Arab Gulf J. Scient. Res., Agric. Biol. Sci., **B5** (3), pp. 455-462 (1987)

Morphological Variations of *Tubularia crocea* (Agassiz, 1862) (Hydrozoa: Tubulariidae) in Egyptian Harbours

Fayez A.M. Shoukr and Mohamed E. Abdel-Hamid

Department of Zoology, Faculty of Science, Tanta University, Tanta, Egypt.

ABSTRACT. The gymnoblastic hydroid *Tubularia crocea* (Agassiz, 1862) was prominent among fouling communities in the Egyptian harbours at Alexandria, Port-Saied and Port-Taufiq. This hydroid showed morphological variation in the number of oral and aboral tentacles, and gonophores. These variables were significantly and positively correlated with the length of the hydroid. In spite of the morphological variation of this species, its identification is reliable and there is no need to construct a new species.

Hydroids are frequently observed among the fouling communities on ship's bottoms and harbour installations in Egypt. Thirteen species of gymnoblastic and calyptoblastic hydroids have been recorded among the fouling organisms (Abdel-Hamid *et al.* 1984 and Shoukr *et al.* 1984). The gymnoblastic hydroid *Tubularia crocea* is widespread in Egyptian seas (Shoukr 1982). Morphological variation in this hydroid throughout the year suggests that more than one species might be present. *T. crocea,* like *T. individsa,* develops a single polyp from one actinula larva. Therefore, it is a solitary hydroid living in clumps and not a modular (colonial) hydroid. Fenchel (1905) made a very careful study on the variability of specific criteria in the genus *Tubularia.* He stated that twenty two forms of *Tubularia* described previously as separate species were all referable to *Tubularia larynx.* Rees (1963) and Brinckmann-Voss (1970) considered that *Tubularia polycarpa* and *T. mesembryanthemum* were synonymous with *T. crocea.*

The aim of this paper was to investigate morphological variation in *T. crocea* in Egypt and to show that insufficient study of variation in specific characters of a hydroid may lead to errors in identification and unnecessary description of new species.

Materials and Methods

Samples of the hydroid *T. crocea* were collected from the Egyptian harbours at Alexandria, Port-Saied and Port-Taufiq from Feb. 1980 to Jan. 1981. The hydroids were narcotized with magnesium sulphate to prevent shrinkage following fixation and preservation in 5% sea-water formalin. Clumps of this species were separated into single individuals and the stem length of the isolated hydroids were measured. The oral and aboral tentacles on 53 hydroids and the gonophores on 44 hydroids, randomly selected from Alexandria harbour, were counted and the relationship between these variables and hydroid length examined by linear and non-linear regression analysis (Spiegel 1972, Bishop 1974 and Walpole 1976).

Results

Description of Tubularia crocea

The hydranth of *Tubularia crocea* has filiform tentacles arranged in two whorls, one oral and one aboral. The polyps appear as aggregate individuals forming clumps with occasionally false ramification. The perisarc of the hydrocaulus is slightly annulated at its origin from the stolon and at irregular intervals along the stem. The coenosarc forms a collar under the hydranth base. The aboral tentacles are more numerous than oral ones. The sexes are separate and gonophores grow in long unbranched racemes. The male gonophores are round or oval and devoid of apical tentacles. The female gonophores are elongate and characterized by 4 to 8 laterally compressed apical tentacles which surround the spadix (Pl. I A and B).

Morphological Variables

The hydroid *Tubularia crocea* exhibits much morphological variation in Egyptian water. The variation included the stem length of polyps, the number of oral and aboral tentacles and the number of gonophores. The relationships between these variables, are shown in Figs. 1, 2 and 3. The equations for the regression of hydroid length (x) on tentacles and gonophores numbers (y) and of tentacles and gonophores numbers (y) on hydroid length (x) are calculated and regression lines are drawn on the figures. There is an upper limit to all variables. Oral & aboral tentacles and gonophore numbers reaching to 22, 28 and 16 respectively. The individuals length is up to 120 mm. The correlation coefficients (0.755, 0.751, 0.752 respectively) indicate that as *Tubularia crocea* grows, there is a linear increase in the number of tentacles and gonophores. The hypothesis that the data show a non-linear trend was tested by non-linear regression and rejected.

