Table 1. Actual and calculated values of number of nodules on pigeonpea plant due to inoculation with the wild type strain and its Azi^r mutants as single or mixed cultures. (Values mean of 20 plants in 10 leonard jars)

Single strain inoculation			Mixed strain inoculation		
				No. of nodules formed	
Strain	Genotype	No. of nodules formed	Strain	Actual	Calculated†
ARS39(w)	wild	12 8			
Azi5	mutant	41 5**	W+Azi5	12.5*	27.2
Azi30	mutant	22 0	W+Azi30	14.0	17.4
Azi36	mutant	12.5	W+Azi36	18.7	12.7
Azi50	mutant	27.3*	W+Azi50	12.8	22.1
Azi51	mutant	23.5	W+Azi51	19.4	18.2
Azi52	mutant	8.0	W+Azi52	32.0**	10.4

SEM = 7.1, LSD $P<0.05 = 14.4$, $P<0.01 = 19.2$.

†Values mean of nodules produced by each strain as single strain inoculant.
*&** Significant at $P<0.05$ and $P<0.01$ respectively.

ARS39 and its six spontaneous azide-resistant mutants were examined for their ability to nodulate pigeonpea cv. Pusa 33 as single cultures as well as in pairs with the wild-type strain. Mutants were isolated through different experiments by plating 0.1 ml stationary phase cell suspension (10^3–10^8 cells ml^{-1}) on yeast extract L-arabinose agar containing $>36\,\mu g$ NaN_3 ml^{-1}. Sporadic colonies, which appeared after seven days were checked for purity and resistance to higher concentrations of sodium azide. All the six mutant strains used in this study were resistant up to 200 μg NaN_3 ml^{-1} medium and retained this resistance even after the plant passage. The inoculum mixture contained equal number of cells of each strain and the total population was 10^8 cells ml^{-1}, equivalent to the population in single strain inoculum. The study was conducted in replicated Leonard jars[6], under bacteriologically controlled conditions in glasshouse during the monsoon season.

Examination of roots after 30 days of sowing revealed that the number of nodules formed by two mutants (Azi5 and Azi50) were significantly more than the nodules formed by the wild type strain (Table 1). Among mixed inoculation treatments, a combination of wild type strain and Azi52 produced significantly more nodules than formed by two strains individually. Since the ratio between wild type and mutant strains in the inoculum mixture was 1:1, theoretically each strain should get equal opportunity of infecting the roots and total number of nodules should be equal to the mean of number of nodules formed by two strains when inoculated individually. The significant deviations in nodule number by the mixture of wild type and Azi52, and wild type and Azi5 show that there was interaction between the two inoculant strains, which affected the total nodulation. Though the total number of nodules on the roots is controlled by the host plant[7], it appears that the cumulative effect of interactions between the strains in mixed population, also stimulate or inhibit the total nodulation on root system.

1. Dowling, D. N. and Broughton, W. J., *Annu. Rev. Microbiol.*, 1986, **40**, 131.
2. Purchase, H. F. and Nutman, P. S., *Ann. Bot. N. S. W.*, 1957, **21**, 439.
3. Diatloff, A. and Brockwell, J., *Aust. J. Exp. Agric., Anim. Husb.*, 1976, **16**, 514.
4. Winaro, R. and Lie, T. A., *Plant Soil*, 1979, **51**, 135.
5. Handelman, J. and Brill, W. J., *Appl. Environ. Microbiol.*, 1985, **49**, 818.
6. Vincent, J. M. (ed), *A Manual for the Practical Study of the Root Nodule Bacteria. International Biological Programme*, Blackwell Scientific Publications, Oxford, 1970.
7. Kosslak, R. M. and Bohlool, B. B., *Plant Physiol.*, 1984, **75**, 125.

Received 30 October 1992; revised accepted 31 March 1993

An unusual giant pycnogonid (Pycnogonida–Colossendeidae) *Decolopoda qasimi* sp. nov. from Antarctic waters

V. Jaya Sree, R. A. Sreepada and A. H. Parulekar
National Institute of Oceanography, Dona Paula, Goa 403 004, India

Five specimens of benthic pycnogonids collected from the Southern Ocean are described. Of these, two are identified as *Nymphon australis* (Hodgson) and two as *Ecleipsotherma spinosa* (Hodgson). One specimen under the class Colossendeidae, is described as new to science, *Decolopoda qasimi*, sp. nov.

