Phosphorite occurrence off Chennai

V. Purnachandra Rao *et al.* in their article[1] have stated that the cruise 126 of *ORV Sagar Kanya* was mainly organized to deploy meteorological data buoys and the samples were collected during the deployment of data buoys. They have also mentioned that 'Earlier study of phosphorites in the *vicinity*, however, did not clarify the source of P'. They have again pointed out that 'exploration needs to be carried out at closer grid spacing'. Based on sampling along two widely spaced transects, an area of approximately 636 sq km has been worked out.

The finding of phosphorite off Madras by GSI[2] is well known to NIO scientists through the referred publications by GSI and presentation of a paper in the International Symposium held at NIO, Goa[3]. Hence, there is enough scope to believe that the NIO scientists have gone to the area with a purposeful intention to collect the samples in the same area, though the potential of the reported occurrence of phosphorite is known clearly to the authors. Further, it may be noted that NIO is a member of GSI Central Geological Programming Board Subcommittee on marine geology, wherein the prospects of marine mineral occurrences are often discussed from time to time.

The area of occurrence of phosphorite reported by GSI earlier[2] and the area mentioned in the recent publication[1] are the same but not in the vicinity as contemplated by the authors. Further, the source of phosphorus from the older Cretaceous–Eocene rocks exposed in the area, microbial origin of phosphatic nodules, probable phosphatic nodular formation during lowered sea level positions of Upper Pleistocene period have been suggested by GSI based on petrographical and scanning electron microscopic studies. The sampling transects have been presumably planned by NIO, keeping in view the data already published.

Mineral exploration is one of the main charters of GSI. GSI always plans with systematic grid pattern of sampling to arrive at actual resource potential in a specific area. Accordingly, the area of occurrence of phosphorite off Madras was systematically sampled by 10×10 km grid initially (1991) and later by 5×5 km grid (1994). Subsequently, the selected zones have been sampled by 2.5×2.5 km grid during 1996 and 1997. Based on our systematic grid sampling the actual area of occurrence of phosphorite off Madras has already been worked out and published.

In the article under reference[1], no importance has been given to the earlier publications on the same phosphorite occurrence reported by Marine Wing, GSI. Hence, the article[1] creates an impression that the phosphorite occurrence off Chennai is being reported for the first time, but the fact is different. However, their plan to provide further information such as age of the phosphorite occurrence off Chennai (reported earlier by GSI) may enhance scientific knowledge.

1. Purnachandra Rao, V. *et al.*, *Curr. Sci.*, 1998, **74**, 574–577.
2. Gaitan Vaz, G., *Indian J. Mar. Sci.*, 1995, **24**, 8–12.
3. Gaitan Vaz, G., Vijayakumar, P. and Rao, B. R. L., International Symposium on Geology and Geophysics of the Indian Ocean, 1996, Abstracts.

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Response

We take cognizance of the reaction by G. G. Vaz to our note on phosphorites off Chennai. The fact that his paper published in the *Indian Journal of Marine Sciences* was cited in both the introduction and discussion parts clearly shows that we were aware of the GSI work undertaken previously in this region. Indeed, we never made the claim that ours was the first report of the occurrences of phosphorites in this area. If, however, the implication is that since GSI has initiated the work in this region and 'mineral exploration is one of the main charters of GSI', others should not sample these phosphorites for further research, then this is scientifically untenable. Science progresses mostly through incremental additions to what is already known, and as long as the results add substantially to the existing knowledge, their publication should not and cannot be denied.

We still maintain that the cruise was mainly organized to deploy meteorological data buoys and to sample from shelf-edge geomorphic features along the Indian coast. Even if it were not be so, we fail to see what difference it would make. After all, the GSI work is in the public domain, and we do not see why we could not sample the same region again. The best-studied areas of marine phosphatization (e.g. the Peruvian upwelling zone) have been sampled during repeated expeditions by the Russians and Americans. We have a genuine interest in the *processes* responsible for the formation of phosphorites along the Indian coast, on which we have been working since 1985 and have published several papers on these aspects. Our scientific rationale is to correlate the phosphorites of the east and the west coasts of India and compare their morphology, mineralogy, geochemistry, genesis and economic aspects. We have no need to camouflage our work, as implied by Vaz.

