MICA ZONES AND THE EARLY IRON AGE SITES IN SRI LANKA: AN EXPLORATORY STUDY

> "They have a marble which resembles tortoise-shell, pearls also precious stones, and these are all held in high esteem." (Pliny on Taprobane)

"The name mica is applied to a group of minerals which are complex aluminium silicates with potassium hydroxyl, magnesium and ferrous iron and in some varieties - sodium, lithium, and ferric iron. Mica is characterized by excellent basal cleavage and by a high degree of flexibility and elasticity" (Herath 1975:44; also see Mathur 1968; Watt 1891/1972:239-240; *WI* 1962: vol.6, 354-359). This form of narrow introduction to the mineral known as mica cannot help in the evaluation of the archaeological significance or the important position assigned to mica during the Early Iron Age. Recent investigations on the environmental archaeology of Sri Lanka have revealed some amount of information related to the utilization of this non-metalic mineral in antiquity.

The use of mica may have an antiquity going back to the Pre-historic period in Sri Lanka. It is suggested that the Mesolithic people used this mineral in their ritual cave art (Deraniyagala 1971:38). The succeeding Proto-historic Megalithic Black and Red Ware (BRW) culture reveals more positive evidence for its use from archaeological sites (Seneviratne 1984:278-279). The deposition of mica flakes in Proto-historic megalithic burials and the occurrence of mica-glazed pottery in Proto and Early-historic habitation layers is common to both Peninsular India and Sri Lanka.

The deliberate inclusion of mica within Proto-historic burials is suggestive of some degree of prestige value and a socio-ritual practice attached to this mineral. To note a specific instance from South India, a layer of mica dust emerged at the bottom of an urn at Chataparamba, near Cochin in Kerala (*vide* Leshnik 1974:75). Mica cannot be

found in this region and obviously it carried sufficient social importance to be imported from the interior hills of Kerala. Similarly, the Proto-historic urn burials at Adichchanallur (District Tirunelveli, Tamilnadu) yielded flakes of mica in the course of early investigations at that site (Rea 1915:4,5). Mica does not occur in the lower Tambraparni valley and it has to be transported from the upper reaches in the Agastiyamalai hills. Interestingly enough, mica flakes adhering to copper rods were unearthed from the burial urns at Pomparippu in Sri Lanka (*ASAnR* 1957:30-31). Similar flakes of mica have been reported from the cist burials at Galsohonkanatta (Pin-vewa) near Yapahuva (*ASAdR* 1967-68:78).

Its continued use, in the post-Megalithic period, indicates social importance attached to mica even by Early historic society. Significantly the *Naturalis Historia* of Pliny (23-79 A.D.) records that Taprobane produced a "marble which resembles tortoise-shell." He also goes on to equate its social prestige at par with gold, silver, pearls and precious stone (McCrindle 1901:106). The mineral that comes closest to this discription is mica (*vide* Nicholas 1963:106). In view of this, the occurrence of mica-glazed pottery along with skeletal remains from the Pre-Arrotine layer at Mantai (Chanumugam et Jayawardana 1954:65) may indicate that mica was used on de-luxe ware associated with more affluent social groups. We may also note that mica-glazed sherds were found from an unstratified context at the Citadel (elite residential complex) of Anuradhapura during the 1969 excavation (Deraniyagala 1972:83, 103).[1]

Pieces of mica were found within the Tissarama at Anuradhapura (*ASAdR* 1960:65) and also from the area south of

---

1. It is difficult at times to ascertain whether the mica may have been introduced to the clay during the process of production or whether it was a natural formation in the raw material. Clay, or kaolinite (hydrated silicate of alluminium), derives from feldspathic rocks and is never found in a pure state but with other minerals (deriving from feldspathic rocks) such as mica (contd.)

the Abhayagiri stūpa during the recent excavations at that site. The excavator at Abhayagiri notes that "this material was collected and prepared for some specific use" (Wikramagamage 1984:87).[2] The specific use of mica during the Early Iron Age is not known to us, though it is pointed out that in ancient India the usage of mica ranged from ornamentation (personal and clothing), buildings, pottery, pigment and the most purified variety for medicinal purposes (*vide* Watt 1891/1972:239-240). Copper rods (having traces of mica), such as those found at Pomparippu, were unearthed from strata 4a (Early historic) at Anuradhapura during the Citadel excavation (Deraniyagala 1972:146 fig. 24). These may be identified as antimony rods, what are also known as kohl sticks, so commonly found within the Proto and Early historic context in India (*ibid.*). Kohl is a preparation based on powdered sulphide of lead or sulphide of antimony. These rods were quite obviously used for applying eye collyrium. It is possible that well-powdered and purified mica, which is a glittering substance, may have been used for personal ornamentation.[3]

It is not altogether impossible that mica was an export commodity during the Early historic period. The 1980 excavation at Mantai in fact revealed flakes of mica (in Trench A) brought into this port-city from another source (*vide* Carswell et Prickett 1984:52). "A marble which resembles tortoise shell", was therefore known to the foreign merchants and it is not surprising that Pliny was aware of this particular mineral found in Taprobane (*vide* Seneviratne 1985; 1985a).