THE pycnogonid fauna of the Southern or the Antarctic Ocean is reportedly richer than the Arctic and includes a large assemblage of the world's polymerous species[1,2]. Colossendeids and Nymphonid species are commonly known from this region and 14 genera and approximately 100 species have, so far, been reported[3–13]. Gigantism amongst the species and even in some genera is a marked character of the Antarctic pycnogonid fauna. Eights[14] described the first ten-legged form, *Decolopoda australis* from the South Shetlands. A 12-legged species was reported as *Sexanymphon mirabilis*[1]. The naturalists considered this to be an error of observation until the expedition of BANZAR when a polymerous form was obtained[7].

The material which formed a part of the benthic biota was collected by bottom sampling gears, between lat. 69°54'S and long. 12°49'E, during the X Indian Scientific Expedition to Antarctica (November 1990 to March 1991). The pycnogonids were hand-picked in the laboratory, when the benthic samples were being sorted out for taxon composition. Of the five specimens, two each could be identified as *Nymphon australis* (Hodgson) and *Ecleipsotherma spinosa* (Hodgson) respectively. The remaining specimen, which was large with 10 legs, could not be compared with the already known species of pycnogonids, and therefore, it is described here as a new species, under the genus, *Decolopoda*.

Decolopoda qasimi, sp. nov. (Figures 1 to 3)

Material. One specimen, male.

Type locality. Lat 69° 54' S and Long. 12° 49' E; Queen Maud Land Coast. East Antarctica. Depth 150 m. The biotic coinhabitants are large hexactenellid sponges, gorgonians and sea cucumbers. Type of bottom deposits—sand, coral debris and bryozoan fragments.

Description. Trunk somites fused and without any tubercles or spines. Proboscis oblong, directed downward, wider at the anterior tip, longer than the trunk, which is typical for an epiphytic form to feed on corals and bryozoans. The eyes are faintly discernible with the eye tubercle not so high, rounded and bearing two minute protuberances one on each side near the apex. Cephalon with well marked neck. Chelifore with 3 segments, palps with 9 segments, ovigerous leg with 9 segments bearing no ornamentations or spines on the surface. The 'strigilis' ornamented with denticulate spines, numbers 5, 4, 4, 3. Abdomen straight, tapering and with no spines. Legs slender, all over covered with hair. The second ambulatory leg with 9 segments, femur 330 mm and the length of the 5 pairs of legs are all the same.

