would disrupt, with fragments still attached to the ends of the chromosomes (Figure E). These fragments could be used to reconstruct the NM at the end of cell division[16].

Résumé. La microscopie életronique des noyaux méiotiques de l'amphibien tétraploïde *O. americanus* et de la souris a permis d'émettre l'hypothese suivant laquelle le complexe synaptonémique résulte de l'invagination de la membrane nucléaire, le synapsis étant la conséquence de ce mécanisme.

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Karyological Description of Three Species of the Genus *Passer*

Inspite of the growing number of karyologically studied species, comparative studies of bird species, both close to each other and from different populations, carried out so far are still insufficient.

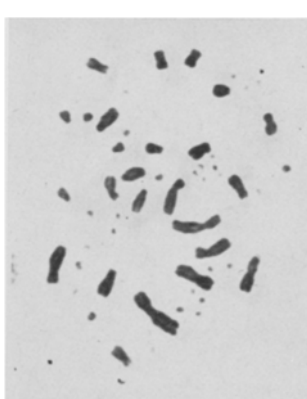
This paper describes the karyotypes of West Siberian and Middle Asian representatives of 3 species of sparrows: *Passer d. domesticus* (3 nestlings, 2 adult males and 1 adult female, vicinities of Novosibirsk), *P. d. griseogularis* (8 nestlings and 2 adult males, Dushanbé, Tajikistan); *P. hispaniolensis* (7 nestlings, Dushanbé; 1 adult female, Gheok-Tepe, Turkmenia); and *P. montanus* (1 nestling, 2 adult males and 3 females, vicinities of Novosibirsk; 1 adult male and female, Dushanbé).

Chromosome preparations were obtained by direct method from bone marrow cells of preliminarily colchicinized nestlings and adult birds, according to conventional cytogenetical technique[1], and stained in Giemsa. For each species about 25–30 metaphases were analyzed.

Domestic sparrow, Passer domesticus. $2n=76$. On comparison of karyograms of 2 subspecies of the domestic sparrow, no differences were found[2]. In the chromosome complement of this species, 12 chromosome pairs are clearly identifiable (Figure 1). The first submetacentric chromosome is remarkable for its size. Two next chromosomes (submetacentric and subtelocentric, respectively) are equal in size but shorter than the first chromosome. The 4th chromosome represented by a pair of metacentrics on metaphase plates in males is single in females. This allows us to identify it as *Z*-chromosome. Next to them in the karyotype are 4 submetacentrics-metacentrics of decreasing size. The next 2 chromosome pairs, of about the same size, are acrocentrics. The small acrocentric chromosomes NN11–12 can be well detected on metaphases and may be designated as transitional to the group of microchromosomes. The *W*-chromosome in chromosome sets of females can be determined rather distinctly. It is a submetacentric, the 12th or 13th by size.

The willow sparrow, P. hispaniolensis. $2n=76$, as in the preceding species. In the individuals studied, from different areas, the chromosome complements do not differ. The chromosomes of this species are like those in

[1] C. E. Ford and J. L. Hamerton, Stain. Tech. *31*, 247 (1956).
[2] S. I. Radjabli and E. N. Panov, Problems of Evolution (Novosibirsk) *2*, 255 (1972).



