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The taxonomy and ecology of the chaetognaths  
in the epipelagial of the North West African  
upwelling region

by

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Summary

The different water bodies in the region investigated off NW Africa can be characterised and delineated by analysing the chaetognath fauna. The highest chaetognath abundancies were encountered in highly productive regions (tropical coastal water, nutrient-rich upwelling water). Regions with a low bio-productivity level, in contrast, were only slightly colonised. *S. tasmanica*, *S. minima* and *S. decipiens/neodecipiens* were found to inhabit cold upwelling water. *S. enflata*, *S. hispida* and *K. mutabii* could be used as indicators for tropical water.

Résumé

Par l'analyse de la faune de chétognathes devant le nord-ouest de l'Afrique est possible une caractérisation et une délimitation des corps aquatiques de la région étudiée. Des abondances maximales de chétognathes se trouvaient dans les régions à productivité élevée (eaux côtières tropiques, eaux de force ascensionnelle riches en substances alimentaires) tandis que les régions avec une bioproduktivité faible étaient seulement peu peuplées. *S. tasmanica*, *S. minima* et *S. decipiens/neodecipiens* se sont avérées comme représentants des eaux de force ascensionnelle froides. *S. enflata*, *S. hispida* et *K. mutabii* pouvaient être employées comme indicateurs des eaux tropiques.

The investigations on the distribution and ecology of the chaetognaths occurring in the upwelling water and the adjacent water bodies commenced in 1973 using material from a network of closely spaced stations off Cap Blanc ( $20^{\circ}40'$  -  $22^{\circ}45'$  N) were continued by studies encompassing a large region off North West Africa. The region investigated consists of seven zonal transects between Bahia de Garnet and Cap Verga. The samples were taken during seven voyages undertaken from 1970 to 1974 by the research ship "A.v.Humboldt" at various times of the year.

The samples were taken by means of a UNESCO Standard Closing Net Type II (FRASER, 1968) from three depth ranges of 0 - 25 m, 25 - 75 m and 75 - 200 m respectively. The mesh size of the net was 200  $\mu$ m. The samples were fixed on board by means of 4 % formalin buffered by carbonate.

As a result of taxonomic studies, 16 chaetognath species or groups of species which differed from each other by their specific horizontal and vertical distributions or by their tolerances with regard to a number of environmental parameters could be distinguished. It was not possible to finally settle the question of the taxonomic status of *S. bierii* and *S. tenuis* by means of the meristic studies which were undertaken. Our investigations necessitate the revision of the boundaries governing the distribution of *S. tasmanica* and *S. regularis*.

The chaetognath population of the upper 200 m could be split into a subpopulation inhabiting relatively cold and another inhabiting relatively warm water on account of their temperature and salinity requirements. This categorisation is based on the distribution of abundancies in the T-S diagram, the  $20^{\circ}\text{C}$  isotherm serving as an approximate boundary. A third additional neutral group which, as a result of the relatively great tolerance of the animals with regard to abiotic environmental parameters, was almost evenly distributed with regard to abundance over the T-S diagram could also be distinguished.

In order to determine the most important environmental parameters governing the distribution of the chaetognaths, the

effects of 10 abiotic and 7 biotic factors for which correlations had been found were subject to closer scrutiny. It was found that the temperature, salinity, phosphate content and zooplankton biomass are the decisive factors.

The highest chaetognath abundancies were encountered in water with a relatively high zooplankton density, that is in the nutrient-rich upwelling region and in the highly productive region of southern coastal area. The lowest chaetognath abundancies were found in waters with a low bioproduction level as characterised in the region investigated by the northern upwelling region and the tropical surface water. A broad assessment of the ecology of the species found in the region investigated was undertaken on the basis of characteristic data compiled for each species in the form of an animal-geographical/ecological table. There is some justification in the use of six species (*S. hispida*, *S. enflata*, *K. mutabii*, *S. tasmanica*, *S. minima* and *S. decipiens/neodecipiens*) as hydrographic indicators.

It was possible to characterise and delineate the different water bodies in the region investigated by the combination of indicator species, dominant chaetognath species and the standard abundance ratios. This made it possible to detect changes in the standard abundance ratios which could then be used to detect hydrographic changes such as the mixing of different water bodies, active upwelling, the intrusion of foreign water masses etc.

The dominant chaetognath species in the cold water upwelling region were *S. friderici*, *S. tasmanica* and *S. minima*. *S. tasmanica* served as an indicator since this species could be closely correlated to the relatively "young stable" upwelling water. The two species *S. decipiens/neodecipiens* which colonised cold water upwelling regions virtually independently of the nutrient content also indicated the presence of a cold upwelling water body.

Cold water upwelling regions with a low nutrient content were indicated by *S. minima* and this was corroborated by the

occurrence of *S. decipiens/neodecipiens*. The dominant species were *S. minima*, *S. serratodentata*, *S. tasmanica* and *S. friderici*.

None of the chaetognath species was so closely bound to the water of the north equatorial current (Canaries current) that it could be used as an indicator species. The joint occurrence of *S. minima*, *S. serratodentata*, *S. lyra* and *S. hexaptera* together with the virtual absence of neritic species was, however, characteristic.

*S. enflata* and *K. mutabii* were found to be indicator species for tropical water. *S. enflata* was simultaneously the dominant species in this water body and was followed, with regard to abundancies, by *S. serratodentata*, *K. subtilis* and *S. hispida*.

The highly productive tropical coastal water was characterised by the occurrence of *S. hispida* accompanied by *S. friderici* and *S. enflata*.