Tubularia crocea in Alexandria harbour are larger and have more gonophores than hydroids from Port-Saied and Port-Taufiq (Table 1). These differences seem

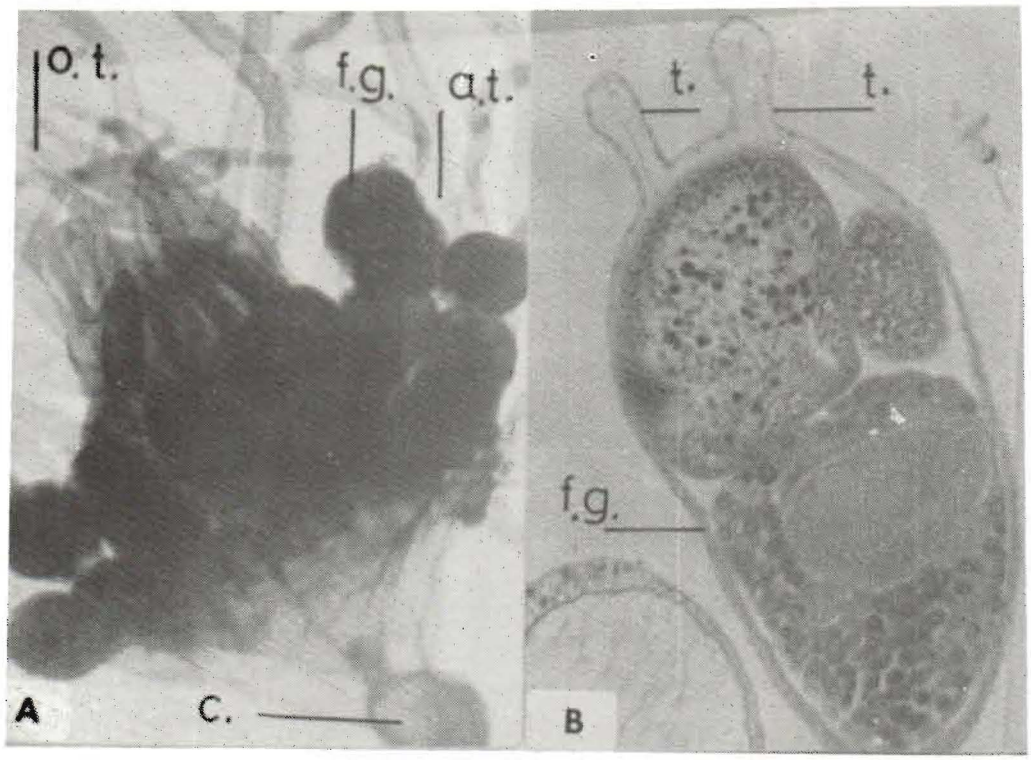

Plate 1

A. Mature female hydranth of *Tubularia crocea*. X 32
a.t., aboral tentacle; c., collar; f.g., female gonophore; o.t., oral tentacle.

B. Female gonophore of *Tubularia crocea* showing laterally compressed tentacles (longitudinal section). X 160
f.g., female gonophore; t., tentacle.

to be related to seasonal variation. The actinula larvae have 0-4 oral tentacles and 5-8 aboral tentacles. These larvae often settle on the stems and hydrorhiza of their parents and the subsequent growth produces a sort of false branching.