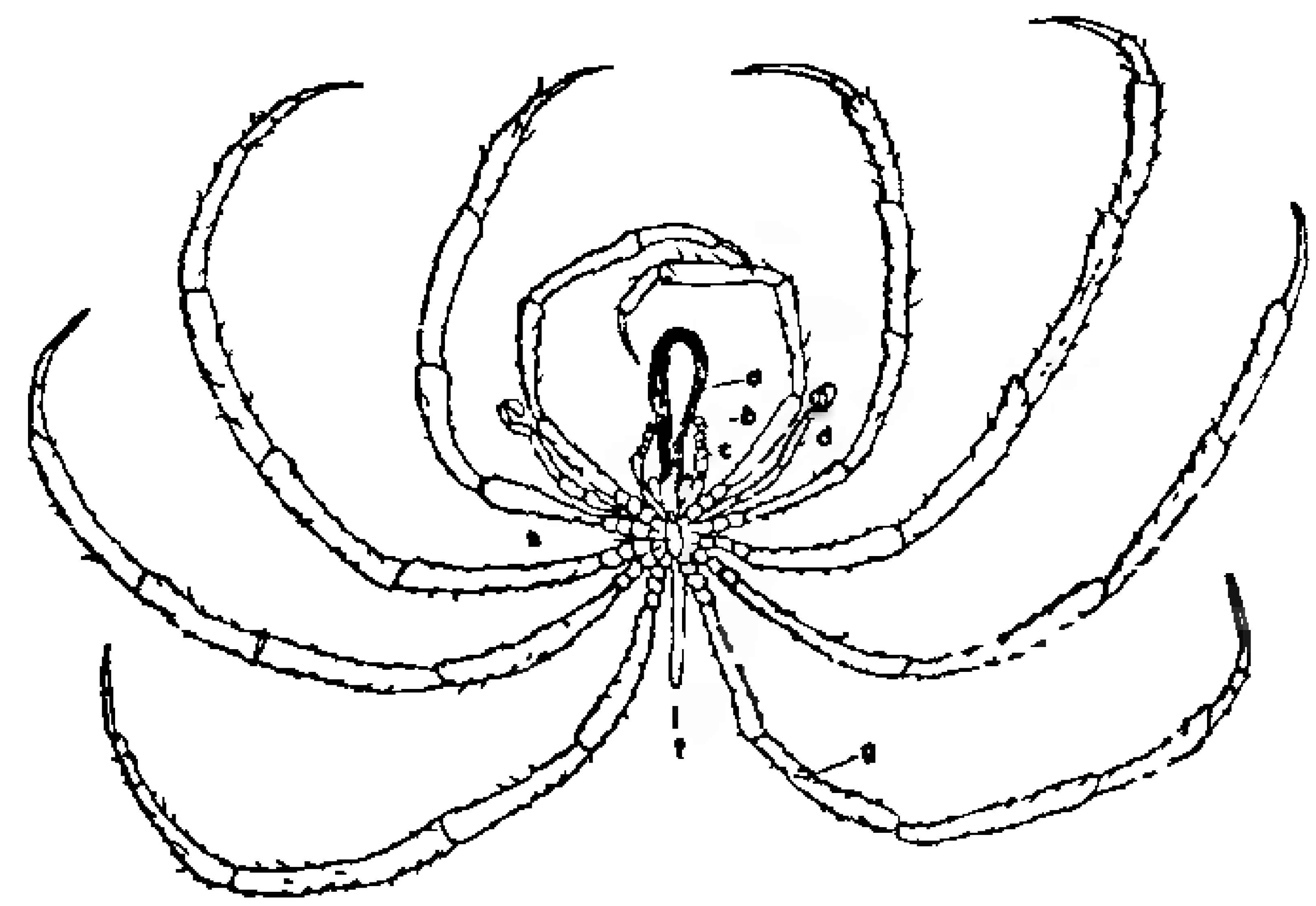

Figure 2. Dorsal view of *D. qasimi*, sp. nov. (nat. size). a-proboscis; b-palp; c-cheliphore; d-ovigerous leg; e-trunk; f-abdomen; g-hair.

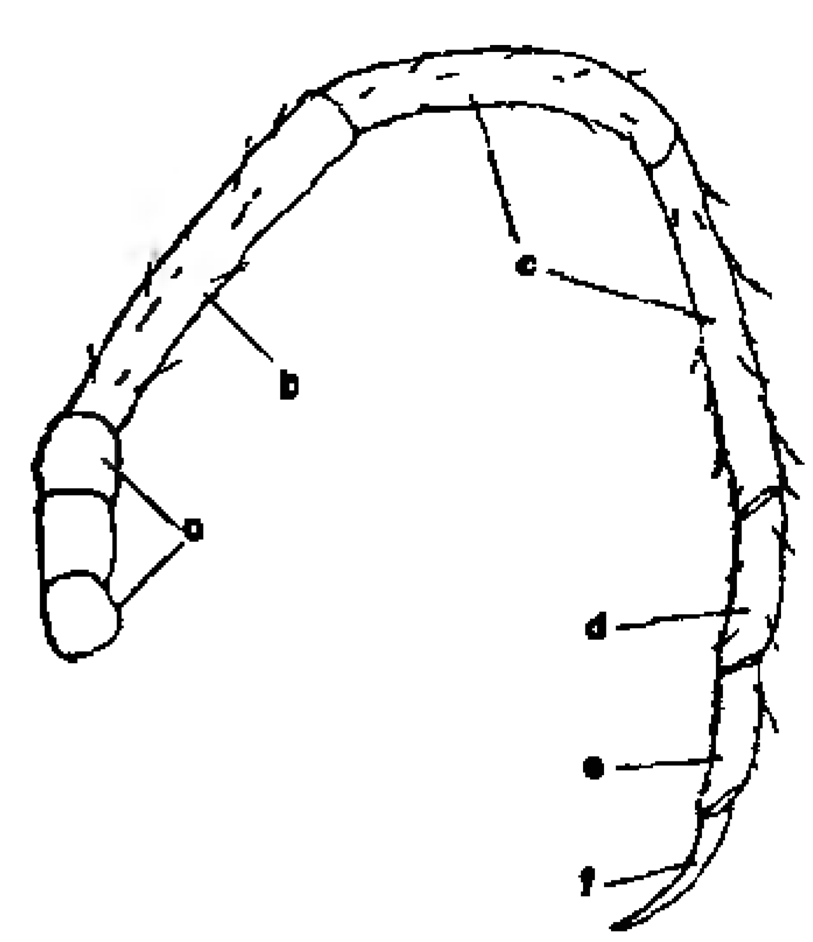

Figure 3. The ambulatory leg of *D. qasimi*, sp. nov. a-coxae; b-femur; c-1st & 2nd tibia; d-tarsus; e-propodus; f-claw.

