amur Region) and occurs only in the Arkharinsky District. This specie was registered in the Khingansky Nature Reserve within the 1970–1990s (Darman, 1990), and a single animal was recorded by a camera trap in 2020.

The current range of yellow-throated marten in Russia consists of four isolated patches (Fig. 2). The most northern area, which size is constantly decline, is located on the left bank of the Amur River within three regions of the Russian Federation — the Amur Region: north-west part of the Arkhara River basin; the Jewish Autonomous Oblast: north-west area of the Lesser Khingan, Sutarsky, and Pompeevsky ranges, northern part of the Shukhi-Poktoi Range, and southern part of the Bureinsky Range; and the Khabarovsk Krai: the basin of the Urmi middle course, and southern part of the Kukan Range. Earlier, this area was connected to the main range in basins of Gur and Machtovaya rivers. Nowadays, it is isolated from other parts of the range in the Russian Federation, but might be connected to the

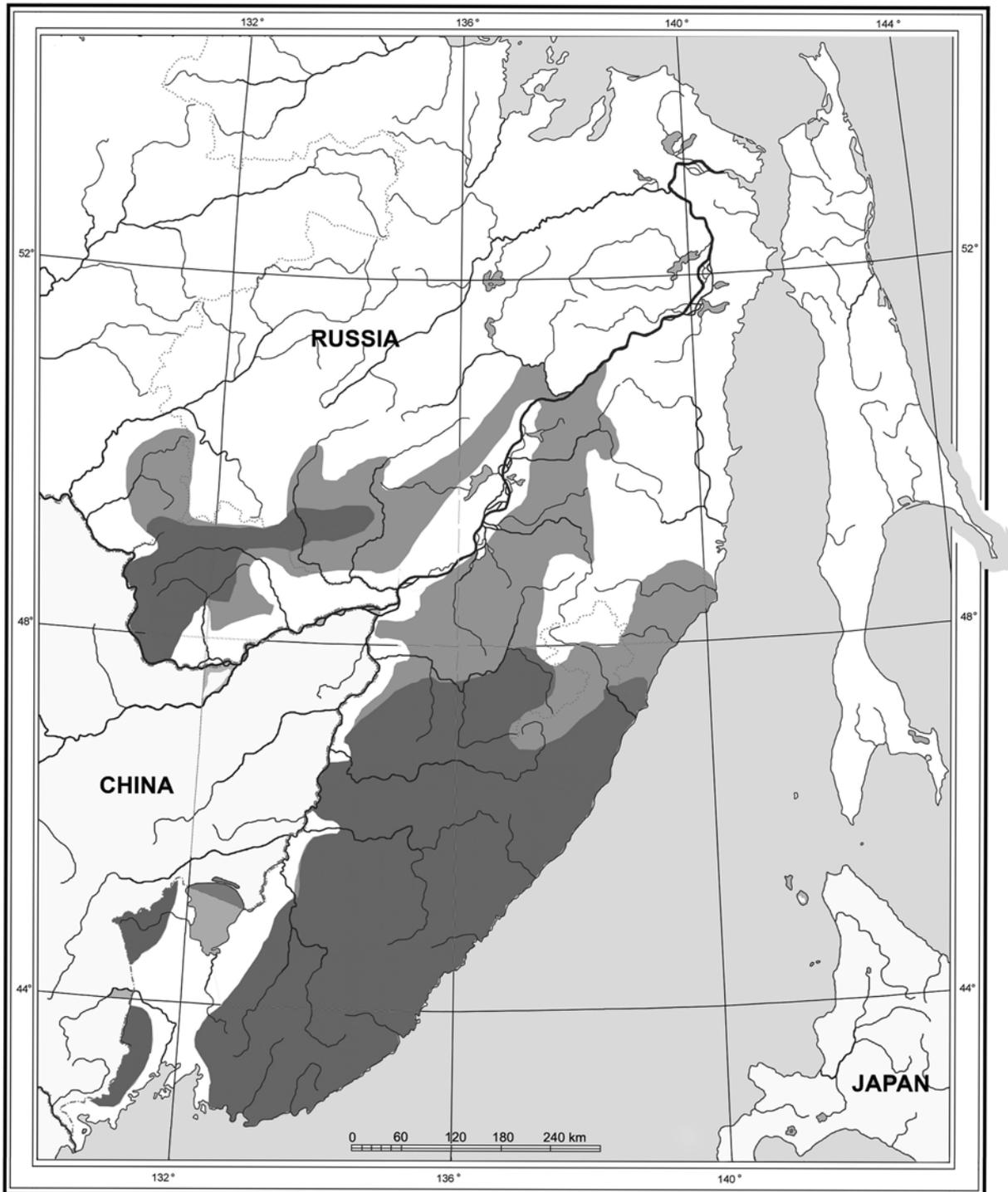
**Table 1.** Relative abundance of yellow-throated martens in protected natural areas of the Primorsky Krai (based on the data of camera traps).

