

CONTRIBUTION ON NATURAL HYBRIDS BETWEEN TWO VALID SPECIES OF
APHANIUS (PISCES: CYPRINODONTIDAE) FROM THE BARDAWIL-LAGOON;
 NORTH SINAI, EGYPT.

by
 WOLFGANG VILLWOCK ¹⁾

Abstract: Since TORTONESE's publication (1947), in which he postulated the existence of natural hybrids in the Bitterlake Timsah, sited in the course of the Suez Canal, the question has been repeatedly asked if there really do exist species-hybrids between Aphanius dispar dispar (RÜPPELL, 1828) and A. fasciatus (HUMBOLDT & VALENCIENNES, 1821).

In 1983/1984 the author was able to catch a significant number of specimens from the extended Bardawil-Lagoon in the northern Sinai, Egypt, and from the Suez Canal region. The fish, especially those from the shallow waters of the Bardawil-Lagoon (n=165) were examined with respect to all available morphological characters as well as the histological structures of their gonads and also their enzyme patterns. As a result, it could be shown that the huge Bardawil population consists of A. dispar dispar (20♂♂/57♀♀) and A. fasciatus (19♂♂/20♀♀) as well as hybrids between both species (presumably 23♂♂/26♀♀). The same situation appears to exist in land-locked bodies of water within the Suez Canal region, although the counts of adult specimens obtained from there are not sufficiently high as to confirm this suggestion beyond all doubt.

The ecological reasons and evolutionary aspects concerning this single known occurrence of natural hybrids in Aphanius are discussed below.

During two visits to Egypt (1983, 1984) the opportunity was given to resort to several localities at which Aphanius was known to occur ²⁾.

Most of the authors reporting on these Old World fishes agree with the opinion that the recent Aphanius dispar dispar

1) Zoologisches Institut und Zoologisches Museum, Universität Hamburg, Martin-Luther-King-Pl.3, D-2000 Hamburg 13, Fed. Rep. of Germany.

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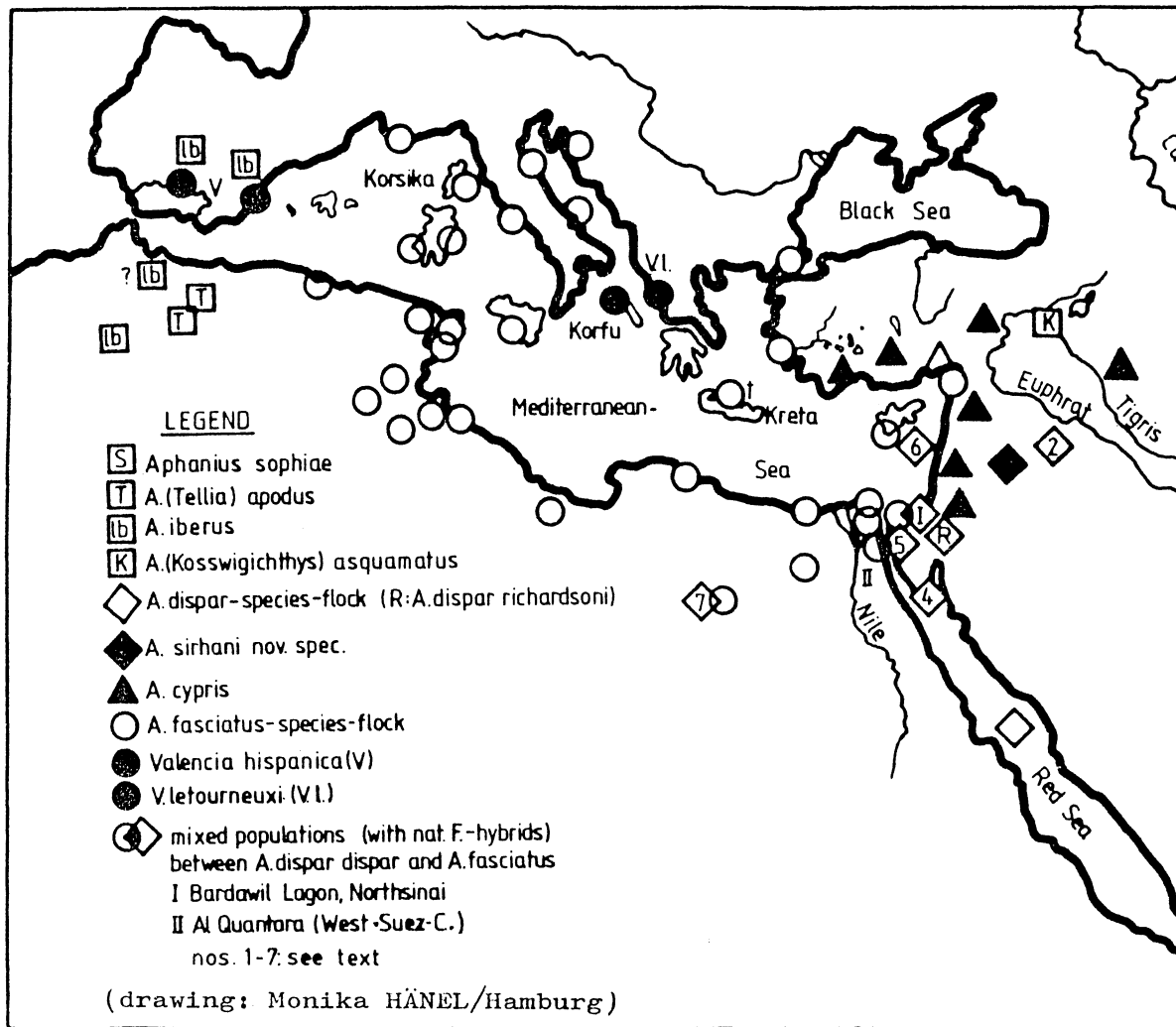
is the eastern relative of A. fasciatus. While A. dispar occurs mostly along the shores of the Arabian Peninsula, of Iran and Pakistan - except for some inland habitats of marine origin as far as to India in the east (YAZDANI & BHARGAVA, 1969) -, A. fasciatus is on the contrary mainly distributed in ancient and recent lagoons of the Mediterranean Sea, with the exception of Morocco and Spain, where a third species, A. iberus, is living in bodies of water similar to those of A. fasciatus further east (see fig. 1).