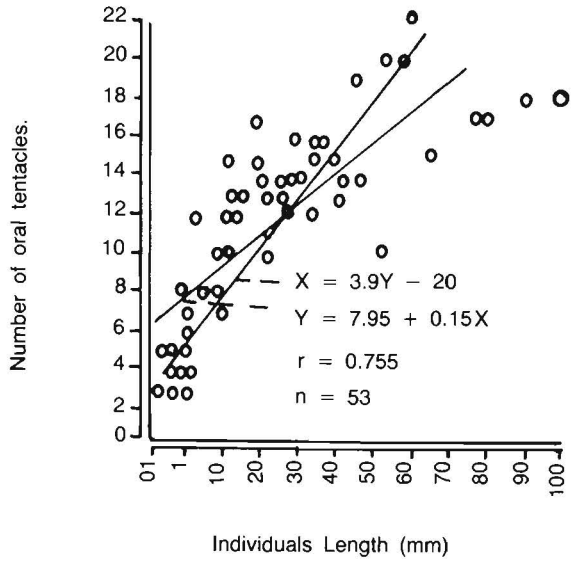

Fig. 1. The relationship between the length of individuals and the number of oral tentacles in *T. crocea*.

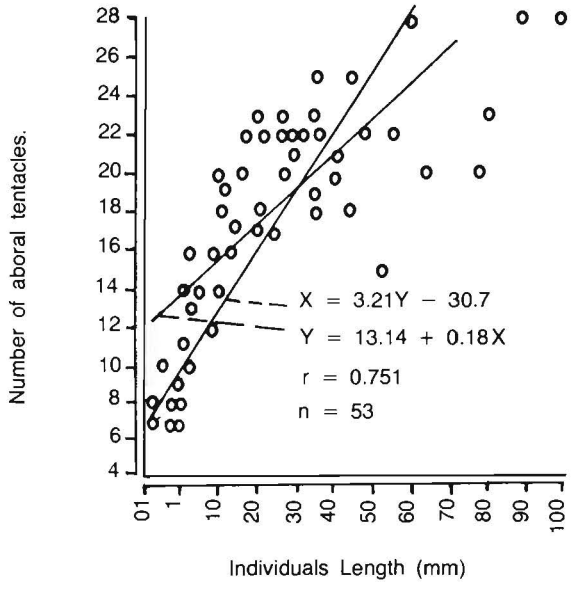

Fig. 2. The relationship between the length of individuals and the number of aboral tentacles in *T. crocea*.

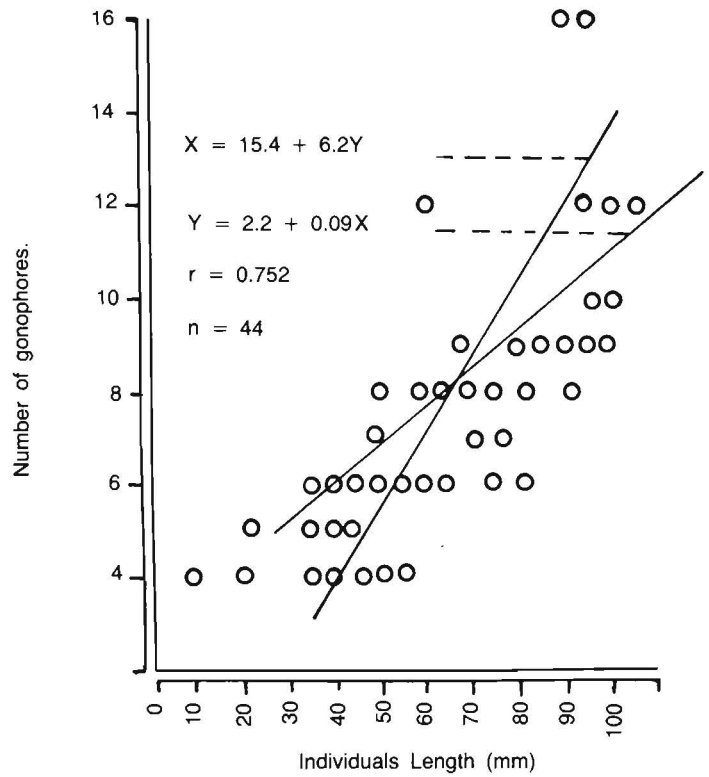

Fig. 3. The relationship between the length of individuals and the number of gonophores in *T. crocea*.