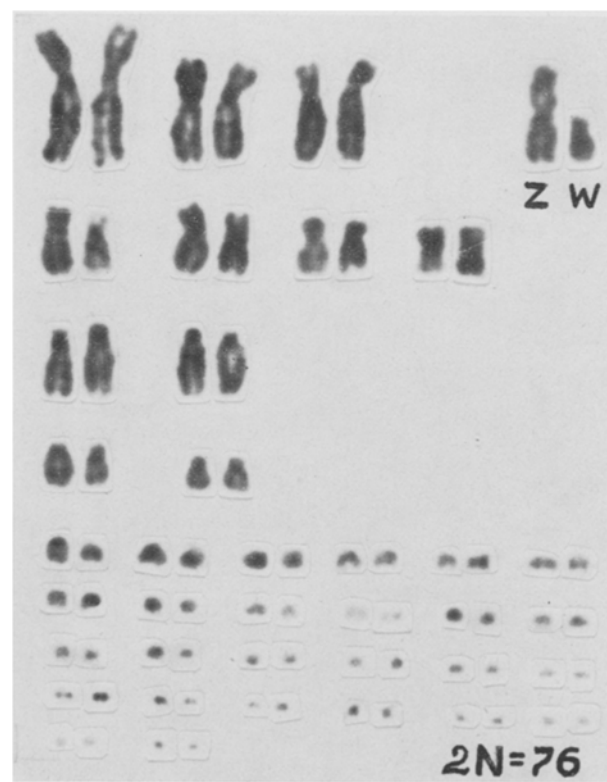


Fig. 1. Karyotype of female *Passer domesticus*.

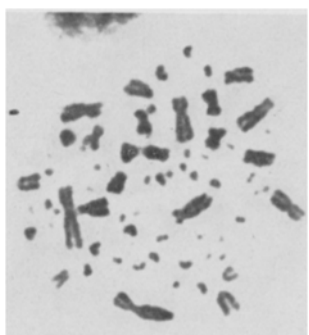
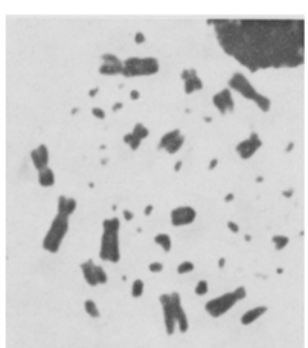


Fig. 2. Karyotype of female *Passer hispaniolensis*.

domestic sparrow, both morphologically and according to their position in the karyogram (Figure 2). An exception is only 1 autosomic pair (the 10th in our karyogram) and the *W*-chromosome which show no shoulders in the chromosome set of the willow sparrow (telocentrics). Such karyotypical differences could be conditioned by a pericentric inversion. The Z-chromosome is the 4th in size, metacentric.

The tree sparrow, P. montanus. $2n=78$. Unlike the previous species, in the chromosome set of this one only 8 pairs of macrochromosomes can be designated. Such a reduction of the number of identifiable chromosomes is caused by the absence of 2 metacentrics which are present in the 2 previously described sparrow species. The rest autosomes and the *Z*-chromosome of the set look similar to those of the others species. Unlike 2 other species, the *W*-chromosome is represented by a very small acrocentric (Figure 3).

Among the birds studied, 1 female *P. montanus* from Dushanbé showed aberrant karyotype. In this karyotype 9 pairs of macrochromosomes are identified. But chromosomes from the group of meta-submetacentrics were grouped in pairs unsatisfactorily (Figure 4). Thorough analysis of about 20 metaphases of this female shows that 4 chromosomes comprise 2 more or less heteromorphical pairs, while 2 chromosomes are clearly without homologs. Morphologically similar chromosomes consist of 2 pairs of metacentrics in karyotype of *P. domesticus*,



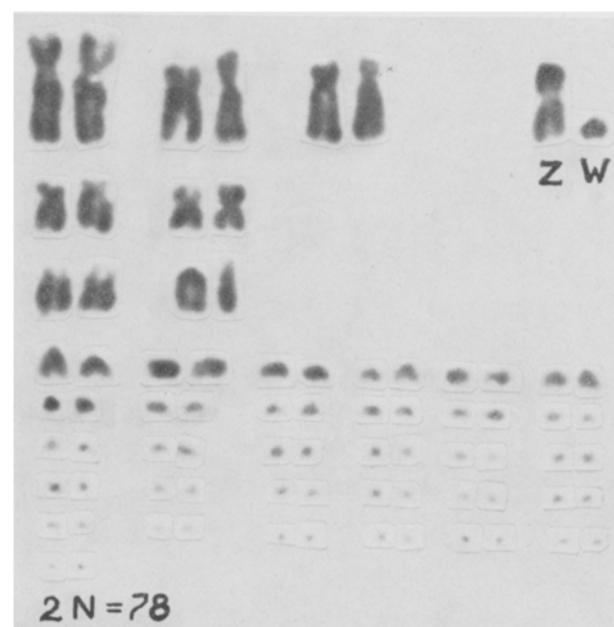


Fig. 3. Karyotype of female *Passer montanus*.

