Table 1. Relative preference coefficient for size classes of *G. weberi* (p_{12} = relative preference coefficient for size class ⩽ 2 mm compared with size-class 2.1–3.0 mm; p_{13} = relative preference coefficient for size-class ≤ 2 mm compared with size class 3.1–4.0 mm; p_{23} = relative preference coefficient for size class 2.1–3.0 mm compared with size class 3.1–4.0 mm) with respect to predation on the three size classes (p_1 = ≤ 2 mm, p_2 = 2.1–3.0 mm, p_3 = 3.1–4.0 mm) of *F. baconi*

	Size-class (mm) of *G. weberi*				
	2–3	4–5	6–7	8–9	10–11
p_{12}	0	–3.08	–1.03	–0.27	–0.29
p_{13}	0	–5.07	–2.99	1.41	1.27
P_{23}	0	1.99	1.96	1.14	–0.98

relative preference coefficients can range from 0 to – 2 for negative preference and from 0 to + 2 for positive preference, it is evident that the leech preferred ≤ 2 mm *F. baconi* over 2.1–3 mm individuals, and 2.1–3 mm *F. baconi* over 3.1–4 mm individuals.

Though leeches are habituated to suck blood or haemolymph from the body of their prey individuals they are also adapted to swallow the living prey organisms as a whole as is evident by the dropping of shells of the limpets in the containers following predation by *G. weberi*. This sort of feeding has also been noted by Kutschera[6] in the leech *Erpobdella octoculata*, while feeding on *Chiromonus* larvae. However, whatever be the mode of feeding, *G. weberi* is undoubtedly a potential predator of *F. baconi*. It is most likely that these leeches would prove effective if they are considered as biological control agents for medically important limpets, be it *F. tenuis* or other species occurring in the tropical zone.

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G. ADITYA
S. K. RAUT*

Ecology and Ethology Laboratory,
Department of Zoology,
University of Calcutta,
35, Ballygunge Circular Road,
Kolkata 700 019, India
**For correspondence.*
e-mail: jayantadhar@vsnl.net

Natural gas at shallow depth in the placer sands of Amalapuram coast, East Godavari district, Andhra Pradesh

The Krishna–Godavari basin (KG basin) is located in the central part of the eastern passive continental margin of India that is known for its hydrocarbon potential since the last two decades. Exploration by ONGC in this area has resulted in the estimation of about 1060 million tonnes of hydrocarbon resources[1]. Large accumulations of biogenic gas are found in Montana, USA and Saskatchewan, Canada[2].

The Atomic Minerals Directorate for Exploration and Research (AMD) has been actively involved in the exploration of heavy mineral-bearing beach placers along the east coast in general, and KG basin in particular. Exploration (field season 2000–01) of heavy minerals along the coastal tract between Goutami and Vainateyam Godavari rivers, a part of the KG basin, near Amalapuram was undertaken by Dormer drill machine which is operated manually, to a maximum depth of 15–18 m in the beach sands (Nageswara Rao and Desapati, T., unpublished AMD report, 2001). During the course of drilling near Amalapuram Engineering College (lat 16°25′44.3″N; long 81°59′04.7″E; Toposheet no. 65 H/15; Figure 1), which is 1.6 km away from the present-day coast, natural gas (highly combustible) was encountered in a borehole at a depth of 7.5 m.

To confirm the inflammability of this gas, it was lit with a matchstick. Two more boreholes were drilled 15 m away from the first borehole, covering about 30 m^2 area, in which also natural gas was observed at the same depth. The burning of gas was observed for about 20 min with normal pressure and gas emanation appears to be a continuous phenomenon. The flame was extinguished by covering the hole with mud and sand. The litholog of the borehole is also shown in Figure 1. The natural gas was observed after puncturing the silty layer at 7.5 m depth in all the three boreholes. The production wells of ONGC are located far away from this locality, where oil and gas occur at a depth of more than 1650 m.