Table 1. Morphological variations of *Tubularia crocea* from different Egyptian harbours.

Variables	Alexandria harbour	Port-Saied harbour	Port-Taufiq harbour	Total variation
Polyps length	0.3 - 120	7 - 46	0.7 - 60	0.3 - 120
Tentacles no.				
Oral	3 - 22	8 - 16	3 - 20	3 - 22
Aboral	7 - 28	12 - 24	7 - 22	7 - 28
Gonophores no.	4 - 16	4 - 6	4 - 6	4 - 16
Mature polyps length:	15 - 120	18 - 46	18 - 60	15 - 120
Immature polyps length:	0.3 - 100	7 - 25	0.7 - 53	0.3 - 100
No. examined	917	54	58	1029
Date of collection	Feb. 1980 - Jan. 1981	Sept. 1980	Oct. 1980	Feb. 1980 - Jan. 1981

N.B. All measurements are in millimeters.

Discussion

Tubularia crocea is a tubularian hydroid with a cosmopolitan distribution in warmer waters (Rees 1963). There is much variation in the morphology of this hydroid in Egyptian harbours throughout the year. Many authors have been confused in their identification of hydroids for lack of detailed studies of such variation. Brink (1925) stated that the weak point of hydroid systematics was based on the fact that the study of the variability of external characters has not been taken into consideration in the discovery and description of new species. Fenchel (1905) showed that some forms of *Tubularia* that were described as new species (*e.g. T. coronata, T. bellis, T. humilis* and *T. polycarpa*) were in fact, *Tubularia larynx*. The same author pronounced that such error in identification occurred as result of insufficient notice been given to variability in specific characters. Hawes (1955) mentioned that the hydroid *Tubularia bellis* differs from *T. larynx* only in the height of the colony. Furthermore, Hughes (1983) showed that the hydroid *Tubularia ceratogyne* is merely a form of *Tubularia indivisa*.

Taxonomy of the genus *Tubularia* is based on colony branching, number of oral and aboral tentacles and annulation of the perisarc (Fraser 1937). Specific characters of hydroids are subject to much variation within the same species. Many *Tubularia* species apparently correspond to *T. crocea* when morphological variations are taken into consideration.

The colonies of *T. crocea* in Egypt appear unbranched or with false branching resulting from settlement and growth of actinula larvae on the parent stems and hydrorhizae. In such a condition the infertile hydroid may be confused with *T. larynx*. The ranges in the numbers of the oral (3-22) and aboral (7-28) tentacles of *T. crocea* encompass those found in other species such as *T. marina, T. polycarpa* and *T. mesembryanthemum*. Other specific characters, such as the presence of a collar under the hydranth and shape of male and female gonophores, are also similar in these species. Thus, the species *T. marina* (described by Fraser 1937), in addition to *T. polycarpa* and *T. mesembryanthemum* (described by Allman 1871), is synonymous with *T. crocea* (Rees 1963 and Brinkmann-Voss 1970).

It is obvious that the morphological differences in *T. crocea* in the Egyptian marine water reflect seasonal and ecological variation in growth and gonophore development (Abdel-Hamid *et al.* 1983). With respect to the morphological variations of this hydroid, its identification is constant and does not lead to the erection of new species.

Acknowledgment

The authors are indebted to Dr. M.R.M. Abd-Alla and Dr. A.M. Anwar,

Mathematics Department, Faculty of Science, Tanta University, Egypt, for their valuable discussions in statistical analysis.

References

Abdel-Hamid, M. Mona, M. and **Shoukr, F.** (1983) Seasonal variations of growth and sexual maturity for *Tubularia crocea* (Cnidaria: Hydrozoa) in the Eastern Harbour of Alexandria, *Delta J. Sci., Tanta University* **7(2):** 713-733.

Abdel-Hamid, M., Mona, M., Shoukr, F. and **Seif, A.** (1984) Check list of some Hydroids in marine fouling in Egyptian waters *J. Fac. Sci., Ain Shams University.*

Agassiz, L. (1862) Contribution to the Natural History of the United States, *Acalephae* **4:** 1-380.