Even up to the present, some authors repeatedly mention the occurrence of A. fasciatus along the eastern Mediterranean shore of Palestine (HAAS & STEINITZ, 1947; STEINITZ 1951), or, in a more precise description, from Israel (LOTAN, 1982). The author himself could not verify this statement, but only found some disjunct populations of A. dispar dispar in lagoons and salines along the Israelie coast. Perhaps the confusion may derive from so-called exceptionally cross-barrred males of A. dispar, that exist, according to KRUPP (1983), in small numbers in some Arabian populations of this species.

For years now, A. dispar dispar has been known to occur in the extended Lagoon of Bardawil in the North Sinai, forming there a huge population in the shallow warm water (fig. 2). This occurrence of A. dispar in the southeastern Mediterranean became interpreted by several authors as an invasion from the Red Sea through the Suez Canal since its opening in 1869 (HAAS & STEINITZ, 1947; STEINITZ, 1951; BEN TUVIA, 1953; KOSSWIG, 1951, 1955).

As far as is known from literature, TORTONESE (1947) was the first author mentioning the possibility of natural hybridization between the two species in discussion, assuming, that this hybridization may have happened along the course of the Suez Canal itself, especially in the Bitter Lakes and Lake Timsah. A. fasciatus was said to have penetrated into the Suez Canal and reached the Lakes (TORTONESE, 1964).

During present travels to Egypt and additional controls by A. HANSEN (see footnote 2) TORTONESE's assumptions could not be confirmed. In numerous repeated samplings there only were found



numerous specimens of A. dispar dispar (fig. 4).

On the other hand, for several years it is well-known that the Bardawil Lagoon has not only been settled by a population of the above mentioned A. dispar, but by a remarkably large number of A. fasciatus as well (fig. 5).

Before the question may be answered, since when and from where the Bardawil population of A. fasciatus has been derived from, it seems to be worth to mention that apart from specimens of A. dispar dispar and A. fasciatus (which existed in ratios of 2:1 in 1983 to about 6:1 in 1984) F₁-hybrids between these species were found to about one third of the total number of specimens taken (c.f. fig.1, I).

