BIRBAL SAHNI INSTITUTE RADIOCARBON MEASUREMENTS II

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The radiocarbon dates covered in this list were measured during 1978. Chemical and counting procedures are as reported previously (R, 1978, v 20, p 398-404). Age calculations are based on the conventional $^{14}$C half-life (5570 yr) and on the contemporary value of 95% of the activity of NBS oxalic acid. Errors quoted correspond to 1σ value which takes into account the counting statistics, the uncertainty in the half-life, and the instability of the counting system. The ages are not corrected for isotopic fractionation in nature.

ACKNOWLEDGMENTS

The authors thank T K Mandal for assistance in sample preparation and operation of counting equipment. Technical and laboratory help rendered by V S Panwar and P S Saluja is thankfully acknowledged.

A new set of electronics constructed by O Fernandes of Hydrology group, Tata Institute of Fundamental Research, Bombay were used for about 50% of the measurements reported in this list. We are indebted to Rama, Head of the Hydrology group, for making the facilities available and to O Fernandes for the construction and testing of these units.

SAMPLE DESCRIPTIONS

QUATERNARY SAMPLES

Himachal Pradesh series

Varved clay samples from Leedong ($32^\circ$ 28' N, $77^\circ$ 54' E), Dist Lahul and Spiti. Samples coll from natural exposure and subm by A Bhattacharya, Birbal Sahni Inst Palaeobotany (BSIP), Lucknow to date late Quaternary vegetational changes.

**BS-73. Varved clay**

$28,310 \pm 3070$

Depth 43 to 77cm.

**BS-74. Varved clay**

$24,030 \pm 580$

Depth 179 to 220cm. *Comment: BS-73 most likely contaminated with coal particles. Samples found devoid of pollen.*

Three profiles of black silt samples from Mari ($32^\circ$ 15' N, $77^\circ$ 15' E), Dist Kulu. Samples coll from trial trenches and subm by A Bhattacharya to date past vegetational changes of the region.

*Profile 1*

**BS-85. Black silt**

Modern

Depth 5 to 7cm.

**BS-86. Black silt**

$1975 \pm 110$

Depth 17cm.
**Profile 2**

**BS-87. Black-brown clay**
Depth 40 to 44cm.

7985 ± 110

**Profile 3**

Black brown humus, depth 65cm.

**BS-71a. Lumps of organic matter**

870 ± 110

**BS-71b. Clay fraction**

Comment: BS-71a indicates incorporation of humus of later origin. Pollen analysis of profiles is in progress.

Clay samples from Chottodara (32° 18' N, 77° 33' E), Dist Lahul and Spiti. Sample coll and subm by A Bhattacharya to date past vegetational changes.

**BS-89. Carbonaceous clay**

Depth 5 to 8cm.

Modern

**BS-99a. Carbonaceous clay**

Depth 38cm.

Comment: carbon content found insufficient in 5 deeper samples of 2.35m profile. Pollen analysis of profile in progress.

Modern

**BS-82. Monali**

Clay sample from Monali (32° 15' N, 77° 10' E), Dist Kulu. Depth 15cm. Coll and subm by A Bhattacharya to date vegetational sequence.

Modern

**BS-84. Chandratal Lake**

1220 ± 350

Carbonaceous sediments, depth 127 to 132cm from Chandratal lake (32° 28' N, 77° 40' E), Dist Lahul and Spiti. Coll and subm by A Bhattacharya to date vegetational changes. Uppermost two samples of the profile had insufficient carbon.

**BS-55. Batal**

Varved silty clay, depth 26 to 43cm from Batal (32° 14' 30" N, 77° 33' 40" E), Dist Lahul and Spiti. Coll and subm by A Bhattacharya. Comment: top and bottom samples of the profile, BS-54 and BS-60, are dated at 495 ± 90 and 1370 ± 135 (R, 1978, v 20, p 398-404). Pollen analysis of the profile is in progress.

**Modern**

**Nilgiris series**

Samples from bore hole in peat deposits from Upper Bhawani (11° 21' N, 76° 45' E), Dist Nilgiris, Tamil Nadu. Coll and subm by H P Gupta and K Prasad, BSIP. Samples date pollen diagram.

**BS-76. Peaty clay**

280 ± 100

Depth 0 to 5cm.
BS-75. Peaty clay 1920 ± 100

Depth 30cm. *Comment*: two deeper samples of the profile, BS-52 and BS-53, have been dated at 5690 ± 110 and 18,540 ± 290 (R, 1978, v 20, p 398-404). Pollen analysis of the profile indicates the occurrence of grasslands with scanty tree elements about 5690 ± 110 yrs BP and the subsequent re-immigration of the shola forest at the site during the last 2000 yrs BP.

