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Introduction

Elaboration of sensitive and operational approaches to assess a population condition is still urgently needed for both theoretical population and evolutionary studies and for nature conservation to monitor an environmental health under various anthropogenic impacts. An approach that is being developed in this issue is based on developmental stability study in natural populations with particular reference to morphological estimates.

The problem of developmental stability has been studied for a long time (eg Astauroff 1930, Schmalhausen 1940, Mather 1953, Waddington 1957, Thoday 1958, Timofeeff-Ressovsky and Ivanov 1966, Soulé 1967). Presently the population and conservation biology has found its own interest in the problem (eg Palmer and Strobeck 1986, Yablokov 1986, Zakharov 1987, 1989, 1992, Zakharov and Graham 1992, Zakharov and Clarke 1993, Markow 1994). Unfortunately, now we can find more reviews on the problem than original publications, while the set of original studies seems to be needed to establish the approach for a wide application in both theory and practice. To accomplish the goal we have already originated comprehensive study of developmental stability of various wildlife species. The aim of this issue is to present the recent results obtained specifically on mammals.

In this issue we try to summarize the results of long-term studies conducted on several mammalian species in laboratory experiments and in nature to establish the concept of developmental stability as an important population parameter. At first, the contents of this publication might seem to be eclectic just as a collection of separate studies on different species, from voles and shrews to bisons and seals, but all studies presented have been carefully designed within the concept which has been step by step established and developed through the chain of laboratory and field models on various stress impact.

In Part I, the developmental stability is considered as a characteristic of "population health" and environmental stress is supposed to act as a main cause for its deterioration. To assess an applicability of this characteristic to monitor population condition, a comparison of the samples of the Baltic seals collected in time of different level of pollution is carried out (Zakharov *et al.*, a). It evidences an opportunity to monitor possible changes in population condition under increase and decrease of anthropogenic impact, and DDT and PCB in particular. Reliability of the suggestion is supported by experimental estimation of the PCB impact on developmental stability of mink (Borisov *et al.*, a).

To establish developmental stability deterioration as a non-specific response of an organism on any stress impact, social stress is modelled in the laboratory strains of rat (Valetsky *et al.*). To answer the question, if the changes in developmental stability really indicate an alteration in an organism condition, an immune status has been assessed for the same experimental material (Pronin *et al.*). These data demonstrate an opportunity to reveal changes in population condition under the stress impact of not only anthropogenic, but also natural factors.

To assess applicability of the approach for background monitoring, ie an ability to reveal possible changes in a population status in natural conditions, developmental stability study is carried out during population cycle in sympatric populations of five shrew species in central Siberia (Zakharov *et al.*, b). The data allow to recommend the approach to monitor a population status even in cases when an application of the commonly used fitness parameters is hardly possible. Deterioration of an organism condition under the overpopulation stress impact is also revealed by cytogenetic estimates of developmental homeostasis in voles (Dmitriev *et al.*), as another evidence of the importance of morphological estimates of developmental stability for an organism condition assessment.

To estimate the role of developmental stability in phenotype variability, the developmental stability measures are compared with commonly used measures of intrapopulation phenotype diversity (Zakharov *et al.*, c). The results illustrate that not only dynamics of genotype variety, but also the alterations in the level of developmental stability can be of great importance for changes in phenotype diversity in natural populations.

As for the genetic stress impact, in Part II it is assumed that heterozygosity decrease or disturbance of general genetic coadaptation could adversely affect the developmental stability level. To test the hypothesis, the complex experiment was specially designed on the laboratory rat strains (Borisov *et al.*, b). All experimental results reveal the developmental stability to be dependent on general genetic coadaptation. In spite of the obvious instability under decreased average heterozygosity, the real situation with developmental stability depends not on a heterozygosity as such, but on what alleles are combined in a genome.

Deterioration of developmental stability is observed as a result of long-term laboratory maintenance of the strain derived from natural populations (Zakharov and Sikorski). The difference in developmental stability could be revealed between the populations differed in genotype variety caused by specificity of their origin (Baranov *et al.*). Analysis of developmental stability for the hybrids provides an information on the condition of the parental forms and general similarity of their genomes (Baranov and Zakharov).

Thus, developmental stability can be characterized as a measure of genetic stress under disturbance in genetic coadaptation resulted from inbreeding or cross of genetically different forms. The study of the phenomenon allows to answer the question, if the genetic change is accompanied by an alteration in an organism condition. An absence of developmental stability disturbance under inbreeding has led to the conclusions: (1) this characteristic is not a measure of homozygosity and (2) it can not be considered as an important index to monitor population status especially for rare and endangered species (Fowler and Whitlock 1994). The first conclusion is obviously true and other more direct methods should be used for this purpose. An absence of the correlation between developmental stability and heterozygosity just illustrates that heterozygosity decrease does not necessary lead to a change in an organism's condition. The second conclusion is not correct as an assessment and monitoring of an organism's condition seems to be crucial to protect the species and rare and endangered species in particular.

The data presented in this issue also illustrate an opportunity to use so called "false phenes" (Mednikov 1981, Yablokov 1986), the discrete phenotypic variations, which mainly reflect not changes in a genome, but disturbance of ontogenetic trajectory (Waddington 1957, Berry and Berry 1967, Berry 1975), as a useful tool for "population health" study. The basic finding of the studies presented in the publication is that developmental stability proves to be a reliable tool to assess population condition and its possible change under genetic and environmental stress.

It has been demonstrated that an information on the level of developmental homeostasis, as the most general characteristic of an organism's condition, can be obtained through the morphological estimates. Wide applicability of this approach specially for a study of natural populations is an obvious advantage of it. In such a case the analysis can be limited to the certain characters of external morphology that makes it possible to study live organisms. Morphological estimates could also be made on the museum collections. An importance of morphological estimates for an organism's condition assessment has been supported by similar data obtained from cytogenetic (Dmitriev *et al.*) and immunological (Pronin *et al.*) measures of developmental homeostasis. We would like to draw an attention of various experts in mammals as well as in other wildlife species to the study of developmental stability as a population parameter and support a revival of an interest to the morphological study that provides us with an important information on an organism's condition that could be hardly possible to obtain even through the most sophisticated molecular methods.

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