

Itoigawa Hisui (jade rock), Japan -Candidate of Global Heritage Stone Resource designation

Ko Takenouchi^{1*}, MIYAJIMA, Hiroshi¹, IBARAKI, Yousuke¹, KIJIMA, Tsutomu¹, YAMAGISHI, Youichi¹, KATO, Hirokazu²

¹Itoigawa Geopark Promotion Office, ²National Institute of Advanced Industrial Science and Technology

Global Heritage Stone Resource (GHSR) designation, that is new international designation of natural stone resources, has been progressing by the International Union of Geological Sciences (IUGS) and the International Association for Engineering Geology and the Environment (IAEG) after the approval at the 34th International Geological Congress (IGC) held in Australia, 2012.

GHSR designation aims to promote the recognition for importance of natural stone resources that have occupied a vital position in their utilization or been highly evaluated in cultural history. This designation is expected to raise public and statesman's concern about the stone resources, promote utilization of natural stone, and keep materials of the resources for maintaining stone heritages as well as constructing new buildings of high quality. This designation can validate the importance of the natural stone resources in the area.

Itoigawa Global Geopark includes a lot of evidence that shows the world's oldest Hisui (jade rock) culture. They are jade localities in mountainous area, jade pebbles on the riverbeds and the beach, ornaments made from jade that have been excavated from historic sites dating from the Jomon Period to the Yayoi Period (6000 to 2000 years ago), etc. Museums and educational programs are provided for students and general public to learn about this jade culture. Research activity has clarified the genesis and exhumation process of jade rock, the history of utilization, and the discovery of jade from the Jomon Period to the modern age.

Abbreviated checklist for GHSR designation is as follows.

Formal Name for this proposed GHSR designation: Itoigawa Hisui (Jade rock) **Stratigraphic (or Geological) Name:** Occurred as tectonic blocks in serpentinite melange. **Other Names:** Nothing. **Commercial Designations:** Itoigawa Hisui (Itoigawa Jade). **Principal Location of Quarry or Quarries:** No quarries in operation. **Geological Age and Geological Setting:** Hisui is a metamorphic rock that was formed in the deep part of the plate convergent zone in front of the Gondwana continent about 500 million years ago. Hisui is included in serpentinite bodies as a tectonic block in Paleozoic and Mesozoic systems. **Petrographic Name:** Jadeitite, omphacite-jadeite rock and omphacite rock. **Primary Colour(s) and Aesthetics of Stone:** Chemically pure jadeitite has a white color, omphacite rock shows green, Titan-bearing jadeitite shows purple, Titan-bearing omphacite rock shows blue and graphite bearing jadeitite shows black respectively. **Natural Variability:** None. **Composition (optional):** NaAlSi₂O₆ (jadeite), (Na, Ca)(Al, Mg, Fe) Si₂O₆ (omphacite). **Geotechnical Properties:** Hisui has a high toughness because it consists of clusters of jadeite and omphacite microcrystals, however minor fractures and faults are common in the rock. Density (kg/m³) 3.0-3.4 **Suitability:** Hammer stone, ornament, sculpture, jewelry. **Vulnerability and Maintenance of Supply:** Its conservation is obligatory because natural Hisui stone shows minor production from the river and seashore. The Kotakigawa Hisuikyo and Omigawa Hisuikyo are protected as natural monument of the nation. Use of Hisui should be permitted only in sustainable collecting. **Historic Use and Geographic Area of Utilization:** Hisui was first used for hammer stone in the early Jomon Period (7000 years ago). In the middle Jomon Period (6000 years ago) it had been used for stone ornaments such as Taishu(Hisui pendant) and then from the late Jomon Period through Yayoi Period to Kofun Period (4000 to 1700 years ago) for Magatama(drop-shaped Hisui bead), respectively. They have been excavated from archeological sites in Japan (Hokkaido, Honshu, Shikoku, Kyushu and Okinawa islands). In addition, golden crown with Magatama made in 6th century was found in the Korean Peninsula. In the modern age it is used for sculpture and jewelry.

Keywords: Global Heritage Stone Resource, Jade rock, Itoigawa, subduction zone, world's oldest jade culture