


EXPEDITION
National Park Smolenskoye Poozerye
(Smolensk Lakes)
June 2018


Expedition members:

Head: Ershov Dmitry - deputy Director of CEPF RAS, candidate of technical sciences.
The participants:
Tikhonova Elena - leading researcher, CEPF RAS, candidate of biological sciences;
Gavrilyuk Egor - senior researcher CEPF RAS;
Geraskina Anna - senior researcher, CEPF RAS, candidate of biological sciences;
Vasenkova Nadezhda - 1 year postgraduate of zoology and ecology of Moscow State Pedagogical University;
Employees of the Smolensk National Park:
Khokhryakov Vladimir - head of Forest Inventory and Monitoring Department, candidate of biological sciences;
Bavshin Igor - GIS specialist of the monitoring and information support department, researcher.

Research Areas

Aerial photography from an unmanned aerial vehicle (Phantom 3 Advanced) and decoding of images

Geobotanical descriptions and assessment of the biometric characteristics of the tree stand

Soil and zoological researches

Scheme
location and aerial photography from UAVs (yellow squares)

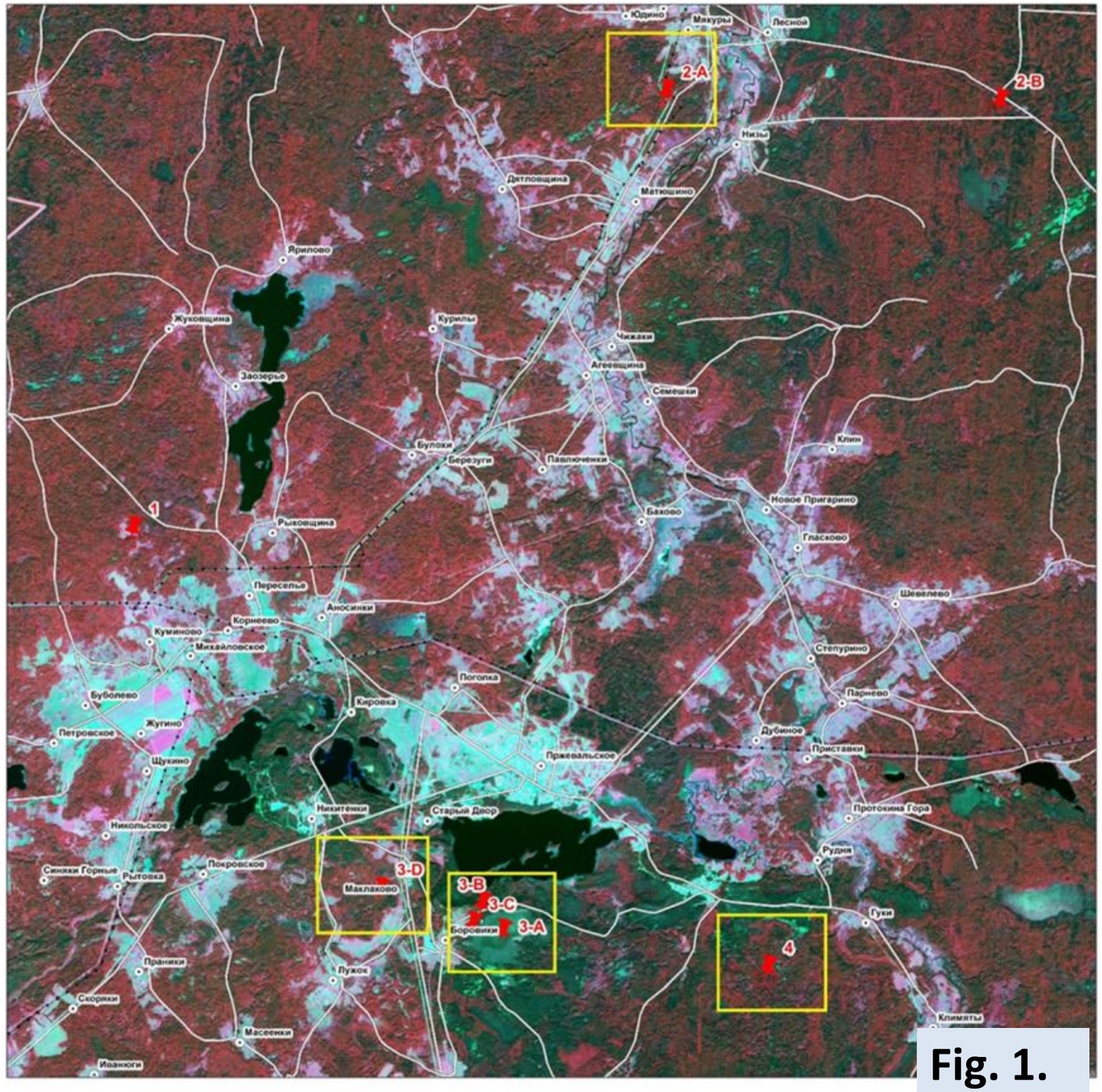

Fig. 1.

