РОССИЙСКАЯ АКАДЕМИЯ НАУК

НАУЧНЫЙ СОВЕТ ПО ПРОБЛЕМАМ ИЗУЧЕНИЯ, ОХРАНЫ И РАЦИОНАЛЬНОГО ИСПОЛЬЗОВАНИЯ ЖИВОТНОГО МИРА

ЗООЛОГИЧЕСКИЙ ИНСТИТУТ РАН

МЕТОДОЛОГИЧЕСКИЕ ПРОБЛЕМЫ РАЗВИТИЯ ЗООЛОГИИ

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ABSTRACTS

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экосистеме могут быть важным экологическим фактором, влияющим на процесс макроэволюции водных животных. Наряду с абиотическими факторами внешней среды они могут способствовать закрытию старых и открытию новых лицензий в экологических системах, оказывать влияние на сукцессию сообществ и определять направления макроэволюционных изменений отдельных групп животных.

BIOTIC INTERACTIONS BETWEEN FISH AND AQUATIC INSECTS AS ECOLOGICAL FACTOR OF THEIR EVOLUTION

Analysis of biotic interactions between aquatic insects and fish in modern and ancient lakes have shown that biotic interactions are significant for macroevolution of aquatic animals. Together with abiotic factors they affect the opening of new ecosystem licenses for species and closing the old ones. They also direct the succession and evolution processes in animal communities.

С.Д. Гребельный
Зоологический институт РАН,
Санкт-Петербург, Россия

S.D. Grebelnyi
Zoological Institute RAS,
St. Petersburg, Russia

КЛОНАЛЬНЫЕ ВИДЫ, ИХ РОЛЬ В ФОРМИРОВАНИИ РЕГИОНАЛЬНЫХ ФЛОР И ФАУН

У организмов, находящихся на разных стадиях филогенетического развития, механизмы рекомбинации различны. У прокариот геном заключен, как правило, в одну кольцевую хромосому, и рекомбинация осуществляется только посредством передачи из клетки в клетку, из хромосомы в хромосому участка ДНК. Половой процесс чередуется с длительными периодами клонирования. Эукариотические организмы — в том числе высшие животные и растения — переходя к циклическому партеногенезу, на новом, более совершенном генетическом уровне (с двухступенчатым мейозом, высокой частотой кроссинговера, мозаичной структурой гена, интронами и др. усовершенствованиями) пользуются апробированной прокариотами стратегией размножения.

Жизненный цикл, включающий смену периодов клонирования и половой рекомбинации, в ряде случаев дает несомненные преимущества. Он позволяет совместить широкий внутривидовой (межпопуляционный) ***полиморфизм*** с большим ***однообразием*** особей в локальных популяциях и их высокой приспособленностью, которая часто сопровождается (или обеспечивается) гетерозиготностью по многим генам. Такой жизненный

цикл позволяет популяции быстро реагировать обратимыми изменениями на многолетние и даже сезонные изменения среды сдвигами частот аллелей, соотношения полов и пр.

CHARACTERISTIC FEATURES OF CLONAL SPECIES AND THEIR ROLE IN COMPOSING OF REGIONAL FAUNASAND FLORAS

For a long time it has been known that phenomena designated as the "species" are of quite different kinds. There are some essential differences between the so-called clonal species unable of true sexual reproduction associated with genetic recombination and common bisexual panmictic species (which were named "biological species" by Ernst Mayr). Some clonal forms are oftentimes considered to be distinct species because they possess a number of basic features of a separate species — geographical range, distinct morphological peculiarities *etc.* In spite of obvious difference between clonal and bisexual species the latter can also show some signs of cloning.

Clonal species

1. Non-recombining forms (clonal species, races, varieties *etc.*) are widely spread in nature. More than 50% of flowering plants (including higher polyploids and apomictic diploid forms) and a large number of animals are known to breed without normal sexual recombination of genes. In prokaryotic organisms the recombination is not directly associated with reproduction. It was also cleared up that seed production in higher plants as well as eggs laying or viviparity in animals (the so-called "sexual reproduction") very often occur without meiosis and a proper fertilization. It happens when a true sexual reproduction is substituted by any kind of apomixis (parthenogenesis, gynogenesis *etc.*). In such a case the young bodies of offspring simply continue their mother's life. In genetic sense the change of generations does not proceed here, because the genotype of juveniles is as it were a Xerox-copy of a maternal genotype.

2. It has been shown that as a result of interclonal competition only a few fittest combinations of alleles are left. The loss of genetic polymorphism leads to a lack of evolutionary plasticity that seems to be an inevitable fee for a short period of prosperity in populations of non-recombining forms. They become extinct owing to any considerable climatic shift and then appear again. Thus, the transference of a true recombining species to cloning (apomixis) is an easiest but very primitive evolutionary decision.

3. The recent geographic distribution of clonal forms proves them to be very young. According to the results of estimation based on different approaches their age seems likely to be no more than 10-12 thousand years. The complete blocking of recombination may be considered as one of the kinds of reproductive strategy. It is the strategy, which allows clonal forms to occupy rapidly some territories of being

under changed environment. According to terminology of our foreign colleagues (J. Maynard Smith *et al.*) apomicts have "a short term advantage" being compared to their bisexual relatives. That is why in young faunas and floras which come into existence within some territories getting free from glaciers or highly influenced by man the clonal races and species prevail in number.

4. It is clear that non-recombining forms (species, races *etc.*) are mainly produced by their closest bisexual relatives which use all the advantages of recombination obtained for a long time of evolution.

Bisexual species

5. Species consisting of males and females or hermaphroditic individuals are not so ephemeral, being compared to clonal forms. They are able to apply all the diversity of alleles accumulated by panmictic populations for composing some new combinations and therefore can exist for a longer time. However such a gift is not free of charge. Unrestricted shuffling the genes not only creates, but with highest probability destroys the best combinations of them. Therefore the offspring of being brought into life by even the most outstanding (=adopted) parents more often occur to be quite ordinary.

7. The genetic recombination in any bisexual species, if being investigated in detail, always shows that even in a typical "panmictic" population the free combining of hereditary characters does not proceed in a whole extent. Gene linkage and a variety of some particular mechanisms known to restrict the recombining (heterozygosity of inversions, suppressed or strictly localised crossing-over *etc.*) always make genome avoid complete mixing.

It seems to be surprising that replication of identical genotypes and recombination can occur in populations of the same species:

• in populations of *Daphnia* species the season-dependent interchange of bisexual and parthenogenetic generations is known to occur;

• in *Otiorrynchus* and some other species of Curculionidae there are two separate groups of geographic populations — the parthenogenetic (Scandinavia) and bisexual ones (valleys of Alps).

In the obligate bisexual species, the optimal balance of capacity for obtaining some new characters and preserving of those well-tested by natural selection is provided by joint effect of panmixis and crossing-over on the one hand, and stoppage of recombination in some definite parts of chromosomes, on the other hand. Therefore even here, one can observe some features of cryptic cloning in the conservative (locked for crossing-over) parts of the genome.