Peat from Nanjanad (11° 22' 52” N, 76° 38' 10” E), Dist Nilgiris. Coll and subm by K Prasad. Samples to date pollen diagram.

BS-106. Peat 4005 ± 90

Depth 20 to 50cm.

BS-120. Peat 10,620 ± 160

Depth 70 to 100cm.

BS-122. Peat 19,310 ± 360

Depth 120 to 150cm.

**Rajasthan series**

Samples from trial trenches from Rajasthan. Coll and subm by A K Saxena, BSIP to date pollen diagram.

BS-99b. Didwana 7210 ± 160


BS-81. Kanod 7840 ± 300

Dark clay, depth 2.3 to 2.4m from Kanod (27° 9’ N, 71° 10’ E), Dist Jaisalmer. *Comment*: sample belongs to a profile different from the one reported earlier (R, 1978, v 20, p 398-404).

Oxidized layer from base of sand dune, depth 76cm, from Budha Pushkâr lake (26° 31’ N, 74° 35’ E), Dist Ajmer. Coll from natural exposure and subm by A Prakash, BSIP.

BS-77a. Lumps of organic matter 425 ± 90

BS-77b. Clay fraction 825 ± 120

*Comment*: botanical analysis of oxidized layer reveals presence of Chara nucules suggesting its deposition under fresh water conditions. A nearly similar deposit in this basin has been dated on typologic evidence to upper Palaeolithic (Allchin, Hegde & Goudie, 1972).

**Gujarat series**

Samples from natural exposure from Rajpipla (21° 0’ 45” N, 73° 0’ 50” E), Dist Broach. Coll and subm by R K Kar, BSIP, to date top fluvial deposit in Pleistocene sections.
BS-95. Charcoal 160 ± 95
Depth 0.9m.

BS-102. Charcoal 245 ± 90
Depth 1.2m.

BS-96. Charcoal 330 ± 140
Depth 3.15m.

BS-100. Charcoal 330 ± 70
Depth 3.3m.

BS-101. Shells Modern
Depth 3.0m.

GEOLOGIC SAMPLES

BS-88. Chengalpattu, Tamil Nadu 5210 ± 145
Peat, depth 3.4m, from Chengalpattu (13° 14' 10" N, 80° 16' 30" E),
Dist Chengalpattu. Coll and subm by S Subramanian, Geol Survey of
India, to date alterations in shore line.

BS-83. Ambou, Himachal Pradesh 38,270 ± 2480
Carbonaceous clay, depth 0.3m, from Ambou (30° 32' 30" N, 77° 42'
E), Dist Nahan. Subm by Engg Geol Div, Geol Survey of India, to date
the neotectonic event.

ARCHAEOLOGIC SAMPLES

Ayodhya series
Charcoal samples from Ayodhya (26° 45' N, 82° 10' E), Dist Faizabad.
Coll and subm by B B Lal, Indian Inst of Advanced Study, Simla, to date
the late phase of Northern Black Polished (NBP) Ware period.

BS-66. Charcoal 2065 ± 120
Depth 3.12m.

BS-69. Charcoal 1975 ± 100
Depth 4.05m.

BS-70. Charcoal 2130 ± 105
Depth 4.31m. Comment: dates confirm archaeol estimate (Agrawal et
al, 1978).

Peddabankur series
Peddabankur (18° 35' N, 79° 25' E), Dist Karim Nagar, is an historic
site. Subm by S Ramesan, Dir Archaeol and Museums, Andhra Pradesh.

BS-67. Historic levels 1920 ± 110
Wood charcoal from Sec II, Div 81, Layer 2, depth 0.65m.
BS-68. **Historic levels** 1940 ± 110

Wood charcoal from Sec I, Div 74, Layer 2, depth 0.75m. *Comment*: dates agree with earlier known dates from the site (Agrawal & Kusumgar, 1973).

**Polakonda series**

Polakonda (17° 42' N, 79° 26' E), Dist Warangal. Subm by Dir Archaeol and Museums, Andhra Pradesh.

BS-97. **Megalithic culture** 2045 ± 90

Wood charcoal, depth 0.87m, submitter’s sample no. PKD/2/77. *Comment*: date agrees with archaeol estimate.