Aerial photography

Using specialized software, Gavrilyuk Yegor designed the UAV flights for surveying 300-by 300-meter sections of the earth's surface for all areas planned for surveying (Fig. 1). The sites were designed in such a way as to cover as much as possible the locations of the ground survey sites performed as part of the current expedition, as well as in 2016 and 2017. An example of designing aerial photography sites in the area of the Boroviki settlement is shown in the figure (Fig. 2)

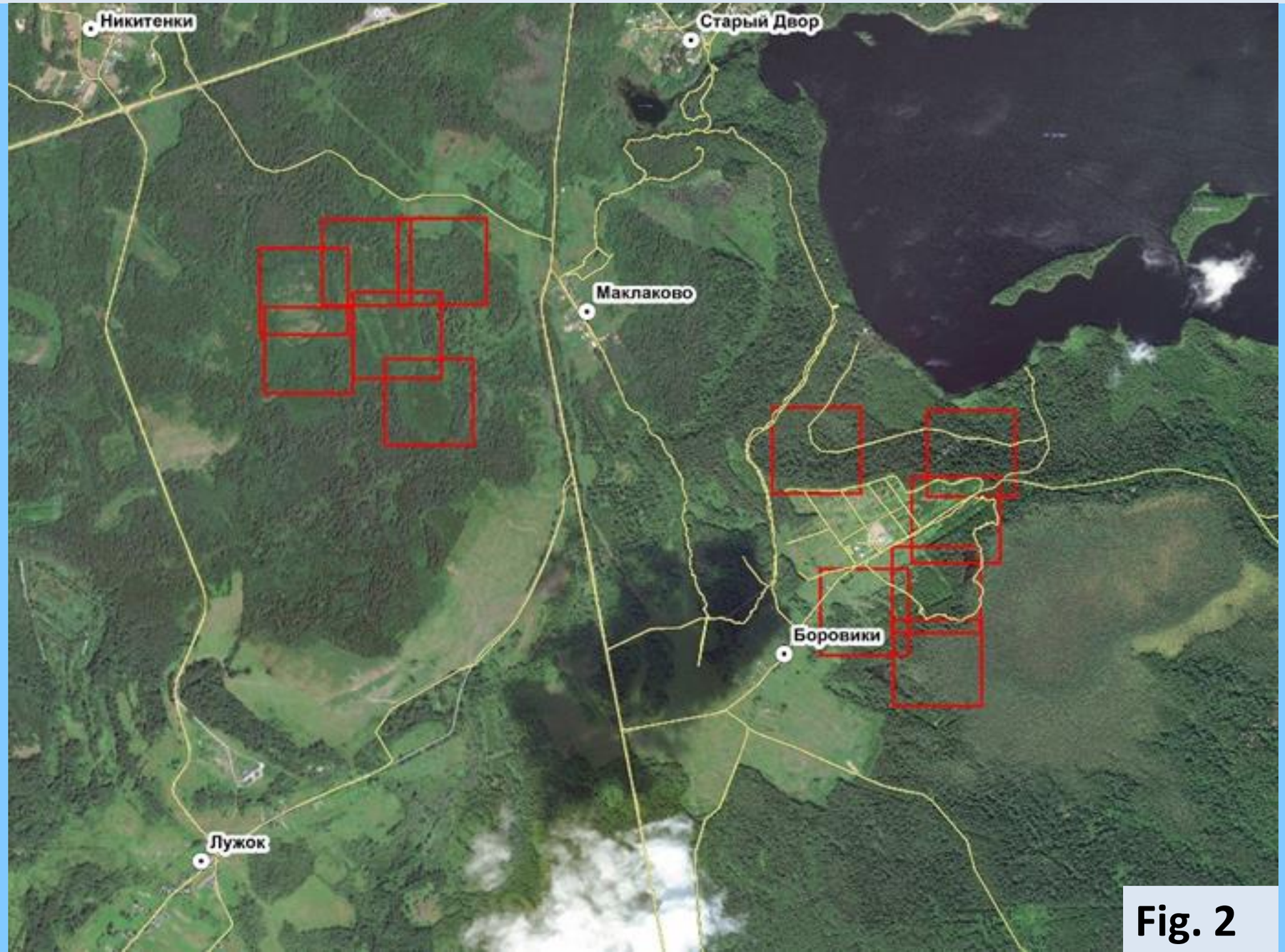

Fig. 2

Aerial photography

Aerial photography was carried out during unstable weather conditions: with continuous cloud cover and cumulus cloud, which affected the quality of the obtained images of the surface and forest cover. The quality of the survey was significantly affected by wind speed. The shooting was carried out under conditions of different illumination (at different angles of the Sun in the period from 9 to 16 hours).

BAs a result, about 8,000 images were taken for the creation of orthophotomaps and further research work with the aim of developing new algorithms and methods for automatically deciphering tree crowns and assessing the biometric characteristics of the main forest-forming species of the park.

Examples of aerial photographs with different forest composition

Aerial photography of forest areas was carried out at altitudes of 100, 150 and 200 meters above the earth's surface in three types of ecosystems: a swamp, a forest of natural origin, overgrown agricultural fields (Fig. 3-6).

