Utilization Certificate

1. **Title of the project:** Ecobiology of Tatta Paani thermal spring of Padder, Kishtwar (J&K)
2. **Sanction Order no.** RUSAJU/2/2019-20/36/3428-3499 dated 5/11/2019
3. **Name of the PI:** Dr. Arti Sharma
4. **Department:** Department of Zoology, University of Jammu
5. **Total Project Cost:** Rs. 1,00,000
6. **Statement of Expenditure:**

Head	Total grant released	Total expenditure incurred (INR)	Unspent Balance (INR)
Consumables	40,000/-	39,631/-	369/-
Travel (Domestic & Field)	40,000/-	40,000/-	0
Contingency	20,000/-	19,995/-	5/-
Total	1,00,000/-	99,626/-	374/-

Certify that out of Rs. 1,00,000 (One Lakhs only) of Grant-in-aid, sanction vide order no. RUSAJU/2/2019-20/36/3428-3499 dated 5/11/2019 in favour of Dr. Arti Sharma (PI), a sum of Rs. 99,626/- has been utilized for the purpose of research for which it was sanctioned and the balance of Rs. 374/- remained unutilized.

Signature

PI

ECOBIOLOGY OF TATTA PAANI THERMAL SPRING OF PADDAR, KISHTWAR (J&K)

Thermal springs are nature's perfect constant temperature laboratories where temperature remains more or less constant and are distributed throughout the world. Humans have had various kinds of relations with hydrothermal features throughout history, continuing even today. Since ancient times, hot springs have been used for medicinal purposes. Many reports have shown that water of these springs has therapeutic effects for treating various diseases. There has been a long history of people bathing in hot springs to treat skin diseases, stomach and rheumatic disorders. Thermal springs nowadays are under severe anthropogenic stress due to their increased use for industrial processing, agricultural, aquaculture, bottled water extraction of rare elements (Baradac's *et al*. 2001, Atkinson and Davidson, 2002, Helemen and Ramsey 2004, Petraccia *et al*, 2005). Hot springs contain life even long before they reach the surface. Sulphur smell from hot spring is caused by anaerobic bacteria living deep in Earth's crust. Flora and fauna residing in these thermal springs are called as thermophilic organisms. Geothermal areas are also considered the main habitat of thermophilic organisms which have attracted great attention because of thermostable enzymes present in them.

The Jammu and Kashmir UT is bestowed with number of hot water springs and Tatapani is one of its kind, which is situated in the Paddar area of Kishtwar district. **Paddar**, is a remote valley in Kishtwar district of J&K, northern India. It covers the whole northeast portion of Kishtwar district bordering Zanskar (Ladakh) on the north, Pangi, Himachal Pradesh on the East and Marwah-Wadwan on the West. The valley is known for its sapphire mines. The thermal spring in Paddar is located in Tattapani village, where people of the area as well as from far come to take dip in hot water so as to get rid from various bodily aliments.

A very little work has been done to explore their ecobiology thus, an attempt has been made to explore the least explored thermal spring of Tatapani (Paddar) in Kishtwar district. The survey of Paddar area of District Kishtwar was conducted to identify the hot water springs. Physico-chemical parameters of main spring were analysed in order to study its water quality. Planktonic and microbial community was also analysed.

The study conducted revealed that the entire Tattapani village of Paddar area abounds in a thermal spring ranging extremely hot to luke warm water. The main spring was

rectangular, situated in front of Sheshnag temple and many other small springs were also present in the vicinity of main spring. Physical parameters of water were analysed on the spot which revealed high water temperature about 53.5°C at the main kund of the spring, while the neighbouring springs showed slightly lower temperature than the main spring during the study period.

Among the chemical parameters the amount of DO was low and CO_3^{2-} showed complete absence, level of FCO_2, bicarbonates, chlorides, calcium, magnesium and nitrates remained high throughout the study period. Whereas phosphates and sulphates remained in low concentration. Phytoplankton identified from hot springs were prokaryotic cyanobacterial species and members of chlorophyceace and bacillariophyceace. Preliminary bacteriological studies were also under taken and most common bacteria identified were gram positive bacteria.

Further the bacteria present in the spring will be identified up to Generic level and the screening of these thermophilic bacteria for the production of enzymes which were used in various biotechnological applications will be done in future by using various methodology.