

# Remarks on the Suez Canal as pathway and as habitat\*

by

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The biological phenomena associated with the Suez Canal exist for not more than a hundred years. Although they are of great general importance, they have not been given the attention they deserve. However, it appears that a new phase of interest in this unpremeditated large-scale experiment is beginning. It is hoped that a preliminary discussion of some of the biological problems involved, will contribute to a more precise definition of the subject.

**1. Test of Immigration.** A list of marine organisms of Indo-Pacific or of Red-Sea origin, considered to have penetrated the Suez Canal and immigrated in the Mediterranean Sea, would probably comprise not less than 100 names. There might be some argument regarding the deletion of several of them, and the inclusion of additional ones. Whatever the outcome, there will be no dissension on a substantial deficiency of the list due to our ignorance of an unknown number of species which for many reasons, went unnoticed.

The compilation of a list of immigrants in the Mediterranean and in the Red Sea, respectively, is no easy affair. Judgement on whether the terms of reference have been met, is in certain instances rather difficult. Zoogeographers are frequently confronted with the question whether the absence of records reflects actual non-existence in some area or region. An example of the difficulty involved would be the discovery of an *AIPR* warm-water organism, in the Levant basin, somewhere near Cyprus. The case could be explained as one of the not yet noticed Tethys relics for which the mentioned distribution pattern is typical. But it could as well be claimed for the list of immigrants through the Suez Canal. The difficulty of decision in this and similar cases finds its expression in numerous publications. No doubt, the list of immigrants compiled by the present author but published elsewhere, will neither be accepted without reservations.

**II. Passage of RM Species.** It is worth pointing out that the accepted notion of immigrant lists can be challenged as unrealistic. The published lists (as also the one mentioned above as compiled by this author) include only such species as were never before reported from the Mediterranean Sea. However, there is ample evidence in other published reports that among the migrants proceeding from the Suez end of the Canal, there is a considerable number of species of the *RM*-group. On the movement of *RM*-species from the Mediterranean towards the Red Sea there is less published material, but it takes doubtlessly place. It must, then, be concluded that the organisms issuing from the Port Said opening of the Canal comprise *IP*- and *R*-species as well as *RM*-species. Introduction of individuals of species already represented in the involved area, is immigration at least from the numerical point of view.

**III. Passageway.** In thinking of the Suez Canal as of a link between the faunal realms of the Indian and of the Atlantic Ocean, we appreciate it as a passageway, which permits large-scale movement in two

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Note : *Italicized* capitals indicate : *A* Atlantic; *AIP* Atlanto-Indo-Pacific; *IP* Indo-Pacific; *M* Mediterranean; *RM* Red Sea and Mediterranean.

\* When this paper was submitted as manuscript, it included an appendix captioned *Tentative List of Immigrants via the Suez Canal*. For technical reasons, that part of the article could not be printed in the present publication. It will now appear separately, under the indicated title, in the *Israel Journal of Zoology*, **16** 3, pp. 166-169 (1967).

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opposite directions. A set of physical and chemical conditions interplays with the autonomous tendencies of the passing individuals, the net result being gradual advance within the channel, and, in the event, emergence of organisms, from the channel ends.

**IV. Habitat.** The notion of the passageway is but one aspect of the biological functions of the Suez Canal. Its function as a habitat is not less essential. It is a habitat of a very special kind : relatively recently established, its occupation by living organisms was a protracted process still going on. Drastic changes on the hand of man must have been followed by changes in occupancy and in population structure. Less drastic but almost uninterrupted human activities (Canal maintenance and traffic, and their concomitants) affect the living communities in other ways and dimensions. As the inhabitants respond to the changing environment they become themselves one or as many, factors in the changing habitat. The balance of forces, or influences — if at all existing — within the ecosystem of this habitat, is certainly a very delicate one, never lasting for long periods, easily disturbed to become replaced by another state of scarcely more stability. Failure to take account of this background deprives us of the hope to understand the role of the Canal as an inter-oceanic link. Being a habitat, the Suez Canal harbours populations of its own. They constitute the living counterpart of the abiotic background.