Fig. 3 Sparse mixed coniferous deciduous forest

Fig. 4 Overgrown agricultural field

Fig. 5 Pine and spruce forest

Fig. 6 Swamp with rare pine

Examples of aerial photography of the arboretum

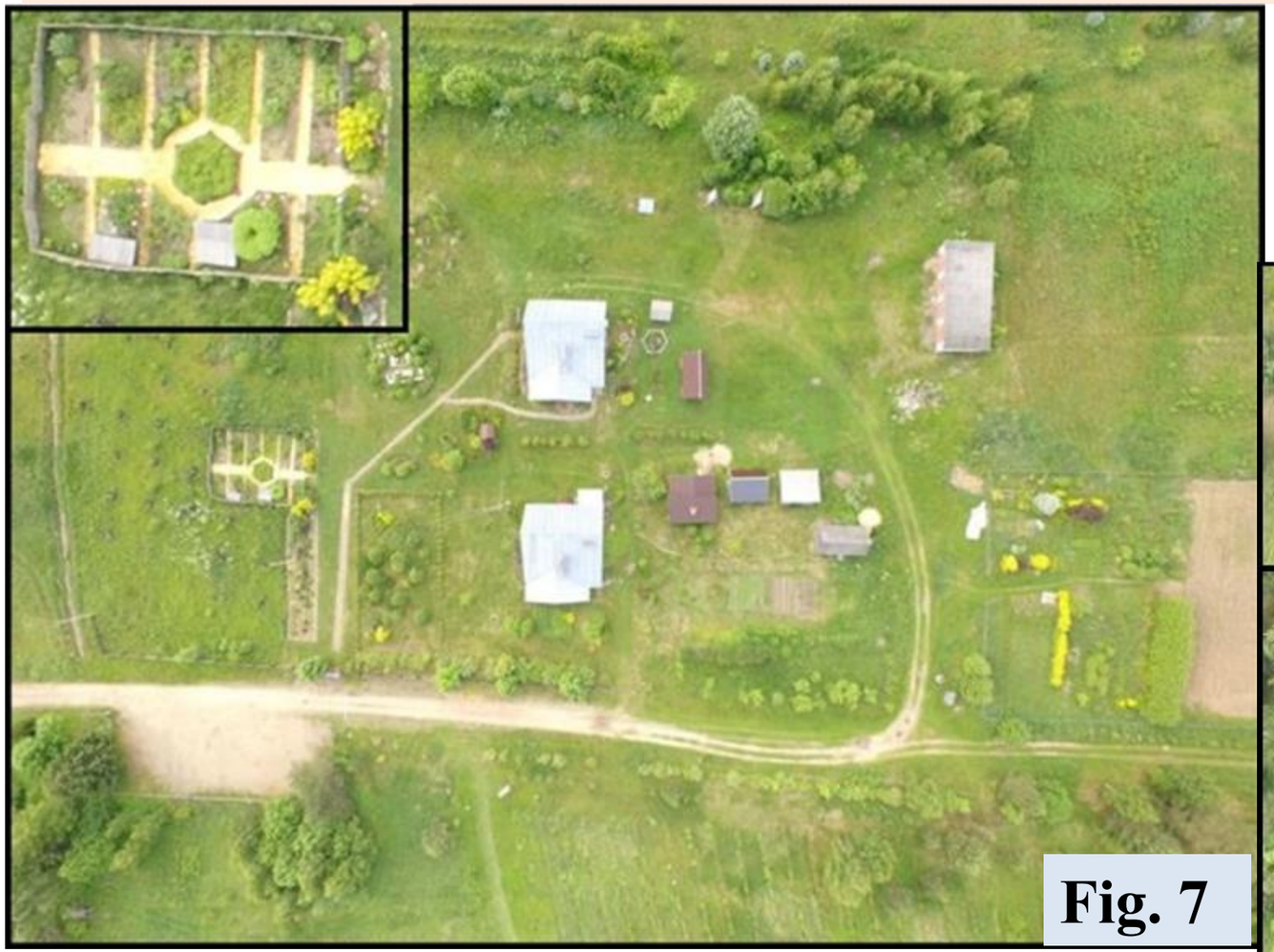

Fig. 7

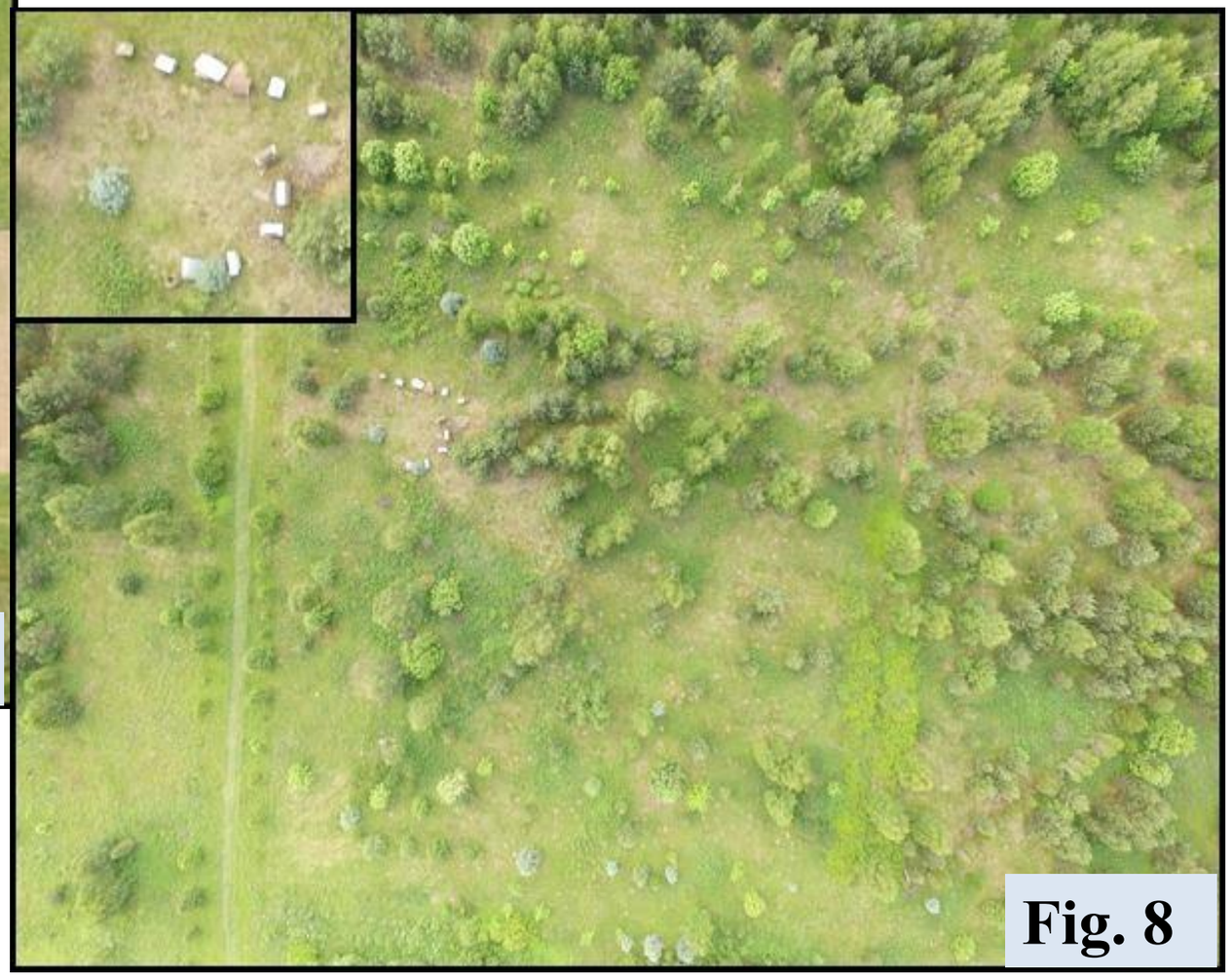

Fig. 8

Aerial photography examples from different heights
- floodplain r. Vasilevka: fragments of a forest plot at 100, 150 and 200 meters

