

TABLE I
Wave velocities (km./sec.) and moduli (10^{10} dynes/cm.²)

Serial No.	Rock type	Location†	ρ gm./c.c.	P %	V_p		V_s		E_s Young's modulus	μ Rigidity modulus	K Bulk modulus	σ Poisson's ratio
					(a)	(b)	(a)	(b)				
1	Migmatite	.. Dalkousie	2.48	11.5	1.49	2.89
2	Orbicular quartzite	Harayana	2.68	0.2	6.00	5.76	3.22	2.91	7.20	2.77	5.95	0.30
3	"	"	2.68	0.2	6.00	5.73	3.34	2.98	7.65	2.99	5.67	0.28
4	"	"	2.71	0.2	5.92	5.67	3.22	2.89	6.79	2.61	5.32	0.30
5	Migmatitic quartzite	Dalhousie	2.68	0.4	4.10	3.63	2.45	1.98	4.09	1.61	3.05	0.27
6	"	"	2.68	0.4	4.20	3.31	2.41	2.06	3.91	1.55	2.67	0.26
7	"	"	2.67	0.4	4.15	3.35	2.36	1.97	3.75	1.49	2.64	0.26
8	Shaly sandstone	.. Simla hills	2.62	3.0	3.54	4.17	1.81	2.17	2.27	0.86	2.14	0.32
9	Augen gneiss	.. Chor area	2.73	0.6	5.29	4.97	2.84	..	5.72	2.20	4.39	0.30
10	"	"	2.74	0.6	5.40	5.35	2.97	..	6.17	2.39	4.80	0.29
11	"	"	2.75	0.6	5.35	4.89	2.89	..	6.01	2.31	4.84	0.30
12	Tertiary granite	.. Mandi	2.66	1.0	4.20	3.84	2.45	2.25	3.94	1.59	2.57	0.24

† The samples are provided by the Department of Geology, Punjab University.

values 'P' are reported in Table I. The observations in the long (a) and short (b) directions of the rock cylindrical specimens are also included. However the elastic moduli are computed from the velocity data of the longer direction.

It is observed that the rock types studied are highly absorptive and exhibit low velocity values. In the case of migmatite (medium-grained and grey-coloured) which is highly porous (11.5%), the V_p itself is found to be low with the result, shear wave propagation could not be studied in that. In the orbicular quartzite (fine-grained and buff-coloured) which is a compact and highly metamorphosed rock, the velocity values are found to be high. Migmatitic quartzite (compact, medium-grained and greyish-black in colour) is an intermediate case.

Shaly sandstone (very fine-grained and greyish-black in colour) and augen gneiss (black-coloured and fine-grained) fall in the intermediate category. The results in tertiary granite which is medium-grained, leucocratic, with the tourmaline crystals being visible are found to be lower than those of precambrian granites. This is in agreement with the results reported by Hayakawa and Balakrishna³ on granites from different countries in which the reasons for the difference in velocities are attributed to the differences of the depth of original formation and the age. As expected the elastic wave velocities of the rock types studied are found to increase with the increase in density and decrease with the increase in porosity. In general it is observed that tertiary rocks show low velocity values.

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National Geophys. M. V. M. SATYANARAYANA RAO,
Res. Inst., E. VENKATANARAYANA,
Hyderabad-7 (A.P.),
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CALANOPIA SEYMOURI SP. NOV.
(COPEPODA : CALANOIDA) FROM
THE ANDAMAN SEA*

In the course of studies on the pelagic Copepoda of Andaman Sea an undescribed species of calanoid copepod of the genus *Calanopia* Dana was encountered in the plankton collections made from Nicobar waters. The description of the new species follows.

Calanopia seymouri Sp. Nov. (FIG. 1, a-j)

Material.—Holotype CMFRI Reg. No. 113, Female, 2.62 mm., from surface plankton collected on 25-4-1968, 17.00-17.25 hours from Nancowrie Harbour, Nancowrie Islands; Allotype CMFRI Reg. No. 114, Male, 2.48 mm., from same sample as holotype; Paratypes CMFRI Reg. No. 115, 25 Males and 25 Females collected around Comorta and Champion Islands, Nicobars. The type specimens are

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deposited in the research collections of the Central Marine Fisheries Research Institute, Mandapam Camp.

Description.—*Female* (Fig. 1, a-e): Length range 2.49 to 2.62 mm.; prosome-urosome

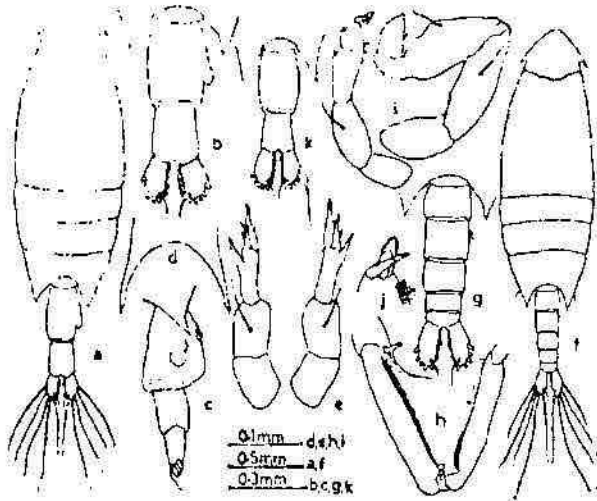


FIG. 1. *Calanopia seymouri* sp. nov. Female: a, dorsal view; b, urosome, dorsal view; c, urosome, lateral view; d, rostrum; e, P-5. Male: f, dorsal view; g, urosome, dorsal view; h, right A-1, segments 18 and 19-21 enlarged; i, P-5; j, terminal portion of left P-5 enlarged. *Calanopia australica* Bayly and Greenwood; k, female urosome, dorsal view.