During the current field season (2003–04) also, while carrying out heavy mineral exploration in the Amalapuram coast, we have observed natural gas that was intercepted at the same depth in five boreholes that were spread over a kilometre length oriented in NE–SW direction; the gas was collected in bottles and handed over to ONGC for analyses, to know whether the gas is biogenic or thermogenic. Analysis of the gas is given in

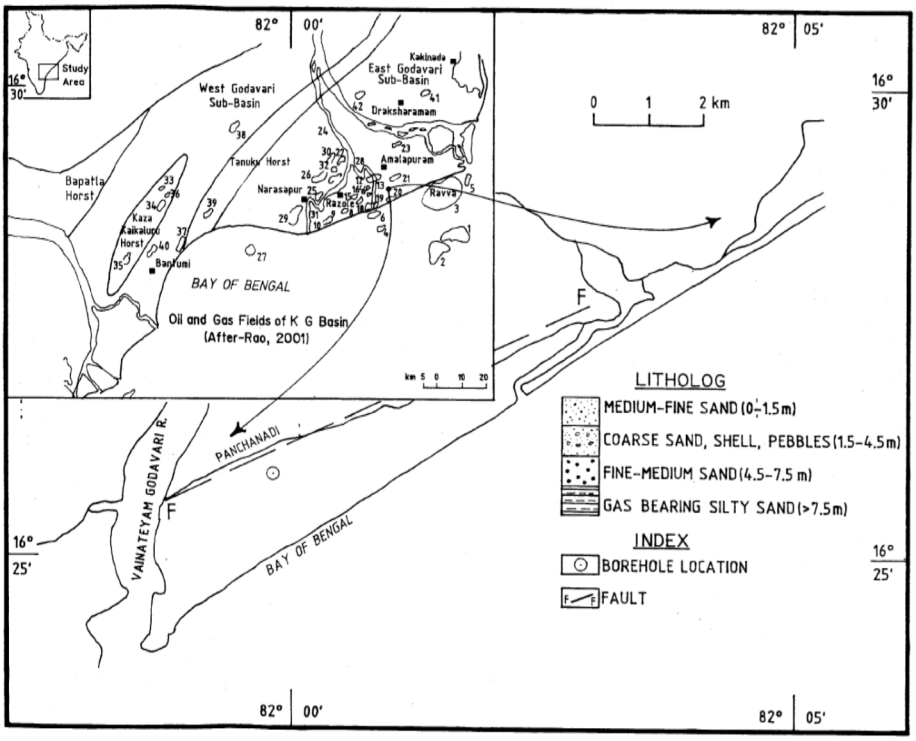

Figure 1. Location map of gas-emanating borehole at Amalapuram coast.

Table 1. Analysis of natural gas

Sample no.	1	2	3	4	5	6
Component	% volume					
Methane	86.02	78.58	79.47	71.11	75.20	76.76
Carbon dioxide	1.38	1.29	1.28	1.49	1.91	1.73
Nitrogen + oxygen	12.60	20.13	19.25	27.40	22.89	21.51
Physical properties at 60°F and 14.73 psi						
Compressibility factor (Z)	0.9984	0.9985	0.9985	0.9987	0.9986	0.9985
Specific gravity	0.6201	0.6503	0.6465	0.6822	0.6676	0.6602
Calorific value (net) kcal/m^3	6987	6381	6454	5774	6107	6233
Calorific value (gross) kcal/m^3	7760	7088	7168	6413	6782	6923

Table 1, which indicates that the gas is (marshy) biogenic. Discussions with ONGC geologists (A. V. V. S. Kama Raju, pers. commun., 2004) indicated that the natural gas occurring in the KG basin contains about 90% methane and all the commercial accumulations are biogenic. ONGC geologists have recorded many gas occurrences in Kovvur, Srirampuram, Turangi, Edurlanka, Tipparu and Gachchakayalpora in the Godavari district and Poranki and Duggirala in the Krishna district.

From the literature it is evident that biogenic gas contains methane and it is associated with thermally immature source rocks and lineament-bounded basement blocks. Both thermogenic and biogenic gases tend to occur in the same basin. The gas samples were sent to ONGC Dehradun for isotopic analyses of carbon. The carbon isotopes in methane are commonly used as a criterion for identifying biogenic gas. However, this method is not entirely reliable, because biogenic gas can have a range of carbon isotope values including those normally assigned to mixed gas or thermal gas.

The roles of lineaments and the fractures in the basement source rocks and in the basin are well studied[3]. In the present case, the structure of the Godavari basin in general and the oil and gas-bearing structures and their play types in particular, were delineated. In this part of the basin, a thick pile of oil and gas-bearing sedimentary sequence with a series of enechelon faults has been well known[1].

The morpho-tectonic evolution of the KG basin[4–6] and the Kakinada bay[7] has revealed many coast parallel faults; and the fault traces on the surface are manifested by beach ridges and at places lined by backwaters. One such fault is traced from Panchanadi in the study area to Mainavanilanka in the Narsapur coast through Sankaraguptam in the Malkipuram coast, cutting across Vainateyam and Vasista Godavari rivers trending northeast southwest, parallel to the coast.