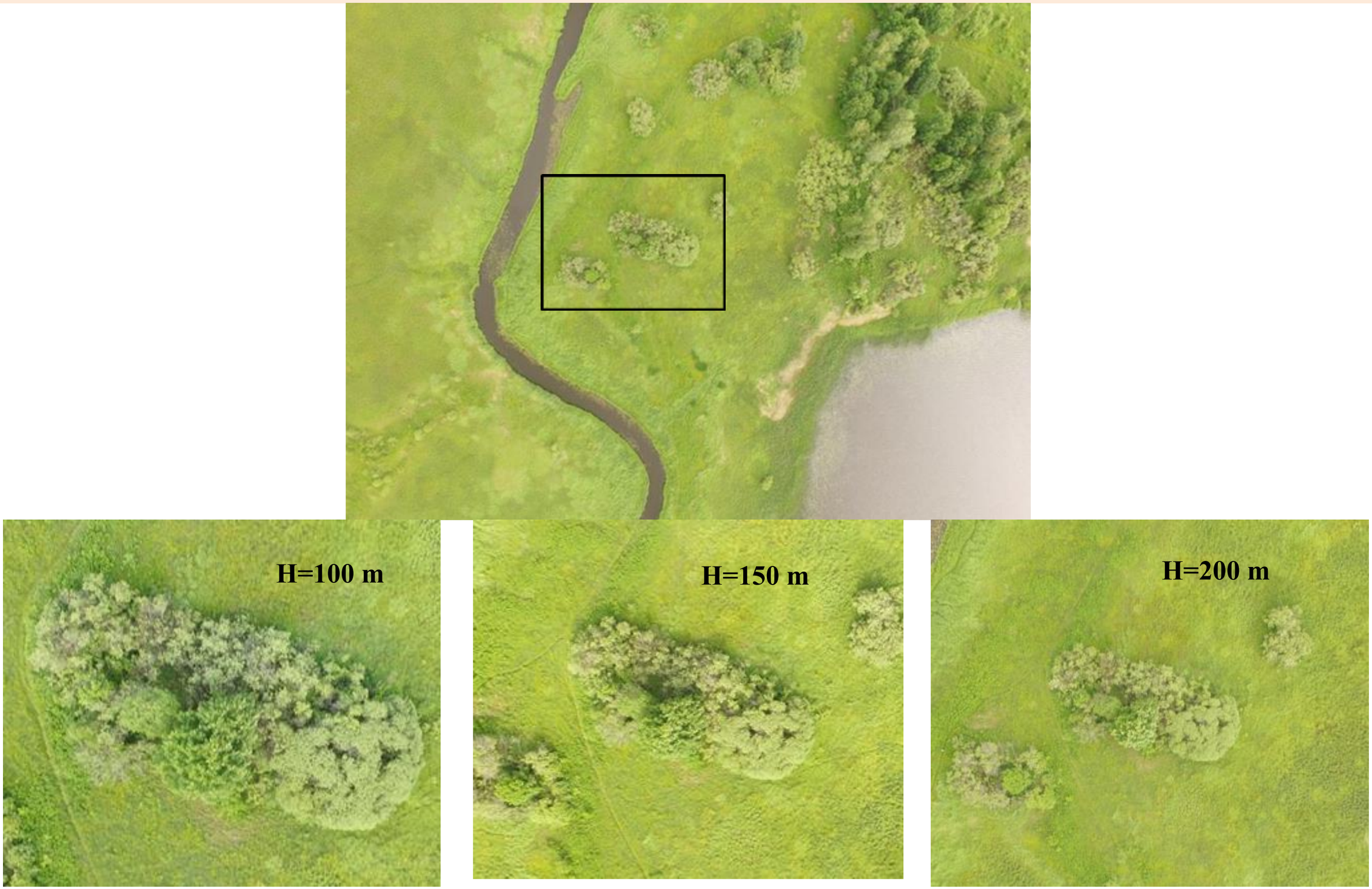

Fig. 9

Geobotanical and taxation description

In the period from June 6 to 9, 2018, 7 geobotanical descriptions were made in the Elshansky and Kurov-Bor forestries. Descriptions were carried out on test areas measuring 20x20 m^2 according to the generally accepted methodology (Mucina et al., 2000; Methodological approaches ..., 2010), revealing the most complete list of vascular plants and bryophytes and indicating their projective cover (in %).