length ratio range 2.56-2.68:1; cephalosome distinct from T-I and with conspicuous lateral hooks; rostrum deeply forked, each fork with a distal inner barb; T-IV and T-V fused, latter produced posteriorly into asymmetrical points, right tip reaching middle of genital segment; two-segmented urosome with caudal rami showing the ratio 50:29:21=100; genital segment asymmetrical with a hemispherical swelling on right lateral margin of segment at about posterior three-fourth of its length; genital segment enlarges ventrally up to about its posterior margin, the condition being quite different from the protuberance found in *C. thompsoni* A. Scott¹; U-II longer than broad; caudal rami asymmetrical, right one slightly broader than long and each ramus with five major setae and one minute seta; A-1 with 19 segments, when adpressed to the body reaches middle of genital segment; Mx_2 and Mxp typical of the genus; P-5 symmetrical with two-segmented basipods; B_2 1.3 times as long as wide and with a seta; exopods two-segmented, as long as the combined lengths of B_1 and B_2 ; Re-1 3.2 times as long as wide, produced at outer distal corner into sub-equal spine-like processes with serrated margin; distal process closely adpressed to Re-2 and

extending to about half its length (in *C. thompsoni* distal process of Re-1 is directed outwards as the proximal process of Re-1); Re-2 with two small outer marginal spines, a stout terminal prong with fine lateral marginal serrations and with one minute spine at inner distal corner.

Male (Fig. 1, f-j).—Length range 2.48 to 2.52 mm.; prosome-urosome length ratio range 2.37-2.44:1; prosome resembles that of female; five-segmented urosome with caudal rami showing the ratio 17:22:17:11:9:24=100; second urosomal segment longest and provided with two hair-like setae on right ventrolateral margin; anal segment short; caudal rami symmetrical, length 2.5 times as long as broad; right A-1 with segments 13-16 enlarged and imperfectly fused; segment 18 with fine villiform marginal teeth; fusion segments 19-21 with inner marginal villiform teeth on proximal part; P-5 asymmetrical with three-segmented right leg; terminal portion of the leg is movably attached to B_2 and consists of a swollen basal portion with two smoothly curved protuberances along inner edge, proximal one with a short seta at its inner base; distal portion sharply recurved outwards swollen medially and tapering to pointed tip; two sub-equal setae are inserted near outer proximal edge of basal and distal portions; B_2 longest, 3.3 times as long as wide and with a seta; left P-5 four-segmented with total length equal to combined lengths of B_1 and B_2 of right leg; Re-1 twice length of Re-2 and with a spine at outer distal corner; Re-2 provided with a spine along middle of outer margin and three sub-equal spines distally—the terminal one directed inwards and serrated laterally the second and third spines directed distad, former broad and stout ending in a conical prong, latter with blunt tip and marginal serrations; a row of fine hairs present along inner margin of Re-2.

The new species is named after the late Dr. R. B. Seymour Sewell in honour of his pioneering works on the Copepoda of this region.

Remarks.—Sewell² noted the differences dealt with above for the new species but he designated the specimens under *C. thompsoni*. Only three species of *Calanopia* have to date been described with cephalic hooks, viz., *C. thompsoni*, *C. sewelli*³ and *C. australica*.⁴ *C. seymouri* will be the fourth species to be described under this group and in the characteristic modification of the genital segment and in the

nature of the fifth leg it differs from the other known species.

Specimens of *C. australica* were also obtained from plankton tows off Comorta and Nancowrie Islands, thus extending the distribution of this recently described Australian species (from Moreton Bay, Queensland) to the Andaman Sea.

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Central Marine F. PARAMESWARAN PILLAI †
Fisheries Res. Inst.,
Mandapam Camp, February 12, 1969.

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† Present address: C.M.F.R. Sub-Station, T. D. Road, Ernakulam, Cochin-11.

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ON THE FUNCTIONAL IDENTIFICATION OF THE

a few chromophobes. The pars intermedia is comprised of predominantly acidophils having large nuclei and finely granulated cytoplasm, few cyanophil and chromophobe cells.



FIG. 1. Pituitary of *Colisa fasciata*. Bouin's fluid, CAHP, $\times 60$. N = neurohypophysis, Pi = pars intermedia, PPD = proximal pars distalis, RPD = rostral pars distalis. Arrows show the position of cyanophils.

Of all the pituitary components in *Colisa*, the cyanophils of the proximal pars distalis exhibit profound correlative seasonal changes associated with the reproductive state of the fish. The cyanophils (Type 1) which lie interspersed with acidophils in the dorsal zone