The backwaters of Panchanadi–Sankaraguptam–Mainavanilanka are aligned parallel to this fault. This fault could be a sympathetic fault to the Matsapuri fault zone[1], which is a reactivated (neotectonic) fault. Around this fault Kesanapalli–Medapadu–Kadali–Bendamurilanka gas bearing structures are delineated[1]. Abrupt turns in the course of the Godavari river and also in the backwaters, variation in sand lithology, and transection of the sand dunes by the backwaters are evidences of neotectonics. The gas-emanating boreholes are close and parallel to this fault.

Correlating the emanation of natural gas with the fault and the hydrocarbon-bearing structures and their play types in and around the area, can it be invoked that escaping of natural gas is perhaps through the reactivated (Sankaraguptam–Panchanadi) fault? Though the entire coast of 70 km was explored by drilling for heavy minerals, gas was found in five boreholes. However, this phenomenon is interesting and the low delivery rates, though discouraging to many operators the wells being shallow and inexpensive to drill and the accumulations are in relatively undeveloped frontier areas, these areas are ideal for small and independent domestic operators.

Further studies need to be carried out to confirm the role of neotectonic activity on the gas-bearing structures in the KG basin.

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M. NAGESWARA RAO
T. DESAPATI
A. V. SUBRAHMANYAM*
R. D. DESHMUKH
G. VISWANATHAN
R. M. SINHA

Atomic Minerals Directorate for Exploration and Research,
Begumpet,
Hyderabad 500 016, India
**For correspondence.*
e-mail: avs5518@yahoo.co.in

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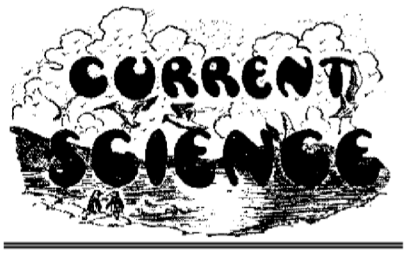

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Truth in anthropology*

There is very great need of a high standard of Truth in all our field work in Anthropology for anthropology is regarded with some suspicion in India. The attempt of certain scholars and politicians to classify the aboriginal tribes as non-Hindu created the reasonable impression that the science was being diverted to political and communal ends; the animism of the aboriginals belongs to the Hindu family obviously. But, the chief thing that disturbed nationalist opinion in India was the creation of the Excluded and Partially Excluded Areas on the move made by a distinguished anthropologist. This arrangement has failed to give the tribes the liberty and protection they want and is to be condemned scientifically. Further, most of the published books on Social Anthropology do injustice by writing in a ridiculous strain about India. Really India's aboriginal population is splendid, verile, honest and kindly and is admirable and worthy of preservation. The publications of the Functional School show that these primitive communities are admirable and lovable. The Ethnographical Survey publications were, however, too bureaucratic, superficial and scrappy, while the Census of India published inaccurate notes on curiosities. Both of these depended on information provided by clerks and other untrained persons; the monographs of the Ethnographic Survey had numerous repetitions. This is the reason why India is almost neglected in the general works on Anthropology, which reproduce the opinions of irresponsible writers with political respectability.

In the interests of truth in anthropology, several things may be emphasised. The investigator should spend several years among the people he studies, knowing their language, and putting himself in sympathy with them. This would be easier for Indian enquirers. He should be 'a detective and a magistrate', for the tribes generally conceal many real facts and motives, or professional informants are unreliable and desirous of publicity more than truth. Negative replies are to be suspected, and conclusions should be firmly based on statistics. The evidence of tribal poetry, folksong, story, proverb and riddle is valuable. The publications also should be well printed and illustrated and expert help should be taken in these matters. Very few Indian words should be given in the text and where given, diacritical marks should be avoided as far as possible. Art and poetry are the sisters of science, in the great family of Truth.

A whole world of Indian life and culture is passing away without proper record and it is high time that we do our field work properly with reference to Truth. But the Truth of science is no static thing, for the scholar passes from truth to truth towards Eternal Truth in which he will find immortality.

M.H.K.

*Summary of the Presidential Address delivered by Mr Verrier Elwin, M.A. (Oxon.), F.R.A.I., F.N.I., before the Anthropology Section of the Indian Science Congress held at Delhi last January.