Study area	Study period, years	Number of stations	Stations with registration of yellow-throated martens, %	RAI 1*	RAI 2**	Mean group size
Lazovsky Nature Reserve	2010–2017	88	33	0.25	0.34	1.4
Zov Tigra National Park	2015–2016	16	31	0.30	0.40	1.4
Bikin National Park	2015–2019	52	15	0.28	0.39	1.4
Land of the Leopard National Park	2013–2018	183	38	0.14	0.19	1.4

Notes:

\*RAI 1 = events × 100 camera trap nights/sampling effort. Where RAI 1 = relative abundance index for species; events = number of independent records per species; 100 camera trap nights=unit of standardization to compare data with other studies; sampling effort = total amount of nights that the camera trap stations were working.

\*\*RAI 2 = events × 100 camera trap nights/sampling effort. Where events = number of independent records per each individual in the group.



**Fig. 2.** Current distribution of yellow-throated martens (dark grey) and areas, where the species disappeared or do not breed (light gray).

populations of China in the area of the Lesser Khingan Range. The main area is located in the Sikhote-Alin Mountains. From the Strel'nikov Range, the border of the habitat turns to the north and includes the eastern part of the Bikinsky District and the Bira River, and then turns to the east crossing the middle course of the

Podkhorenok River. The border of the range is located along the Khor River up to the Chuken River, includes the lower and the upper part of the Chuken River basin, goes along the upper reaches of the Katen, Bikin, and Samarga rivers, and meets the Tatar Strait near the Nel'ma River. In the south-east, the area border goes

from the Ussuri Bay to the Ussurisky Nature Reserve (Komarovka River) by the low-mountain areas. Then it crosses the middle courses of the Ilistaya and Ussuri Rivers and lower course of the Bol'shaya Ussurka River. On the north of the Pozharskaya village the area border crosses the borders between the Russian Federation and China. Two small isolated areas are located in the south-west of the Primorsky Krai on the border with China: in the upper course of the Kommissarovka River (status of the species in this area is unclear, it might be that only entries from China have been registered) and in the area of the Borisovskoe Plateau and Chernye Mountains.

Little is known about species presence on the left bank of the Amur River (Kur and Urmi rivers, lower course of Gorin River). Only single animal tracks were recorded in the basins of the Matai, Kafen, Podkhorenok, and Bira rivers (Ussuri River basin), where the species was regularly observed before (Yudin, 1984). Moreover, the northern part of the range is getting fragmented, and the species was not registered in the areas of formerly dense occupation already for 20 years (Obor, Sita, Nemta, and Pikhtsa river basins, the middle reaches of the Khor and Anyui rivers). For instance, yellow-throated martens were seen only once in March 2020 in the upstream of Durmin River in the central part of the Lazo District of the Khabarovsk Krai, where this species was regularly registered within the last 10 years (due to constant monitoring of the population of Amur tiger, Batalov A.S., pers. comm.).

The species is preserved only in the biggest tracts of Korean pine-broadleaved forests. Lately, yellow-throated martens have not been found in the basins of the majority of rivers of the east spurs of the Sikhote-Alin Mountains within the Khabarovsk Krai (Tumnin, Koppi, and Botchi rivers). It is seldom recorded in Nel'ma River

basin. According to Maak (1861), yellow-throated marten occupied Khekhtsir Range in the middle of XIX century. However, over the last decade it was documented in Bol'shoy Khekhtsir Range only once. The species does not inhabit the Komsomol'sky Nature Reserve, and for 15 years was not registered in the Botchinsky Reserve, even though previously yellow-throated martens inhabited these areas (Oleynikov, 2009; Tab. 2).

Nowadays, the distribution area of yellow-throated martens in the Russian Federation is about 190 000 km<sup>2</sup>. In accordance to the data of the Table 2, the population of yellow-throated martens depleted and the number of observations reduced in the protected areas of the Khabarovsk Krai, Amur Region, and the Jewish Autonomous Oblast. In Primorsky Krai the species range slightly shifted westward to the Sikhote-Alin Mountains, the population size decreased, and the distribution of yellow-throated martens within this territory got fragmented (Fig. 2). In the recent decades, a significant decrease in the population was observed in the Sikhote-Alinsky Nature Reserve and in the central Sikhote-Alin Mountain (Astafiev, 2006; Zaitsev, 2006). This parameter is relatively stable in the south of the Primorsky Krai in comparison with the Khabarovsk Krai. In the south-west areas bordering with China, the population size even increased in the basins of some rivers. In Kedrovaya Pad Nature Reserve, yellow-throated martens were a common species in 1930s. In mid-1960s yellow-throated marten was considered as rare species, and since 1970s animals are observed here not every year (Vasiliev *et al.*, 1984; Korkishko, 1992). At least five animals inhabit the Kedrovaya Pad Nature Reserve within the last years.