On June 8–9, a taxation description of the forest plantation in the Kurov-Bor forestry was performed on a trial plot of 50x50 m2 with a count of all trees with diameters greater than or equal to 5 cm.

In the course of geobotanical descriptions and routes, new locations of rare species of plants listed i**n the Red Book of the Smolensk region** were identified: *Dentaria bulbifera* L., *Neottia nidus-avis* (L.) Rich., *Goodyera repens* (L.) R. Br., *Ranunculus lanuginosus* L., *Huperzia selago* (L.) Bernh. ex Schrank & Mart.

Fig. 10 Huperzia selago

New findings of rare species of vascular plants listed in the Red Book of the Smolensk region

Fig. 11 Dentaria bulbifera

Fig. 12 Neottia nidus-avis

Fig. 13 Ranunculus lanuginosus

Fig. 14 Goodyera repens

General information on geobotanical description points

1. **Aspen-linden with oak, maple and elm sedge-herb.** Yelshan Forestry, Shurovskaya dacha, apt. 60, survey plot 33. 55.61600 N, 31.8795 E 188 m above sea level A gentle slope of the northeastern exposure of a low hillock.
2. **Spruce forest with single oak in A2, oxalis-green moss.** Yelshan Forestry, Shurovskaya dacha, apt. 60, survey plot 6. 55.6247 N, 31.8768 E 181 m above sea level. Aligned watershed.
3. **Oak-spruce forest with a single aspen, oxalis-mixed ground cover.** Yelshan Forestry, Shurovskaya dacha, sq. 60, survey plot6. 55.6263 N, 31.8714 E 173 m asl. The gentle slope of the eastern exposure.
4. **Maple-spruce-linden forest sedge-herb**. Kurov-Bor forestry, Kurov-Borskaya dacha, apt. 39, survey plot 23. 55.4752 N, 31.9119 E 193 m asl The gentle slope of the watershed northwest exposure.
5. **Maple-aspen-linden-spruce forest with a single oak, sedge-herb.** Kurov-Bor forestry, Kurov-Borskaya dacha, sq. 39, survey plot 55.4752 N, 31.9140 E 204 m asl Aligned watershed, elevated location.
6. **Spruce forest with birch and a single aspen, blueberry-green moss.** Kurov-Bor forestry, Kurov-Borskaya dacha, sq. 32, survey plot 33. 55.4868 N, 31.8998 E 188 m above sea level. Gently sloping southwestern exposure.
7. **Birch-spruce forest with linden and a single maple in the undergrowth, reed grass-bilberry-green-moss.** Kurov-Bor forestry, Kurov-Borskaya dacha, sq. 35, survey plot 12. 55.47879 N, 31.84641 E 207 m asl The upper part of the leveled low hill (ridges).

Forests of Yelshan Forestry

Fig. 15 Mixed forest (maple-aspen-linden-spruce with a single oak)