**V. Inhabitation. “ Age ” of Inhabitation.** In the present discussion, two different meanings of the term inhabitant must be distinguished. We have either individuals in mind, or species. When speaking of the duration of inhabitation on the part of a species, it is important to know the *age* of the inhabitant species, which would be the number of generations since settling. In terms of this scale, it is clear that the age of the present inhabitants of the Canal, varies widely. Even those which penetrated from the outside at the very first opportunity are, though staying for the same absolute length of time in the Canal, of different age on the strength of different lengths of generation. But among the inhabitants of the Canal must also be some whose age is not more than one generation. Other inhabitants disappeared : of them, some may have re-invaded the Canal at a later time.

Turning now from diversity of age in the assemblage of species populations, to the consideration of single species, their populations need also not be uniform in age; rather, they will be composed of several age groups. The reason for this is a matter-of-course : as infiltration into the Canal goes on, outside representatives of species which are already firmly settled in the Canal, join in.

**VI. Adaptation.** Now, the more the Canal is recognized as an *exceptional* habitat, the more the concept of adaptation to its peculiar conditions enters the picture, and since adaptation is linked to time and generations, the age of the inhabitants exposed to the Canal environment, becomes a cardinal issue. Inasmuch as the total population of one species is composed of varying age groups, are we faced with different levels of adaptation in one and the same species.

**VII. Features of Transmigration.** The conclusion just reached gains particular significance as we direct our inquiry to the importance of the Canal for the transfer of plants and animals into still another habitat, the Mediterranean Sea and the Red Sea, respectively. Among the individuals reaching the goal, there may be those which passed the whole length of the route from one sea to the other. We assume that these are rare incidents. The majority of immigrants are descendants of the settled communities of the Canal, that is, of populations which in adjusting themselves to the Canal environment, underwent certain changes in their make-up. It is in this new make-up that they enter “the other sea”. And the chances are as we have pointed out, that more than just one make-up will make its appearance in one and the same migrating species, because one and the same species may include inhabitants of different ages.

**VIII. Confrontation of “ Old-Timers ” with “ Newcomers ” of same species.** At this point we have to refer to an earlier section of this paper (II). It has been stated there that among the wanderers entering the Mediterranean area at Port Said, *newcomers* will be found which however, belong to species already represented in the invasion area (*M*-species). We have also found that the great majority of all the immigrants are descendants of established Canal populations, which means that they can be expected to differ from individuals of this species living in the Red Sea. Moreover, the Canal populations are themselves not uniform in age and adaptation level. What takes place, therefore, in part, in the invasion area, is a confrontation of the local *M*-population with an unhomogeneous aggregate of individuals of the same species that underwent varying degrees of adaptation. If reproductive mixing takes place (and this is taken for granted), the product is conditioned, *inter alia*, by adaptive characters acquired in an environ-

ment which is extraordinary, by any standard. How a fairly stabilized population ( $M$ ) will be affected by the ingress of sets of these new characters, in other words, what the effect will be in the sense of evolution, can not be discussed here.

### References

- GOHAR (H.A.F.), 1954. — The place of the Red Sea between the Indian Ocean and the Mediterranean. *Hydrobiol., Istanbul*, **2**, 2-3, pp. 47-82.
- GRUVEL (A.), 1936. — Contribution à l'étude de la bionomie générale et de l'exploitation de la faune du canal de Suez. *Mém. Inst. Egypte*, **29**, viii-245 p.
- STEINITZ (W.), 1929. — Die Wanderung indopazifischer Arten ins Mittelmeer seit Beginn der Quartärperiode. *Int. Rev. Hydrobiol.*, **22**, pp. 1-90.
- Zoological results of the Cambridge expedition to the Suez Canal, 1924. *Trans. zool. Soc. Lond.*, **22**, 6 pts, x-873 p. (1926-1929).