BS-98. **Neolithic culture** 3255 ± 120

Wood charcoal, depth 1.15m, submitter’s sample no. PKD/1/77. *Comment*: date, close to archaeol estimate, indicates late arrival of a Neolithic people from S Andhra Pradesh or from SW Karnataka.

**Dhulikatta series**

Dhulikatta (18° 35' N, 79° 16' E), Dist Karim Nagar, is an historic site. Subm by Dir Archaeol and Museums, Andhra Pradesh.

BS-117. **Historic levels** 1965 ± 90

Wood charcoal, depth 0.15m. Submitter’s sample no. DKT/3/76.

BS-118. **Historic levels** 1910 ± 95

Wood charcoal, depth 0.55m. Submitter’s sample no. DKT/1/76.

BS-119. **Historic levels** 2210 ± 100

Wood charcoal, depth 2.25m. Submitter’s sample no. DKT/2/76. *Comment*: dates establish inception of early historic phase and chronology of Satvahanas.

**Naikund series**

Naikund (21° N, 79° 6' 7" E), Dist Nagpur. Megalithic habitation site at Naikund assoc with Megalithic stone circles. Subm by S B Deo, Deccan Coll, Pune.

BS-92. **Megalithic culture** 2455 ± 100

Wood charcoal from NKD-Md I, Trench C 1, Layer (3), depth 45 to 50cm.

BS-94. **Megalithic culture** 2495 ± 105


BS-78. **Sangamner, Maharashtra** 24,670 ± 710

Freshwater shells from Sangamner (19° 24' 48" N, 74° 10' 12" E), Dist Ahmed Nagar. Shells were found on surface along with Late Stone age (Upper Palaeolithic) artifacts during excavation. Subm by S N
Rajguru, Deccan College, Pune. *Comment* (SNR): date confirms archaeol estimate for Upper Palaeolithic period obtained from Tapti and Belan Valleys.

**BS-103. Inamgaon, Maharashtra**

Charcoal from Trench D\textsubscript{1} & D\textsubscript{2}, Sq E 6 sealed by layer (8), House no. 70, horizontal excavation. Assoc with early Jorwe culture (Period II of Inamgaon). Coll and subm by Z D Ansari, Deccan College, Pune. *Comment*: date confirms archaeol estimate for Upper Palaeolithic period obtained from Tapti and Belan Valleys.

**BS-79. Chennur, Karnataka**

Freshwater shells from Chennur (16° 29' N, 76° 33' E), Dist Gulburga, probably representing food debris found scattered on surface along with Mesolithic artifacts during excavation. Coll and subm by K Paddayya, Deccan Coll, Pune. *Comment*: date agrees with archaeol estimate (Agrawal & Kusumgar, 1972).

**BS-113. Agroha, Haryana**

Charred rice grains from Agroha (29° 20' N, 75° 38' E), Dist Hissar. From archaeol excavation, sample assoc with Indo-Greek coins. Coll and subm by P N Kaushik, Hisar. *Comment*: date much younger than archaeol estimate.

**Oceanographic Samples**

Dredge core samples of coral algal limestone from continental shelf between Vengurla and Ratnagiri along W coast of India. Coll and subm by P C Srivastava, Geol Survey of India, and H N Siddique, Natl Inst of Oceanog, Goa, to date climatic and environmental changes on the basis of sedimentologic and microfaunal studies.

*General Comment*: dates suggest early Holocene period.

<table>
<thead>
<tr>
<th>Lab no.</th>
<th>Location</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>BS-107</td>
<td>16° 40' N, 72° 48' E</td>
<td>8395 ± 145</td>
</tr>
<tr>
<td>BS-108</td>
<td>16° 18' N, 73° 2' E</td>
<td>7845 ± 130</td>
</tr>
<tr>
<td>BS-109</td>
<td>16° 0' 39&quot; N, 72° 50' E</td>
<td>9435 ± 145</td>
</tr>
<tr>
<td>BS-110</td>
<td>16° 0' 20&quot; N, 73° 51' E</td>
<td>8390 ± 140</td>
</tr>
<tr>
<td>BS-111</td>
<td>15° 50' N, 73° 12' E</td>
<td>8300 ± 135</td>
</tr>
<tr>
<td>BS-112</td>
<td>15° 15' N, 73° 0' 36&quot; E</td>
<td>7470 ± 135</td>
</tr>
</tbody>
</table>

**Geophysical Samples**

Dead corals from natural exposure near light house, Minicoy I. (8° 0' 18" N, 73° E). Coll and subm by H N Siddique, Natl Inst Oceanog, Goa, to date storm beaches and formation of islands.

