

Materials of Conferences

**THE SEMITHIN SECTIONS USE
OF VARIOUS HUMAN AND ANIMALS
ORGANS IN THE PARTICULAR
HYSTOLOGY BASES STUDIES FOR MBF
STUDENTS OF THE RNRMU – RUSSIAN
NATIONAL RESEARCH MEDICAL
UNIVERSITY NAMED
AFTER N.I. PIROGOV**

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Available to the Morphology Chair MBF, the standard light–optical products for the histology, having characterized the various human and animals organs and tissues, not always of their good quality, because of their good thickness (e.g. Pavlovich, 2005–2008; Fedoseev, et. al., 2005, Pitzova, et. al, Pavlovich, et. al., 2008; 2009), which is not helped to be understood the peculiarities and their specific features structures by the students. So, the histological technologies and techniques use, combined with the new computer teaching methods use (e.g. Gurina et. al., 2009; Pavlovich, Prosvirnin, 2011) is offered hope to be improved the education, under the students' employment time reducing conditions in the seminars and their lectures. The semithin sections production in the Chair has been carried out by the traditional methods (e.g. Pavlovich, et al., 2011; 2012) with the organs, having contained in the epoxy resins, having stained them by the toluidine blue or the pyronin G. Then, the products digitization, and the panorama shots preparation has been followed. For all this, the obtained illustrations could have the quite different increase. So, the qualitative light optical illustrations producing and the wish to be shared with the world, have been inspired us to be created «The World–Histology» internet–resource [theYa.ru portal page in the Yandex system], on the basis of the semithin sections, which is improved the illustration material help by the students' mastering to the quite various topics on the general and the particular histology of the human and the animals in the normal situation, in the pathology, and in the experiment. So, all the material from the various animal species and the humans has been split by us on the number of the albums: the epithelial, the connective, the muscle and the nerve tissues one; the cardiovascular, the urogenital, the respiratory, the endocrine, the immune, and the hematopoietic systems, the gastrointestinal tract, the skin and its derivatives, and also «The Organ Systems Pathology», «The Cells and Tissues in the Experimental Exposures». In what follows, it

is supposed to be created the albums: «The Organs and Tissues Age–Related Changes», «The Organs and Tissues Morphological–Comparatively Study at the Different Species of Mammals», «The Organs and Tissues Histochemistry», and also «The Cells' Ultrastructure and the Organs and Tissues Extracellular Matrix». So, the students would be able to be self–studied the products, to be reported the challenges, to be posted the comments, and to be participated in the recitations on the topics. And it is quite possible, that especially this site will be of the interest not only to students, but to the specialists and the experts, who is able to be sent their photos, and the discussion, incomprehensible to the researches themselves to be described the products, which will be enhanced our understanding on the morphological diversity of the living systems.

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**BUILDING THE MODELS
INCORPORATING POPULATION
DYNAMICS OF FISH-EATING BIRDS
AND DEPLETION OF FISH RESOURCES**

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Global climate change and population explosions of certain fish-eating bird species are accompanied by expansion of their breeding ranges northwards along major rivers able to provide them with sufficient food resources. One of these species, the Great Cormorant (*Phalacrocorax carbo* L.) started breeding within Saratov oblast fairly recently. Since then, this species' numbers increased exponentially. New breeding colonies of cormorants appear annually. Being fish-eating birds, cormorants hunt for fish in areas traditionally used by local population for fishing and recreation. Pungent and malodorous, cormorants' feces destroy arboreal vegetation on islands where they breed. Consequently, recreational value of such islands diminishes. Additionally, fishermen and fish resource rangers think that cormorants endanger fish resources of the Volga River. In this context, research of the Great Cormorant impact on commercial and recreational fisheries is truly relevant to avoid both unjustified public protests and fish resource depletion.