---

quartz and even other compounds containing iron (Hodges 1965:21). For instance, the fine sand used by the present potters of Sind for mixing with clay has a very high proportion of mica in it (Mackay 1930:129).

2. The excavations at the Sigiriya 'summer palace' revealed 'minute particles of biotite mica' in Layer 9, while 'small particles of mica' were unearthed from Layer II (*vide* Bandaranayake 1984:79). Probably this indicates the nature of mica inclusions in the natural soil composition.

3. The Chalcolithic cultures of West Asia used haematite(contd.)

II

There has been no effort, so far, to systematically analyse the fragments of mica obtained from archaeological sites. Such an analysis may reveal the mineral composition of the samples, thereby indicating the source located in proximity to such archaeological sites. Recent studies indicated that, during the formative (Proto-and Early historic) period, there was a coincidence between particular resource zones and habitation zones (Seneviratne 1986;1987; 1987b). This coincidence obviously had an element of time and space in its distribution across the island. Conversely, there was also the movement of resources (especially minerals) from one eco-zone to another during the formative period (Seneviratne 1986a; 1987; 1987a; Seneviratne et Senanayake 1987; Seneviratne et Rambukwella 1987). It is possible, within the above context, to identify some degree of coincidence and interaction between mica zones and the Early Iron Age sites in Sri Lanka.

Mineralogists identify phlogopite (magnesium mica), muscovite (potash mica) and biotite (ferro-magnesium mica) as the most widely distributed types of mica found in Sri Lanka. As for the general distribution pattern, it is pointed out that phlogopite occurs in association with the crystalline limestones; biotite more widely distributed in the gneissess; and muscovite mica in association with quartz-feldspar-pegmatites of Sri Lanka (Herath 1975:44).

The settlement archaeology of Sri Lanka points to the littoral and the agricultural plains as the primary habitation zone during the Proto-historic period. In this connection the location of a mica yielding source at Kabitigollewa in the north central plains in quite significant. This source is situated between the megalithic sites of Mamaduwa (near Vavuniya) and Tammannagoda (near Ratmalgahavewa). The proximity of Proto-historic burials and Early historic inscription-bearing sites to this resource zone is not without significance. Interestingly enough, the *Mahavamsa* (XXXIII.