Our report, although of a preliminary nature, still provides much more detailed information than the one by Vaz. The important differences between our results and those of Vaz are as follows: we did not get the conglomeratic phosphorites reported by him; instead, we found friable high-grade phosphorites of *in situ* origin. Our observations also showed that phosphorite sands were abundant at some stations where phosphorite pebbles were rare or absent; this was not reported previously. Moreover, we presented chemical data on nine elements of four varieties of phosphorites compared to Vaz's analysis covering only four elements and two phosphorite types. The depth range sampled by us is also much larger (30–293 m) in comparison to the reported occurrence of phosphorites from 150–200 m water depth by Vaz. *The site sampled by us is thus a different geographic domain.*

We reiterate that our interest is not

confined to merely reporting the occurrence of phosphorites; it is much broader scientifically. In this initial report we have attempted to highlight the prospects and *scientific issues* associated with the phosphorites off Chennai. While discussing the scientific results we have given due importance to Vaz's work on index fossils and brought out the implications of palaeogeography of the eastern margin of India on the formation of phosphorites. This interpretational aspect was not presented by Vaz himself from his results. In conclusion we wish to state that of course we are aware and acknowledge that G. G. Vaz *et al* were the first to find and report the phosphorites off Chennai. If it is felt that we should have given more prominence to his work, we do so now. But the point of issue is that we have acknowledged his work, enlarged on it, and hope to continue detailed investigations on the samples collected, the results of which will be published in the near future. As a gesture of fellowship we invite G. G. Vaz and his group to jointly analyse the samples with us, in the hope of synergizing joint collaborations of Indian marine geologists.

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NEWS

Following Shakti '98 US details tighter controls on the export to India of dual-use goods

The extra-territorial application of a domestic US law was triggered when, days after the Shakti '98 nuclear tests in May, the US President 'determined and reported' to the US Congress, under the authority of Section 102 of the Arms Export Control Act (the Glenn amendment), that the Indian activities had 'violated the Act'. On June 22, under the provisions of the US Export Administration Regulations (EAR), the US Department of Commerce's Bureau of Export Administration (BXA) elaborated the implementation of a tighter US export control policy for India as follows (in which 'reexport' means export of US-made items from third countries).

For nuclear and missile-related items (i.e. things, technology and software exported from the US) and Indian entities of concern (i.e. purchasing organizations, laboratories, projects, companies):

- BXA will deny all export and reexport applications for dual-use items controlled for nuclear or missile non-proliferation reasons under the Export Administration Regulations to all end users in India.
- Under the Enhanced Proliferation Control Initiative (EPCI), BXA will publish a list of Indian government and private entities involved in nuclear and missile activities. All exports and reexports of all items subject to the EAR will be prohibited to these listed entitles.

For national-security related items and Indian military entities, BXA will:

- For computers: control the export and reexport of computers over 2000 MTOPS and require an export licence for all exports of these computers to India regardless of end-use or end-user. All applications for computers above 2000 MTOPS for Indian government entities involved in nuclear, missile, or non-government entities supporting India's nuclear or missile programmes will be reviewed with a presumption of denial. Licence applications to other end-users will be favourably considered on a case-by-case basis.
- publish a list of Indian government entities involved in military activities, and will require a licence, reviewed with a presumption of denial, for all controlled US-origin dual-use items (i.e. goods, technology, or software listed in Part 774 of the Export Administration Regulations) with the exception of common use items (those under category EAR99).
- continue to review applications on a case-by-case basis for exports and re-exports to non-government entities in India (i.e. private-sector companies, academic institutions) currently producing items for the military.

For other dual-use items:

- BXA will 'continue to give favourable consideration' on a case-by-case basis to other dual-use export and re-export licence applications to other Indian government and non-government entities.
- BXA will now process all pending licences based on the above criteria. It has reminded exporters of the requirements of the US Enhanced Proliferation Control Initiative (EPCI), including their responsibility to 'know their customers' and to seek a licence for any export or reexport when exporters 'know' or 'have reason to know' that the export or reexport will be used in prohibited activities.

So if you are researching enhancing virility in Ladakh stud Yaks in Leh military farms, check-out BXA's website *http://www.bxa.gov* every time your repeat orders for 'Viagra – animal application – sample' is held up somewhere in Arizona.