Our goal was to build the imitation model incorporating population dynamics of a fish-eating bird species (using Great Cormorant as an example) with depletion of fish resources. The model could

be used for various fish-eating bird species with a similar breeding biology:

- Birds start reproducing at the age of two years
- Annual adult female survival has a probability of P_A
- Annual juvenile female survival (P_J) can be approximated at $0,5 P_A$
- Monogamous reproduction
- Monocyclic reproduction, i.e. one successful brood with a size B and probability of successful fledging p_s , and probability of reneating after unsuccessful breeding p_r .

According to the model, the total population size at year t can be determined as:

$$N_t = N_0 \lambda^t.$$

Population growth rate λ can be computed using the modified equation of the earlier model (Podolsky, 2012 *a*, 2012*b*):

$$\begin{aligned} \lambda &= P_A + P_J \cdot 1/2 \cdot [p_s B + p_s \cdot (1 - p_s) p_r B] = \\ &= P_A + P_J \cdot 1/2 \cdot B p_s \cdot [1 + p_r - p_r p_s]. \end{aligned}$$

The model input includes processes determining changes in bird population structure and size and daily intake of fish by the birds of different age categories. The model outputs are both the estimate of the total fish intake by the birds and the ratio of annual fish resource depletion to the total fish resource amount in the region. Since the modeled system incorporates various processes, we used the object-oriented imitation modeling approach. First, we created the information system as the basis for our model. The information system is essentially the information model of the actual system describing the relationships between the cormorants and fish resources.

At the second stage, we created the hierarchical list of information objects included in the model. The objects were grouped in classes and subclasses of different orders as a dendrogram. Each subclass inherits all the attributes of the class and adds some specific attributes, which are inherited by inferior subclasses of the lower order of hierarchy. It is worth noting that each information object has associations with certain traits reflecting its specificity, indicators determining its condition, factors affecting the object itself, and processes connecting the indicators of its condition with those factors. In our model, the objects were: adult – i.e. reproducing third-year bird, subadult (non-reproducing second year bird), juvenile (first-year) bird, egg (clutch) and a nest.

At the third modeling stage, we compiled the list of information processes relating factors to the indicators of object conditions. Each process is assigned a conditional start. Some of the processes we considered in our system were: «Bird arrival to the breeding sites», «Nest-building», «Egg-laying» (for third-year birds), «Incubation», «Egg loss», «Nest loss», «Reneating», «Nestling-hatching»,

«Nestling-feeding», «Nestling loss», «Adult bird feeding», «Fledged juvenile feeding», and «Fall departure from the breeding sites». Block-structured nature of the model makes it possible to change numbers and parameters of its objects and processes. To ensure the possibility of modeling taking into account statistical nature of the processes, the model can use generators of random numbers for various data distribution types. The process duration and its termination time is set up in the model as well.

Currently, the model is developed in MATLAB. We anticipate its future development using the C# language. If parameterized on the basis of empirical demographic field studies, the model can be potentially used for management decisions on cormorant population regulation in the region.

References

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IDENTIFYING PRIORITIES IN STUDYING SOIL CONTAMINATION OF THE NATURAL AREAS ADJACENT TO BIG CITIES

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Protected natural areas near big cities act as popular recreational sites and source of fresh air for the city residents, and host substantial biodiversity. Contaminated soils may result in plants and fungi rich in pollutants causing health hazards to the city residents involved in picking up berries and mushrooms for consumption. Therefore, it is crucial to determine the environmental condition of soils in natural areas adjacent to the big cities. We identified the priorities to include studying heavy metal, nitrite, microbial and radioactive pollution of soils.

In 2012, we conducted a pilot study of soil pollution within the protected natural forested area «Kumysnaya Polyana» (KP), which covers 4417 ha of the Bald Mountain plateau adjacent to the city of Saratov. The goal of our research was to identify how the proximity to the city limits affected levels of forest soil contamination within KP. With this goal in mind, we grouped 134 forest-management sections of the KP area into three zones: adjacent (close proximity to the city), medium, and remote