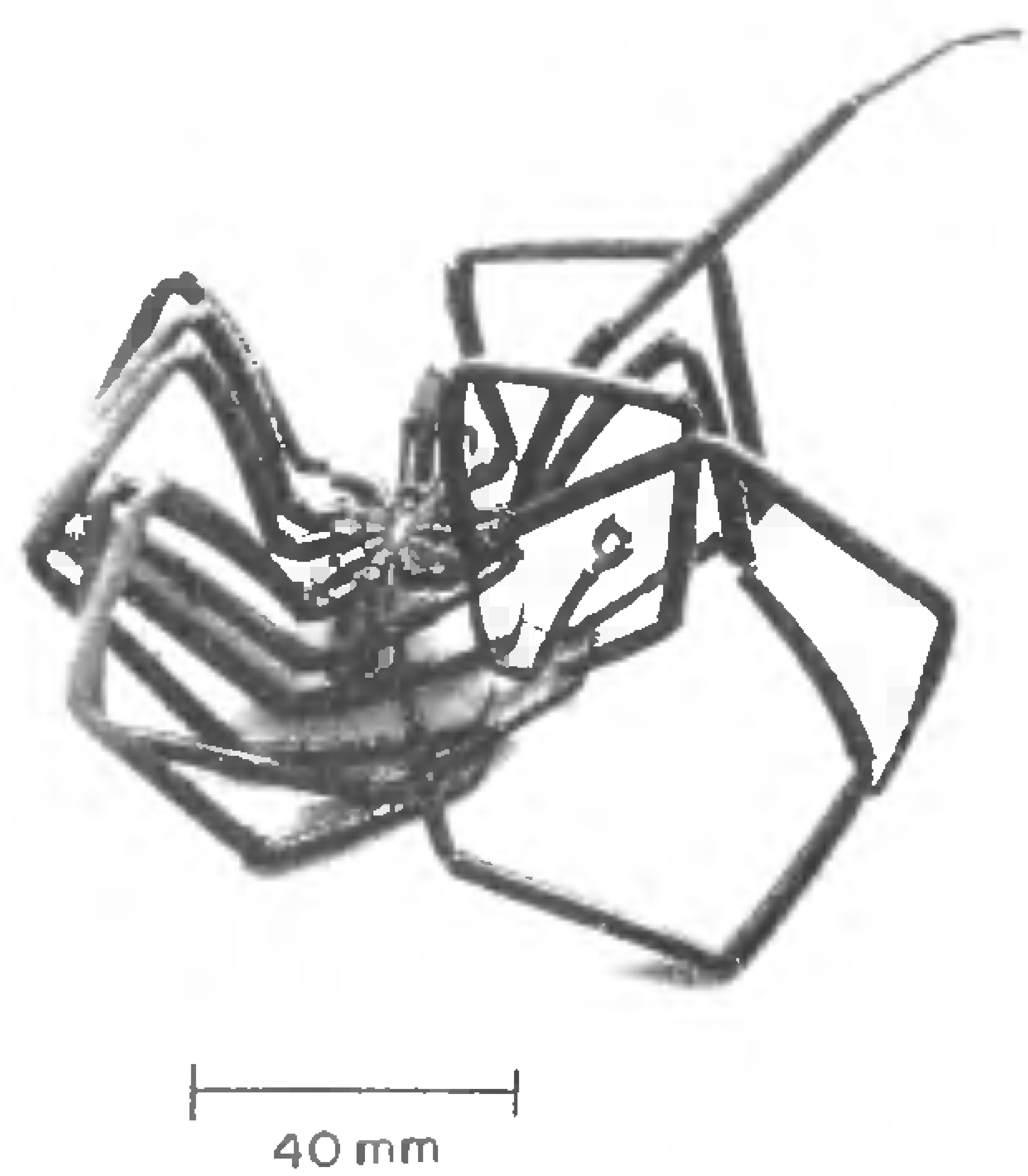

Figure 1. *Decalopoda qasimi*, sp. nov. from Antarctic waters.

Colour. Dark maroon when preserved in 5% buffered seawater formalin.