The claim of hybrids at Bardawil was not only made with respect to their external characters, but could also be made on the basis of histological investigations of their gonad structures as well as on their enzyme patterns (VILLWOCK & SCHOLL, 1985: in press). First results on the before mentioned histological investigations of the assumed hybrids showed the same degree of gonad-sterility and -structures (especially in males) which were already described 20 years ago from different crossbred progenies between the same two species (VILLWOCK, 1964). Even the secondary sexual-characters of the hybrid-males were found to be very similar (c.f. figs. 6a/6b).

Most interestingly, a corresponding situation was found this year in the west of the Suez Canal within natural as well as artificial lagoons along the road from Ismailia to Port Said, about 10km north of Al Qantara (c.f. fig.1, II/5 and fig.3). In the latter case, the number of specimens belonging to A. dispar predominate greatly over those of A. fasciatus and other ones, again believed to be hybrids.

While the status of the Bardawil hybrids has already become confirmed, that of the latter is still under investigation.

The question which has to be answered, is that of the sympatric occurrence of A. dispar and A. fasciatus and the probable reasons for their natural inbreeding. In this connection it has to be remembered that within the Siwa Oasis region in the west o

figs. 2 - 6a/b:
2: Bardawil-Lagoon;
Port Said); 4-6a/b: m
F,- A.dispar x A.fasc
6⁻b: artificial hybri
All photos were taken
before a dark backgro
shot in a day-light c

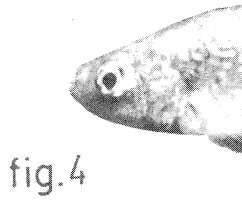
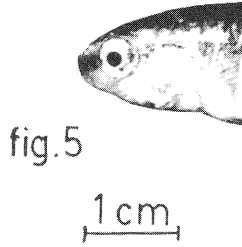


fig. 6



Egypt both species are living together, although in well separated and different habitats. If the interpretation of this western most distribution of A. dispar, according to which the recent situation was caused by a marine transgression during the last interglacial times, is correct, the additional question might be asked, if the southeastern Mediterranean populations of this species are really recent invaders of the Mediterranean or are remains from ancient periods. The scope of this contribution does not allow a sufficient discussion of this interesting problem, but allows only to point out that it is an unsolved one. However it is fact, that the results of all investigations that were carried out on all of the different A. dispar populations in discussion (fig. 1) showed genetic identity between them all (i.e. crossbreeding, enzyme patterns: VILLWOCK et al., 1983).

Most probably, the difference between the non-occurrence of natural hybrids in the Siwa Oasis and the appearance of numerous natural hybrids between these two species in lagoons west and east of the Suez Canal may best be explained by the different given situations. In the Siwa Oasis both species are microgeographically as well as ecologically separated, while in the lagoons around the Suez Canal both inhabit the same niches. Furthermore, there are no known isolating mating mechanisms, which might lead to sexual isolation, so that at least a more or less high number of F_1 -hybrids could come into existence by chance - up to now without any indication of a self-regulating hybrid population.

The question since when the possibilities for hybridization may have been provided in the lagoons of Bardawil and west of the Suez Canal may be answered by the following alternatives.

Supposed, the sympatric populations of A. dispar and A. fasciatus, as well as their hybrids, have not been overlooked since a long time, then the possibility might have been given that A. fasciatus already existed within these lagoons and only met recently invaded A. dispar. On the other hand, A. dispar may previously have inhabited the lagoons in discussion, and A. fasciatus most recently passed east of its regular North African tributary, being able to do so after the freshwater barrier of the Nil has broken down because of the damming of the river at Aswan in 1970. If the latter interpretation should be true, other littora

species of marine origin should also be expected to pass the now no longer existing barrier either eastward or westward, respectively. Further observations and investigations may help to decide this unsolved question.

Concerning the discussion remarks made by QUIGNARD/France with respect to the actual existence of A. fasciatus in the etangs west of Marseille the following statement can be made: During three different visits by the author no specimens of A. fasciatus could be found there. The registration of this localit in the distribution map was due to informations derived from literature (citation from collections). However, due to the recent situation that lots of Gambusia spec. are widely spread throughout all the etangs west of Marseille and due to the fact that Gambusia will displace Aphanius by competition wherever they were brought together artificially, it appears to be most probably that Aphanius became lost within the last decades (Gambusia was introduced to the Etang de Berre and those of the Camargue in the early thirties as far as is known to the author).

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