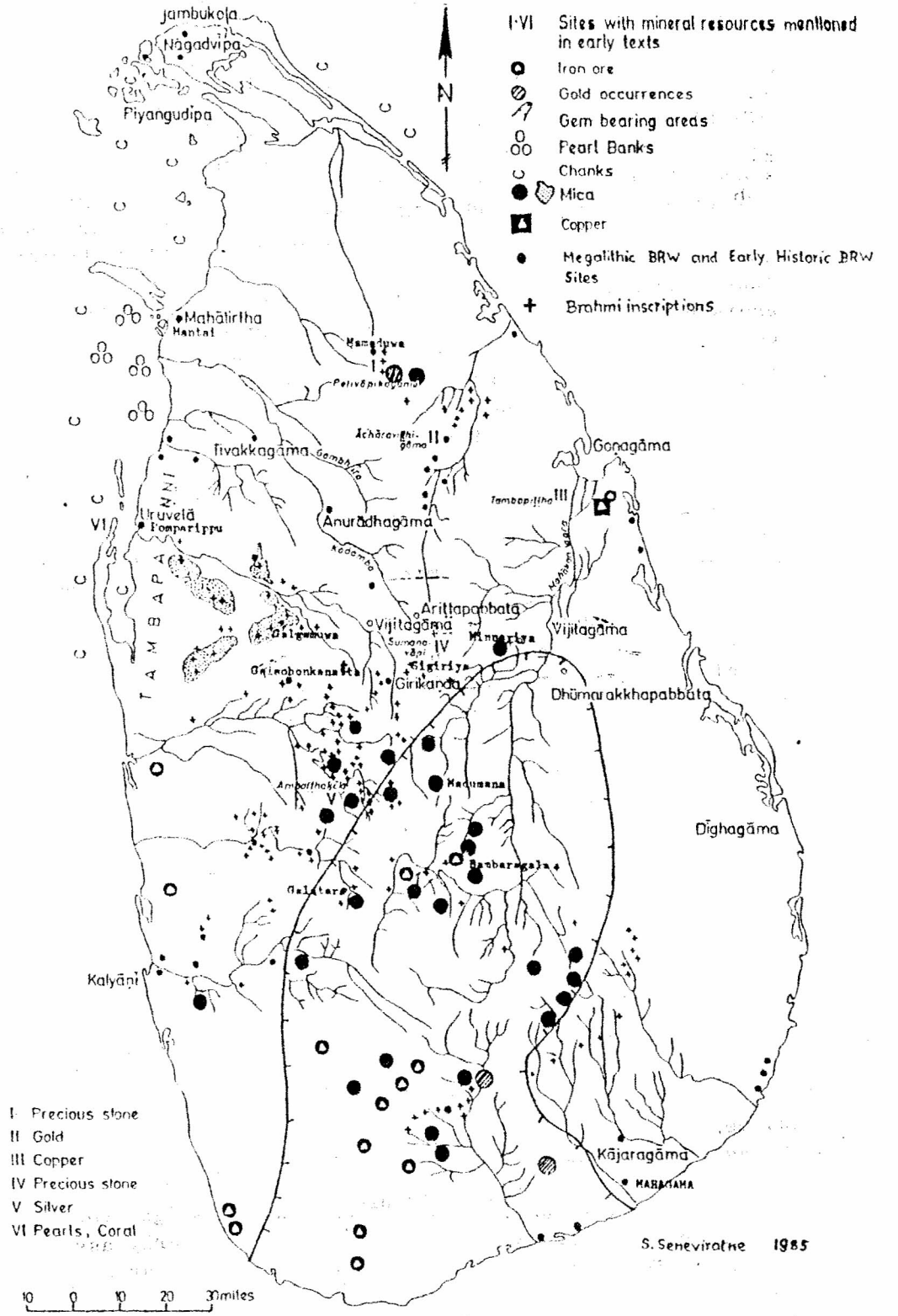
---

galena and malachite for rouge and eye-shadow (Lamberg-Karlovsky 1974:338).

13-15) mentions a gold-yielding resource area three *yojanas* north east of Anuradhapure at a village called Ācharavitthigama. Nicholas locates this site around the Ratmalgahavewa - Kabitigollewa area (1963:170). This region is clearly associated with the charnokite-metasedimentary series characterized by quartzite-graphite-mica schites. It may be noted that quartz formations, in association with charnockitic gneisses , cover a relatively large portion in the north-central plains in Sri Lanka (*vide* Dissanayake et Navaratne 1981:fig.I). Mica is generally found in veins or lanticular intrusions of pegmatites traversing mica schists or mica neisses and they usually carry a core of quartz surrounded by feldspar or feldspar-rich pegmatite (*WI* 1962:vol.6.355).

Migmatitic gneiss with mica can be found in the Tonigala complex in the Puttalam district (Cooray 1969:49). It is obvious that biotite predominates over muscovite in the Tonigala granite (Cooray 1971:21-27). There is evidence that by the 3rd century B.C. the tough gneiss formation of the Tonigala complex was cut in order to fashion drip-ledge caves and also to inscribe donative records on the granite. Such drip-ledge caves and donative records may be seen at Early historic Buddhist sites such as Toniyagala, Toravamailleva, Paramakanda, to mention a few.

It is extremely significant to note a pre-Christian donative record at Galgamuwa mentioning a *manikara* (Paranavitana 1970:No. 1033). Though the term *manikara* is translated into English as 'lapidary' by Paranavitana, the *manikara* of the Early historic period was a specialist who worked all varieties of stone in addition to semi-precious stone. It may be an useful exercise to analyse the variety of mica found at Galsohonkanatta, Pomparippu and Mantai and compare it with the types found in source areas such as the Tonigala granite complex or the one at Kabitigollewa. A third source supplying the main habitation zone of the Early historic period may have been located at Minneriya, which is situated on the ancient highway connecting Anuradhapura with Magama in south east Sri Lanka.


Jambukola
Nāgadvipa
Piyangudipa
Mahātirtha
Hantal
Tivakkagāma
Iruvelā
Pomparippu
TAMBAPANNI
Anurādhagāma
Arittapabbata
Vijitagāma
Girikanda
Gonagāma
Vijitagāma
Dhūmarakkhapabbata
Dīghagāma
Kalyāni
Kājaragāma
MAHĀGAMA
I-VI Sites with mineral resources mentioned in early texts
Iron ore
Gold occurrences
Gem bearing areas
Pearl Banks
Chanks
Mica
Copper
Megalithic BRW and Early Historic BRW Sites
Brahmi inscriptions
I Precious stone
II Gold
III Copper
IV Precious stone
V Silver
VI Pearls, Coral
10 0 10 20 30miles
S. Seneviratne 1985

III

A cursory examination of the map indicates a high concentration of mica zones in the montane region of Sri Lanka. Curiously enough, each zone seems to coincide with Early Iron Age burial or BRW sites, and more specifically with regional groups of early inscriptions. There can be two reasons for this situation.

