TABLE 1

Chemical Composition of the soils inhabited by the Apoda

Constituents	Locality	
	Hechagunda	Balemane
pH	5·55	5·60
Specific conductivity (Micromhos/cm)	2590·00	2485·00
Free calcium carbonate (%)	1·75	1·58
Available phosphorus (mg/100 g soil)	1·77	1·83
Total nitogen (%)	0·17	0·16
Organic carbon (%)	2·58	2·70
Organic matter (%)	4·45	4·66
C/N ratio	15·23	16·75

were found in flowing waters led to the belief that in *Ichthyophis,* the female parent transported the eggs to the nearest freshwater stream at the time of their hatching. Our current observations indicate that the larvae occur in the same environment as that of the adults. If the larvae were seen in streams around such hilly regions [2,3], it appears no more than accidental[4].

Two egg clutches with eggs in advanced stage of development were also collected in the same habitat as that of the adults and the larvae. However, no female parent was found guarding these egg clutches. While parental care appears to be a universal phenomenon in females of oviparous members of the group[5], it is interesting to note that it does not last throughout the period of embryonic development. That the eggs hatched soon after they were collected and brought to the laboratory indicates that perhaps the parent abandons the eggs, around the time of hatching.

While the above observations are of interest as throwing light on the reproductive biology of the Apoda, it would seem necessary and urgent that similar studies be made on the Apoda of other continents.

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DEPOSITION OF CHINESE NUCLEAR DEBRIS IN CHANGME KHANGPU GLACIER, SIKKIM

N. BHANDARI, V. N. NIJAMPURKAR,
P. N. SHUKLA AND V. M. K. PURI*
Physical Research Laboratory
Ahmedabad 380 009, India
*Geological Survey of India
Calcutta 700 071, India

SNOW collected in August 1981 from Changme Khangpu glacier in Sikkim valley shows the presence of nuclear debris. Several radioisotopes, particularly ^{95}Nb, ^{95}Zr, ^{137}Cs etc. at levels ranging between 2 to 60 dpm/litre are found to be present based on gamma ray analysis of these samples. The implications of these results are described here.

Changme Khangpu glacier located at 27° 58′ N, 88° 42′ E at an altitude of 4800 to 5500 m is a small (5.8 km long, 0·6 to 1 km wide) valley type glacier in the Sikkim valley[1] . During the course of glaciological expeditions in collaboration with the Geological Survey of India, Eastern Region, several samples of snow, accumulated during 1980-81, and ice from accumulation zone to the snout in sets of horizontal and vertical profiles were collected. Some samples of Zemu glacier (24 km long) situated nearby (27° 45′ N, 88° 32′ E) were also collected. Most of these samples were collected for ^{32}Si, ^{210}Pb, $^{18}O/^{15}O$ and D/H analysis with a view to study glacier accumulation characteristics, dynamics and palaeoclimatic conditions. Some of this work requires processing in the field. In these procedures, the radioisotopes were scavenged, after addition of suitable carriers, on iron hydroxide in ammoniacal medium. A detailed description and analysis will be reported elsewhere (Nijampurkar *et al* 1982). Here we report the resutls of gamma ray analysis of samples listed in table 1.

The hydroxide precipitate from 10 to 50 litres of snow or ice melt were counted on a high resolution intrinsic Germanium detector located in a 10 cm lead shield. The detector efficiency was determined from a mixed gamma ray source (SRM-4275) obtained from National Bureau of Standards, USA. About 35 peaks could be identified in the gamma ray spectrum of ice. These belong to three groups of isotopes. The natural

TABLE 1

Activity levels of some bomb produced and cosmogenic radioisotopes in Sikkim galciers (dpm/L)

Sample	Nature	Date of Counting	Counting time (min)	Sample amount (litre)	^{7}Be 53d 478KeV	^{95}Zr 65d 725KeV	^{95}Zr 65d 757KeV	^{95}Nb 35d 766KeV	^{103}Ru 39·6d 497KeV	^{125}Sb 2·73Y 428KeV	^{137}Cs 30Y 662KeV	^{141}Ce 32·5d 146KeV	^{144}Ce 284d 134KeV
CK–1	Snow	14–9–81	910	20	15·1	14·5	14·6	31·8	0·95	1·59	1·80	0·41	37·4
CK–3	Snow	11–9–81	2900	33	26·0	27·7	28·4	58·1	2·46	4·17	3·74	1·27	69·6
CK–5	Snout ice	6–9–81	1073	50	0·92	0·90	1·20	2·7	0·0	0·0	0·29	0·0	1·5
CK–6	Snout ice	7–9–81	865	14	0·0	0·0	0·0	0·64	0·0	0·0	0·0	0·0	0·30
Z–26 (dpm/g)	Snout dust	11–9–81	570	10·6g from 12	0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0
B–1	Rain	19–10–81	1000	120	31·1	0·0	0·016	0·08	0·035	0·58	0·0	0·0	0·0
BKG (cpm)		8–9–81	1081	—	0·24 ± 0·02	0·12 ± 0·011	0·12 ± 0·01	0·11 ± 0·01	0·16 ± 0·013	0·17 ± 0·013	0·12 ± 0·011	0·71 ± 0·03	0·49 ± 0·02
Efficiency (%)					4·8	3·5	3·35	3·3	4·6	5·4	3·8	16	18