Allman, G.J. (1871) *A Monograph of the Gymnoblastic or Tubularian Hydroids* Ray Society, part II, London, 450 p.

Bishop, O.N. (1974) *Statistics for Biology,* Longman Group Limited, 2*nd. ed.*, London, 213 p.

Brinckmann-Voss, A. (1970) Anthomedusae/Athecatae (Hydrozoa, Cnidaria) of the Mediterranean, *Fauna Flor Golfo Napoli,* Monogr. **39:** 1-96.

Brink, R. (1925) Notes concerning the variability and the action of environmental influences on the structure and growth of the hydroid colony *Bougainvilli ramosa* and its bearing on systematics, *Proc. Acad. Sci. Amst.* **27:** 1-10.

Fenchel, A. (1905) Uber *Tubularia larynx* Ellis, *Rev. Suisse Zool.* **13:** 507-580.

Fraser, C.M. (1937) *Hydroids of the Pacific Coast of Canada and the United States,* University of Toronto Press, pp. 50-54.

Hawes, F.B. (1955) Notes on the variation occurring in *Tubularia larynx* Ellis, *J. Mar. Biol. Ass. U.K.* **34:** 333-346.

Hughes, R.G. (1983) The life history of *Tubularia indivisa* (Hydrozoa:: Tubulariidae) with observations on the status of *Tubularia ceratogyne, J. Mar. Biol. Ass. U.K.* **63**(2): 467-480.

Rees, W.J. (1963) *Tubularia crocea* Agassiz in British waters, *Nature* **197:** 4873/1223.

Shoukr, F.A.M. (1982) *Studies on some coelenterates (cnidarians) inhabiting marine Egyptian water,* Ph.D. Thesis, Fac. Sci., Tanta University, Egypt, pp. 1-225.

Shoukr, F., Mona, M. and **Bayoumi, B.** (1984) Pycnogonids (Chelicerata: Pycnogonida) associated with fouling hydroids from the Mediterranean Coast of Egypt, *Mansoura Sci. Bull.* **11:** 67-78.

Spiegel, M.R. (1972) *Statistics,* McGraw - Hill Book Company, London, 359 p.

Walpole, R.E. (1976) *Elementary Statistical Concepts,* Macmillan Pub. Co., New York, 231 p.

Received 31/1/1987;
in revised form 16/03/1987)

التغيرات المورفولوجية لهدر من عاريات البراعم في بعض الموانيء المصرية

فايز عبدالمقصود شكر و محمد علوي عبدالحميد

قسم علم الحيوان ـ كلية العلوم ـ جامعة طنطا ـ طنطا ـ مصر

ينتشر الهدر اللاسع العاري البراعم تيوبيولاريا كروسيا بين كائنات الحشف البحري في الموانيء المصرية بالإسكندرية وبور سعيد وبور فؤاد. وتتغير الخواص المورفولوجية لهذا الهدر على مدار العام. وأوضحت الدراسة الحالية إختلاف أعداد اللوامس الفمية ومقابل الفمية من ٣ إلى ٢٢، ومن ٧ إلى ٢٨ على التوالي. وبالإضافة إلى هذا تغيرت أعداد بوليات التناسل من ٤ إلى ١٦. وارتبطت هذه المتغيرات مع طول الأفراد إرتباطاً ذا أهمية حيث أظهرت زيادة موجبة وذلك بعد حساب معاملات الارتباط ومعادلات التراجع. واستنتج على أنه بالرغم من الإختلافات المورفولوجية للخواص المميزة لهذا الهدر فإن تعريفه ثابت ولم يؤد إلى بناء أنواع أخرى جديدة، ولذا يُوصى بأن يؤخذ في الحسبان مراعاة إلا ختلافات المورفولوجية ذات الأهمية التصنيفية لهذه الأحياء البحرية عند تعريف أنواع جديدة حتى لا يحدث إلتباس في التعريف.