In neighboring Northeast China, vast areas have a high degree of anthropogenic transformation and are deforested (Yu *et al.*, 2011), but the yellow-throated

**Table 2.** Yellow-throated martens in the reserves and national parks of the southern Russian Far East.

No.	Nature reserves, national parks	Presence of yellow-throated martens	
		in XX century	nowadays
Amur Region			
1	Khingansky Nature Reserve	*	*
Jewish Autonomous Oblast			
2	Bastak Nature Reserve	+	*
Khabarovsk Krai			
3	Komsomolsky Nature Reserve	*	–
4	Botchinsky Nature Reserve	+	–
5	Bolshekhkhtsirsky Nature Reserve	*	*
6	Anyui National Park	+	–
Primorsky Krai			
7	Bikin National Park	+	+
8	Sikhote-Alinsky Nature Reserve	+	+
9	Ussurisky Nature Reserve	+	+
10	Lazovsky Nature Reserve	+	+
11	Zov Tigra National Park	+	+
12	Land of the Leopard National Park	+	+

Note: '+' — constantly inhabiting; '–' — not inhabiting; '\*' — single records.

marten inhabits the preserved mountain forests. Four areas can be distinguished where there is transboundary movement of the yellow-throated marten. This is the southwest of Primorsky Krai, where the Land of the Leopard National Park is located on the Russian side, and the Northeastern Tiger and Leopard National Park is located on the Chinese side, the sources of the Komissarovka River in the border district of Primorsky Krai, Wandashan Range — Strelnikova Range (Khabarovsk Krai), Lesser Khingan Range (Jewish Autonomous Oblast). At the same time, in the Northeastern Tiger and Leopard National Park, the yellow-throated marten is a common species (Gong *et al.*, 2021).

### Conservation status and threats

Targeted hunting for the fur of this species is not performed. However, traps for fur-bearing animals (*Martes zibellina* Linnaeus, 1758, *Meles leucurus* (Hodgson, 1847), etc.) are used in Russia, and yellow-throated martens die after getting in these traps. The usage of hunting dogs also results in the death of yellow-throated martens. Even nowadays yellow-throated martens are sometimes considered as harmful predators or exotic animals and being hunted by some hunters. The pelts of these animals are used in taxidermy. Lately, illegal trade of living wild animals is developing.

A decrease in the population and habitat of yellow-throated martens is also mediated by the destruction of their habitats by forest felling and fires, drop in the number of prey base (*Sciurus vulgaris* (Linnaeus, 1758) and *Lepus* due to forest degradation, and *Moschus moschiferus* (Linnaeus, 1758) due to illegal hunting), and accidental capture in traps. Roadkill mortality has also been registered.

The habitats should be preserved, and the population size should be estimated. Timber harvesting in Korean pine-broadleaved forests should be banned, and the harvesting of nuts of *Pinus koraiensis* should be limited because nuts are an important component diet of small mammals (common prey of the yellow-throated marten), as well as during the nutting period, the disturbance factor increases. It is necessary to conduct a complete population census using a unified methodology in order to clarify population size and its sex-age structure. The methods of captive breeding of yellow-throated martens should be developed to reintroduce the species in the natural conditions and to conserve the wild populations. New methods of censuring should be created. More attention to the breeding of yellow-throated martens in zoos should be attracted, and researches focused on the systematization and ecology of the species should be conducted.

Yellow-throated martens are still considered as game species in two areas of the Russian Federation (Primorsky Krai and Jewish Autonomous Oblast). These animals should be excluded from the list of game species. Yellow-throated marten is listed in the Red Data Book of the Russian Federation as species requiring special

attention to its status (Danilov-Danilyan, 2001). Yellow-throated marten is listed in the Red Data Books of the Amur Region, Khabarovsk Krai, as well as South Korea and China. The Least Concern category is assigned to this species by the IUCN Red List of Threatened Species (Chutipong *et al.*, 2016).

### Conclusion

The geographic range of yellow-throated marten in Russia has decreased by 25% over the last 30 years. The population decreased two-fold over the past 40 years. A census of the species throughout Northeast Asia, including Korea, northeastern China and Far East of Russia, should be carried out to justify international protection. This species should be included to the Red Data Book of the Russian Federation, and the conservation status of the IUCN Red List of Threatened Species should be reconsidered due to the reduction and fragmentation of the habitat and a drop in the population size, particularly at the northern limits of its geographic range.

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