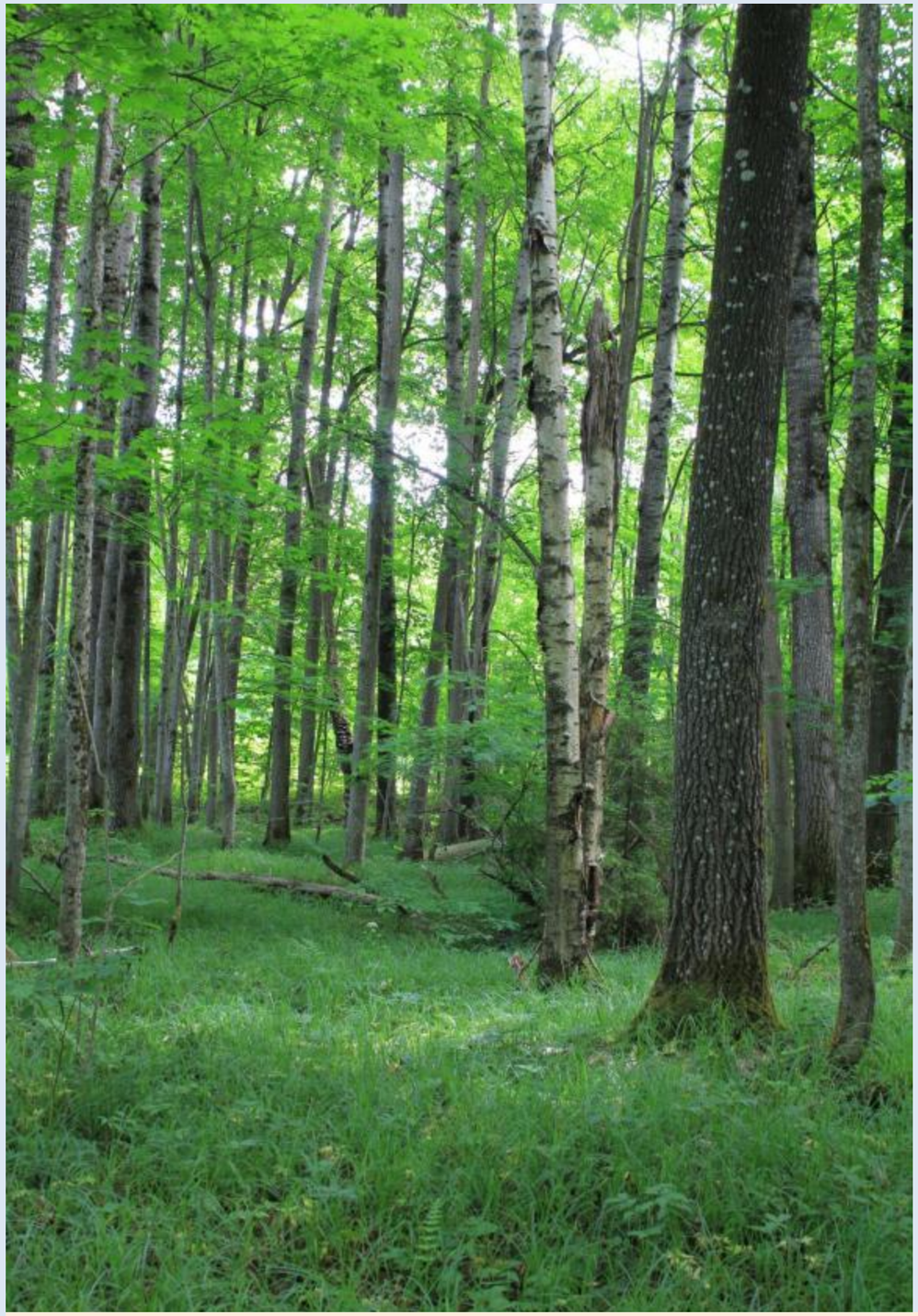

Fig. 16 Aspen-linden forest with oak, maple and elm

Forests of Kurov-Bor forestry

Fig. 17 Spruce forest with birch and a single aspen bilberry-green moss

Fig. 18 Quercus robur (trunk d 89.2 cm) in the mixed forest

Soil and zoological researches

Field material was collected to analyze the fauna and spatial distribution of the species-rich group of soil microarthropods **Collembola** - important converters of organic matter and regulators of soil microflora.

In three types of forests (mixed, deciduous and coniferous) in two replicates (in the Elshansky and Kurov-Borsky forestries), samples were taken of the litter and soil for the electro distillation of Collembola and their further species identification.

For accounting, a fractal-nesting design was used to evaluate the distribution parameters of groups of organisms on different spatial scales: from a few centimeters to tens of meters. A total of 6 series of samples of litter and soil were taken. Each series includes 81 samples (Fig. 24), the total number is 486. The samples were taken using soil boer with a diameter of 8 cm to a depth of 20 cm. In addition, for a general assessment of the Collembola faunal diversity, samples of rotten wood and litter in sphagnum pine forests were collected.

Also in the wet habitats of the three forest types, faunal counts of **earthworms** were carried out (fam. Lumbricidae) – important soil saprophages.