Ra series decay products like radioactive isotopes of Pb, Bi and Tl etc. and ^{40}K which also occur in background show only marginal activities in all the ice samples and also in dust samples. Cosmogenic isotope ^{7}Be forms the second group. ^{7}Be occurs at the level of 8-22 dpm litre as expected from its cosmic ray production in the atmosphere. Similar concentration of ^{7}Be was found in Bombay rains (31±0·2 dpm/litre) collected on 19 October, 1981. The third group consisting of radioisotopes ^{95}Zr, ^{95}Nb, ^{103}Ru, ^{125}Sb, ^{137}Cs, and ^{141}Ce occur only in snow samples and are absent or low in old ice or dust samples. Two high energy neutron products ^{54}Mn and ^{88}Y have also been identified in CK-3 sample. Of these, the most dominant activity is observed of ^{95}Nb (35 d) at 766 KeV and ^{95}Zr (65 d) at 724 and 757 KeV, yielding an activity level of 59 dpm/l to 33 dpm/l respectively in sample CK-3. The presence of these isotopes was confirmed by the gamma ray energy as well as by following their decay for several months. Since ^{95}Zr, ^{95}Nb, ^{103}Ru and ^{141}Ce are short-lived, their presence indicates a source certainly not older than a few years whereas the absence of ^{140}Ba (12·8 d) supports the view that debris is atleast several months old.

Whereas ^{95}Nb, ^{95}Zr, ^{141}Ce and ^{7}Be decayed, the $^{95}Nb/^{95}Zr$ activity ratio in sample CK-3 was 2·11, remaining relatively unchanged, during the 4-month *counting period from September to December 1981.* This ratio of the daughter to the parent nuclide yields a time of production of the parent nuclide at least 10–12 months before the date of first counting. The ratio is only slightly sensitive to the relative amounts of the daughter and parent nuclide present initially. If we use probable ratios in fission yield, the date of production is estimated to be around October 1980.

It has been reported that France and China have been conducting nuclear tests during the past few years. France has conducted five underground nuclear tests at Muraroa atoll in South Pacific since May 1981. China on the other hand have been conducting atmospheric tests at Lop Nor (41°N, 89°E), close to the sampling site since 1964, which have been generally weaker than 3 MT[2]. The last test of 1980 was on 16 October[2]. The fact that the October 1981 rains in Bombay (B-1) contain no bomb produced activity rules out the deposition of French debris on the CK glacier, as in such a case, due to mixing, the debris must be present in equatorial air before reaching the northerly latitudes of Sikkim[3,4]. The underground nuclear explosion carried out by India was in May 1974 and is well contained in the cavity[5]. The debris is therefore attributed to October 1980 Chinese test. The activity in ice corrected for decay to 11 October, 1980 yield ^{141}Ce=1445 dpm/l, ^{144}Ce=156 dpm/l and ^{95}Zr 946 dpm/l. The observed $^{141}Ce/^{144}Ce$ ratio and the ^{95}Zr concentration is well within the range observed by other investigators in rain samples collected in early 1960's [6,7]. These levels represent typical activity, depositing in Himalayan glaciers and could provide reference horizons for the determination of past accumulation rates of the glaciers. These measurements in a vertical profile in accumulation zone is in progress and will be reported elsewhere.

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ON THE DELINEATION OF GONDWANA SEDIMENTS BELOW TRAP ROCKS IN MAHARASHTRA

P. M. MATHEW, P. D. VENKATESWARLU AND U. K. BISWAS
Central Geophysical Division, Geological Survey of India, Calcutta 700 016, India

EXPLORATION of additional coal fields in the known Gondwana basins and their covered extensions needs immediate attention in view of the energy crisis. In this context, delineation of Gondwana sediments at depth, where there is an indirect evidence of their possible presence, assumes greater significance for future exploration. The regional gravity data to the northwest of the Godavari graben, covered by Deccan traps, suggest the possible presence of the Gondwanas below the traps between Nagpur and Amaroati in view