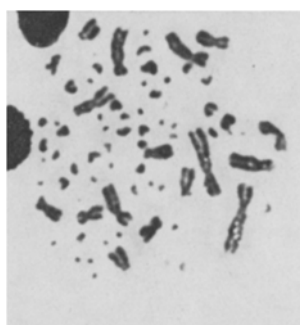


Fig. 4. Karyotype of hybrid female *P. domesticus* × *P. montanus*.

but they are absent in *montanus* – set. We conclude that this karyotype is the result of hybridization of *P. domesticus* and *P. montanus*. This occasional discovery of the hybrid sparrow helps to find homeologs in karyotypes of both species. The change of the number of metacentrics in their karyotypes seems to be accounted for by a Robertsonian rearrangement. Perhaps, this is witnessed also by the difference in diploid numbers of these 2 species.

Thus, between the karyotypes of the 3 sparrow species, there are distinct differences. Of special interest in this respect are the domestic and the willow sparrows, because in the literature there is a common view of the existence of hybrid zones in these 2 species. As an example of stable hybrid population they indicate the form *'italiae'* which is sometimes given the rank of species, *Passer italiae*[3,4]. It is known that related bird species, even with morphologically identical karyotypes, cannot give fertile progeny[5,6]. We do not know whether observable karyotypical differences are quite enough for preventing of sparrows hybridization. Nevertheless, they may be used in recognition of 'clear' and 'hybrid' populations of *domesticus – hispaniolensis* group.

So far we have data on chromosome sets of European representatives of only the domestic sparrow[7,8]. The chromosomes of the willow sparrow from European area has not been studied.

Karyotype of domestic sparrow from the vicinities of Bonn[8] is different from that described here by the absence of one metacentric chromosome pair. However, there is a full resemblance between our data and previously published results of VAN BRINK[7]. The latter gives reason to suppose that there was rather an inaccuracy in the former description of karyotype than a real karyotypic difference in european populations, and that the chromosome sets of Asian and European representatives of the domestic sparrow do not differ between themselves. For the final solution of *domesticus – hispaniolensis* question, further study of chromosome complements of both parental and hypothetical hybrid forms would be of great interest.

As for the karyotype of *P. montanus*, the same situations as with *P. domesticus* take place. Our description of *P. montanus* karyotype is in full accordance with that of HAMMAR[9] but disagrees with that of CASTROVIEJO et al[8]. It seems probable that chromosomes of *P. montanus* are also the same in different points of the range. Karyotypical differences between the tree and the domestic sparrows described by us in the Asian forms are valid also for the European representatives of these species.

As far as *domesticus – montanus* hybrid is concerned, here is the first cytological description of interspecific bird hybrid in the wild. It may be interesting to note that exterior characters of this hybrid female do not differ from those of *P. montanus*.

ВЫВОДЫ. Кариотипы домового, испанского и полевого воробьев отличаются как по морфологии хромосом, так и значениями диплоидных чисел. Обнаруженные различия могли бы, вероятно, служить для распознавания 'чистых' и 'гибридных' особей в зонах предположительной гибридизации домового и испанского воробьев. У европейских и азиатских представителей домового воробья, а также у полевого, хромосомные наборы одинаковы. Кариотип, промежуточный по морфологическим характеристикам между кариотипами домового и полевого воробьев, описан для самки с фенотипом *P. montanus*.

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