Fractal-nesting method of microarthropod accounting

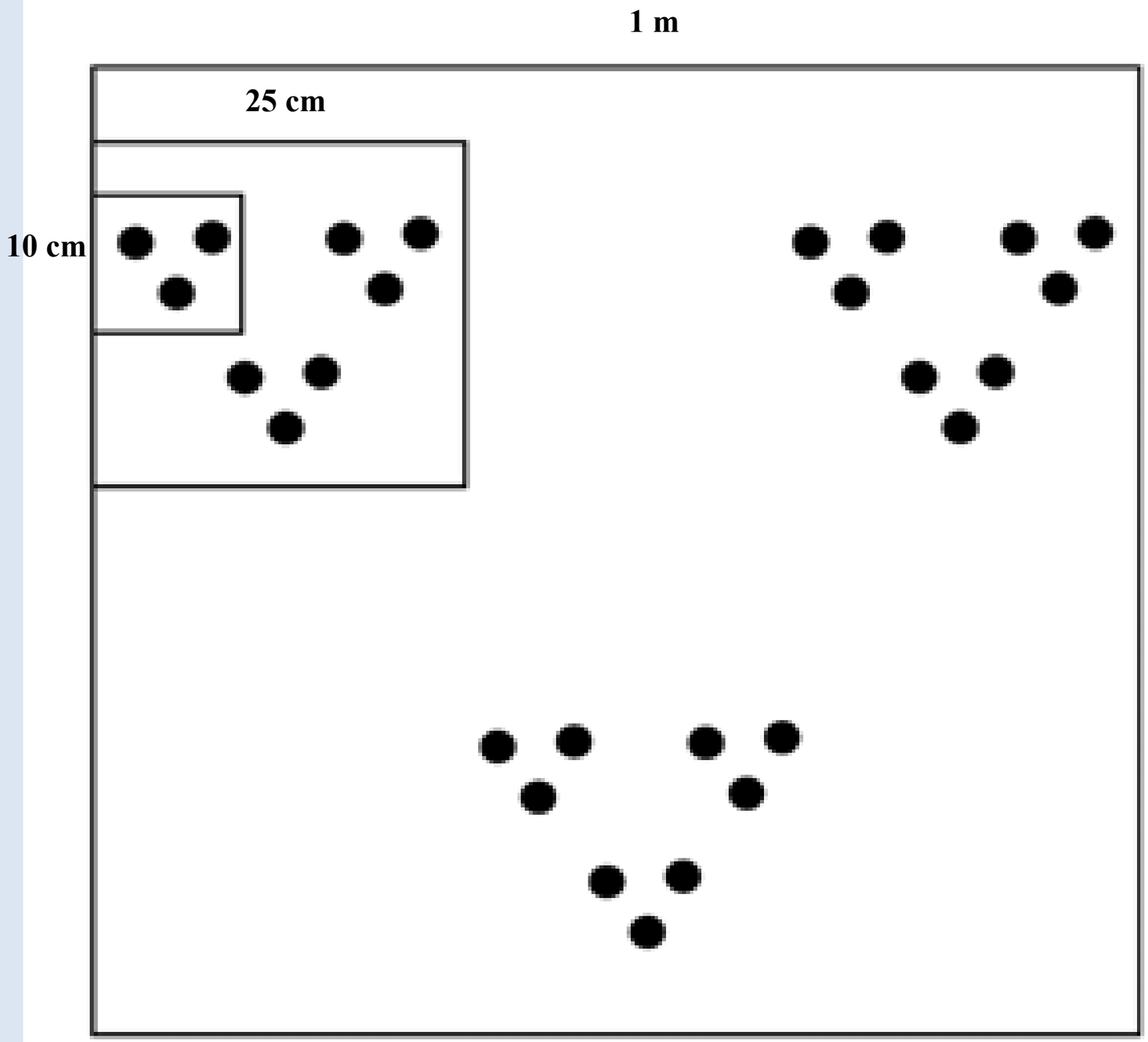

Fig. 19. The layout of samples in the biotope (accounting of Collembola developed by A.I. Azovskim; Saraeva, Potapov, Kuznetsova, 2015)

Quantitative counts of soil Collembola: samples of the litter and the upper soil horizon in three types of forest (A - coniferous, B - broad-leaved, C - mixed)

А Б В

Fig. 20 Samples taken by a soil boer (d = 8 cm) for counting Collembola in different types of forests

Faunistic counts of earthworms

During the analysis of rotten wood, raw litter and soil were found: epi-endogeic worm *Lumbricus rubellus* (Fig. 21), epigeic worms: *Dendrobaena octaedra* and *Dendrodrilus rubidus*.

Fig. 22 Parsing of dead wood

Fig. 21 L*umbricus rubellus* (after fixation in 96% ethanol)

Acknowledgments

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