<table>
<thead>
<tr>
<th>Lab no.</th>
<th>Location</th>
<th>Age</th>
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<tbody>
<tr>
<td>BS-58.</td>
<td>Surface</td>
<td>475 ± 75</td>
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<tr>
<td>BS-59.</td>
<td>2.5m below cutting</td>
<td>2875 ± 100</td>
</tr>
<tr>
<td>BS-61.</td>
<td>Top of cutting</td>
<td>2755 ± 105</td>
</tr>
<tr>
<td>BS-62.</td>
<td>Surface, on shore</td>
<td>595 ± 105</td>
</tr>
</tbody>
</table>
BS-63. Surface 2215 ± 100
BS-64. Surface 2455 ± 100
BS-65. Surface 180 ± 95

References
Results presented in this date list have been obtained from Jan 1977 to Dec 1977, but some earlier measurements are also included. All calculations are based on a contemporary value equal to 0.95 of the activity of NBS oxalic acid standard and on the Libby value for the half-life of radiocarbon. Ages are reported as conventional radiocarbon dates in years before AD 1950. No corrections for $^{13}$C/$^{12}$C ratio were made for measurements reported in this list. Errors quoted ($\pm 1\sigma$) included estimated overall standard deviations of count rates of the unknown sample, contemporary standard and background (Pazdur & Walanus, 1979). Counting equipment and experimental procedures have been described earlier (Mościcki & Zastawny, 1976, 1977; Pazdur et al, 1978; Pazdur & Pazdur, 1979a). Sample descriptions are based on information provided by the submitters.

SAMPLE DESCRIPTIONS

1. GEOLOGIC SAMPLES

   A. Lake sediments


Raduńska Lake series

Core 2 from Raduńska Górska Lake ($54^o 14' N, 17^o 59' E$).

   **Gd-442A. RADG 2/I-1-5 ORG** 6620 ± 180
   Depth from 135 to 165 cm, organic fraction.

   **Gd-442B. RADG 2/I-1-5 ORG** 6600 ± 250
   Duplicate run on 2nd counter.

   **Gd-454. RADG 2/I-1 CARB** 7430 ± 190
   Depth from 145 to 155 cm, carbonate fraction.

   **Gd-446. RADG 2/II-1-5 ORG** 9360 ± 300
   Depth from 325 to 355 cm, organic fraction.

   **Gd-439. RADG 2/II-1 CARB** 9470 ± 270
   Depth from 335 to 355 cm, carbonate fraction.
Gd-438. RADG 2/II-2-3 CARB  
Depth from 330 to 350 cm, carbonate fraction.

Gd-449. RADG 2/III-1-3 ORG  
Depth from 440 to 460 cm, organic fraction.

Gd-445. RADG 2/III-1 CARB  
Depth from 445 to 455 cm, carbonate fraction.

Charzykowskie Lake series
Calcareous gyttja sediments, Core 6, from Charzykowskie Lake (53° 47' N, 17° 28' E).

Gd-451. CHAR 6/I-1-3 ORG  
Depth from 140 to 160 cm, organic fraction.

Gd-475. CHAR 6/I-1-3 CARB  
Depth from 140 to 160 cm, carbonate fraction.

Gd-452. CHAR 6/II-1-3 ORG  
Depth from 340 to 360 cm, organic fraction.

Gd-476. CHAR 6/II-1 CARB  
Depth from 345 to 355 cm, carbonate fraction.

Gd-460. CHAR 6/III-1 CARB  
Depth from 495 to 505 cm, carbonate fraction.

Gd-458. CHAR 6/IV-1 CARB  
Depth from 555 to 565 cm, carbonate fraction.

Mikołajskie Lake series
Calcareous gyttja, Core 2, from Mikołajskie Lake (53° 46' N, 21° 35' E).

Gd-461. MIK 2/I-1-3 ORG  
Depth from 215 to 235 cm, organic fraction.

Gd-471. MIK 2/I-1-3 CARB  
Depth from 215 to 235 cm, carbonate fraction.

Gd-472. MIK 2/II-1-5 ORG  
Depth from 435 to 465 cm, organic fraction.

Gd-464. MIK 2/II-1-3 CARB  
Depth from 440 to 460 cm, carbonate fraction.

Gd-470. MIK 2/II-4-5 CARB  
Depth from 435 to 440 cm and from 460 to 465 cm, carbonate fraction.