The first is the geological and mineralogical formation. The primary occurrence of mica in Sri Lanka is the montane region associated with the Highland series i.e. the Khondalite and Charnockite groups. This formation is also the primary source for other intrusive minerals. For instance, it is noted that charnockitic gneisses in association with quartz formations where mica can be found also have gold occurrences (*vide* Dissanayake et Navaratne 1981: fig.1). Similarly, the crystalline formation found in the Dambulla - Habarana migmatite complex and the Kadugannawa complex, beryl is frequently associated with mica pegmatite masses or veins (*vide* Cooray 1969). A similar association between mica and beryl is reported from the Aravalli system in north India (Mathur 1968:7). It is therefore quite likely that, in their search for mineral stones, the Early historic folk discovered sources of mica associated with the same mineral formations.

The second is related to a functional aspect associated with this mineral. It is perhaps the wider use of iron, and with more regular intrusions to the montane region (prompted by a greater demand for minerals), that may have enhanced the supply of mica to centres of production and distribution situated in the agricultural plains and at port-cities. It may be noted that, unlike metallic ores or mineral stones, which can be categorized as 'weight-gaining objects' (Seneviratne 1987:144), mica is extremely light in weight and has the ability to derive dust or flakes, which is an additional advantage for the convenient transportation of mica from source areas to centres of utilization. For example, as late as 1943, over one ton of mica extracted at Madumana, north east of Rattota, was transported to Illukkumbura by head porterage (Cooray 1961: 143).

It is, however, pointed out that, due to the erratic nature of the pegmatiteand the sporadic occurrence of mica, the pegmatite deposits are less convenient to exploit. Conversely, it is more productive to exploit vein type of deposit. Books of mica occur commonly at the vein and also between the quartz core and feldspar on its two sides (*vide* Herath 1975:44; *WI* 1962:vol.6.355). Since high quality sheet mica is obtained with deep mining, exploitation is largely confined to shallow depths having weathered material invariably yielding scrap mica (Herath *op.cit.*). There are, however, instances when books of mica are exposed at the surface level. For instance at Madumana "large books of mica, some over two feet long, are scattered on the banks of the stream" (Cooray 1961:134).

The lower montane region covered by the districts of Kurunegala, Matale, and Kandy may be identified as the primary mica yielding source area located in proximity to the northern plains. The highest number of Early Iron Age sites coinciding with mica-yielding areas can be located in the same zone. It could be suggested that the demand for high-quality mica may have prompted the explotation of these sources, which was possible only with the qualitative development of better produced tools made of iron and steel during the Early historic period (*vide* Seneviratne 1987).

In this context the Brahmi inscription at Demeda Oya, located near Nalanda, belonging to the 1st century B.C./A.D. may provide us with some useful information. According to this inscription, the lapidaries (*maṇikara*) or *raja* Macuḍi arrived at this site to obtain slabs of stone (*sila iṭaka kaṭaya agatase*) (Paranavitana 1970:No. 830). We have already suggested that these lapidaries may have arrived in this region to work the rock formation to obtain high quality mica (Seneviratne 1984:279). However, it is not impossible that these lapidaries may have worked some mineral stones in this area, which is not located too far from the gem yielding Elahara area to its east. There is also a possibility that the route extending from Dambulla cut across Demeda Oya along natural routes to reach Madumana, where books of mica can be obtained without much effort on the surface of river banks. This same route moved further south

and linked itself with the plateau of Kandy via Bambaragala (*vide* Seneviratne 1987a; Seneviratne et Rambukwella 1987). Similarly, the location of the Gal-atara burial site at Asmadala, near a highly workable deposit of mica, may not be a coincidence after all. Pliny probably speaks of this high quality books of mica as a marble which resembles tortoise-shell.

This exploratory study was intended to be a preliminary investigation raising some relevant issues on resource-use and its inter-relationship with the technology, settlement pattern and its socio-economic significance during the Early Iron Age or the formative period.

SUDHARSHAN SENEVIRATNE

ABBREVIATIONS

ASAdR - Administrative Report. Archaeological Survey of Ceylon.
ASAnR - Annual Report. Archaeological Survey of Ceylon.
Mv - *The Mahavamsa* ed. Wilhelm Geiger. London PTS (1958).
WI - *The Wealth of India* Vol. 6. New Delhi. CSIR (1962).

Bibliography

Bandaranayake, Senake
1984 - *Sigiriya Project First Archaeological Excavation and Research Report. January to September 1982.* Colombo. Central Cultural Fund.

Carswell, John et Martha Prickett
1984 - 'Mantai 1980: A Preliminary Investigation'. *Ancient Ceylon* No. 5: 3-80.

Chanmugam, P.K. et F.L.W. Jayawardana
1954 - 'Skeletal remains from Tirukketiswaram'. *Ceylon Journal of Science.* Section G. 5(2): 65-68.