Measurements (in mm).
Proboscis–230; trunk–120; abdomen–71; chelifore–180; palp–270; oviger–470; *second right leg.* First coxa–35;

second coxa–41; third coxa–41; femur–330; first tibia–340; second tibia–420; tarsus–210; propodus–130; claw–90.

The first ten-legged pycnogonid was described as *Decolopoda australis*[14]. Its polymerous forms are in many ways closer to the other eight-legged forms. The femur of the second leg of the largest specimen (a male of *D. australis*), measures 23 mm with the total length of the leg larger than 100 mm.

The new species, *Decolopoda qasimi* differs from others in having the femur of 33 mm and the total length of the leg, 184.7 mm. The denticulate spines of oviger and the presence of hair only on the legs differentiate the new species from those reported so far.

The holotype with registration number NIO/DOD/DIO/166 is maintained at the Marine Biology Museum and Taxonomy Reference Centre of the National Institute of Oceanography, Goa. The new species is named in honour of Dr S. Z. Qasim, an eminent marine scientist and oceanographer, who pioneered the Antarctic research in India.

1. Hedgpeth, J. W. and Fry, W. G., *Ann. Mag. Nat. Hist.*, 1964, **7**, 161–169.
2. Fry, W. G., in *Biologic Antarctique*, Herma, Paris, 1964, pp. 263–269.
3. Hodgson, T. V., *Crustacea Rep. Coll. Nat. Hist. Southern Cross-London*, 1902, pp. 228–260; *Ann. Mag. Nat. Hist.*, 1904, **14**, 458–462; *Zool. Bot.*, 1993, 10.
4. Bouvier, E. L., *Bull. Mus. Hist. Nat., Paris*, 1905, **11**, 294–298; 1906(a). Nouvelles observation sur les pycnogonides recuellis dans les regions antarctiques an cours de la campagne dirigee par M. Jean Charcot. *C. R. Acad. Sci. Paris*, 1906a, 142–15–22; Exped. Antarct. Franc., 1913, pp. 1–169.
5. Calman, W. T., *Zoology*, 1915, **293**, 1–86.
6. Loman, J. C. C., Fourth Zool Results Swed. Antarc. Exped. 1901–1903, 1923, vol. **1**(2), 41.
7. Gordon, I., Antarct. Exped., 1911–14C (Zool), 1936, **2**, 7–40; Australian and New Zealand Antarctic Research Expedition (B), 1932, **5**, 1–72.
8. Stephensen, K., Scient. Results Norw. Antarct. Exped., 1927–1928, **2**(27), 90.
9. Hedgpeth, J. W., *Proc. US Nat. Mus.*, 1950, **100**, 147–160.
10. Utinomi, H., Biological results of the Japanese Antarctic Research Exped. Spec. Publ., Seto Mar. Biol. Lab, 1959, **8**, 1–12, 1–6.
11. Fry, W. G. and Hedgpeth, J. W., *J. Mem. N. Z. Oceanogr. Inst.*, 1969, **49**, 1–139.
12. Child, C. A., *Smithson. Contrib. Zool.*, 1979, **293**, 1–86.
13. Arnaud, F. and Bamber, R. N., *Adv. Mar. Biol.*, 1987, **24**, 2–86.
14. Eights, J., *Boston J. Nat. Hist.*, 1835, **1**, 203–206.

ACKNOWLEDGEMENTS. We thank the Department of Ocean Development, Government of India for the shipboard facilities for participation.

Received 30 January 1993; accepted 3 March 1993

MEETINGS/SYMPOSIA/SEMINARS

14th Annual Session of the Academy of Environmental Biology and Symposium on Toxicity Evaluations in Biosystems

Place: Indore
Date: 7–9 November 1993

Technical sessions/topics: Impact-assessment studies; experimental toxicology; current methods and techniques in toxicology; case studies; technological advancement in toxicology assessment, role of toxicological evaluation in rural economy.

Contact: Dr N. K. Dhakad
Organizing Secretary, 14th Annual Session of AEB
Department of Zoology
Govt. Girls PG College
Indore 452 003
Phone: 131 405306

Indian Geophysical Union — 30th Annual Convention and Meeting on 'Space Applications in Earth System Science'

Place: Hyderabad
Date: 21–23 December 1993
Contact: Dr P. R. Reddy
Indian Geophysical Union, NGRI Campus
Hyderabad 500 007
Phone: 842 850141, Telex: 425 7018 NGRI IN