

**INTRASPECIFIC DIFFERENTIATION PHENOMENA
IN THE *APHANIUS DISPAR*-SPECIES-FLOCK
(TELEOSTEI : CYPRINODONTIDAE)**

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The *Aphanius dispar*-group is divided into two different subspecies, *A. dispar dispar* and *A. dispar richardsoni*, respectively. While the nominate populations are distributed from the Siwa Oasis/Egypt in the West to and around the Arabian peninsula, the Gulf of Iran to salt pits near Karachi/Pakistan in the East, the *richardsoni*-subspecies is restricted to the Dead Sea region of Jordan and Israel.

Numerous F₁- (hatched from controlled single pairmatings in 25 liter aquaria), F₂- and F_n-hybrids (about 35 different progenies) all showed fertility in the females, but remarkable differences in the degree of gonadal development and structure in males: Males of about 18 reciprocal *A. dispar dispar* interpopulation-crosses from 9 different origins showed more or less "normal" spermatogenesis, but the testes of hybrid-males between members of the different subspecies contained only a few tubules with ripe spermatozoa and many with different stages of meiosis, with spermatogenesis arrested before reaching "full maturity". Moreover, the different *A. d. dispar* x *A. d. richardsoni* F₁-males showed a reduced fecundity which means that only a few of them may successfully reproduce, the others remaining practically sterile. These results indicate that despite the genetic relationship between the two subspecies, there is already a high amount of incompatibility, supposedly caused by the progressive development of substitution genes and transfer of gene-functions (KOSSWIG, 1947) which may induce sterility on a lower structural level e.g. non-completing spermatogenesis, different types of hybrid-male sterility, etc. (VILLWOCK, 1964, 1982).

These results coincide with results of some investigations of enzyme-patterns, reflecting similar "borders" of intraspecific differentiation. Investigations on 20 different enzyme loci of 8 geographically distant (=separated) *A. d. dispar* populations and the Ain Fashka-population of *A. d. richardsoni* from the Israel border of the Dead Sea show more similarity in allele frequencies among the *A. d. dispar* populations group than among these populations and *A. d. richardsoni*. Such similarities or differences have already proved valuable for population and species discrimination in the past: see the material & methods in SCHOLL *et al.* (1978), VILLWOCK *et al.* (1983).

All these investigations confirm both, the common origin of the *A. dispar* species-flock and the different historical stages of their separation in at least two subspecies (the "sister species" of *A. sirhani* [VILLWOCK *et al.*, l.c.] may easily be integrated in this part of the discussion). According to KRUPP (1983) the *A. dispar* ancestors inhabited coastal regions of the old marine, middle-miocene transgression of present Mesopotamia. Their distribution from there started most probably in the end of the miocene or in the beginning of the pliocene. During pleistocene/holocene times, the separation of the *A. dispar* species-flock into separated but still large populations took place such that a bigger one reached the Jordan - Dead Sea valley, which later became a freshwater lake, named Lake Samra, that covered the rift valley from south of the present Dead Sea to the north of recent Lake Tiberias. Thereafter, Lake Samra shrank and developed into the brackish Lake Lisan. Towards the end of the third interpluvial period (called interpluvial C) Lake Lisan itself dried up by desertification so that the existing fish fauna, e.g. *Aphanius dispar*, were forced to move into the remaining bodies of freshwater around the developing Dead Sea. Isolated from the main populations since postglacial times, the Dead Sea *Aphanius dispar* started its development into the recent *A. dispar richardsoni* populations. The settlement of the southeastern Mediterranean by other *A. dispar* populations probably started already during the eustatic fluctuations of the sea-level during the different interpluvial times, passing the region of the Gulf of Suez and one arm of the old Nile estuary. All of these historical suggestions support the abovereported conclusions of a close genetic relationship on the one and the beginning genetic separation on the other, long and well described as species *in statu nascendi*.

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