Local dispersal of land snail *Zootecus insularis* (Ehrenberg, 1831) shell in north west region of Rajasthan (India)

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Abstract: *Zootecus insularis* (Ehrenberg 1831) is a species of gastropod belonging to the family Achatinidae¹. *Z. insularis* is a land snail usually confined to arid and semidesert environments. The species is found in Africa and Southwestern Asia. *Zootecus* genus is widely spread all over the world including Pakistan, India, Afghanistan, Africa and in Arabian countries. This was the first systematic study carried out on *Zootecus insularis* in Government Nehru memorial college, Hanumangarh district, Rajasthan India.

Keywords: Zootecus, land snail, humid, crawling, shells, Tree Bark, identification, empty shells

INTRODUCTION:

Mollusca is the second-largest phylum of invertebrate animals, members are known as molluscs. Molluscs means soft. The study of Mollusca is called Malacology. These organisms are found in the terrestrial as well as aquatic and in deep seas. Their size ranges from microscopic organisms to 20 meters long. Around 76,000 extant species of molluscs are recognized.² The molluscs include many familiar animals, including clams, snails, slugs, and squid as well as some less familiar animals like tusk shells & chitons. Numerous molluscs also live in freshwater and terrestrial habitats. As they dwell in green spaces, they feed on fresh leaves, stems, and bark, as well as species of crops, like mushrooms, berries, and lettuce. Snails feed at night. They feed primarily on decaying matter. They play a very important role in the lives of humans. They are a source of jewellery as well as food. The bivalve molluscs are used as bioindicators in the marine and freshwater environments. But few of them such as snails and slugs are pests. Molluscs have been and still are an important food source for anatomically modern humans. A handful of mollusc species are sometimes considered hazards or pest for human activities. Subclass Prosobranchia have their gills, mantle cavity and anus situated in front of their heart and breath with gills. The prosobranch gastropods include the majority of marine snails, among them conches, cones, cowries, limpets, murexs, periwinkles, volutes and whelks. Subclass Pulmonata or pulmonates is an informal group of snails and slugs characterized by the ability to breath air, by virtue of having a pallial lung instead of a gill, or gills. This group includes many land and freshwater families, and several marine families.

*Zootectus insularis* (Ehrenberg, 1831) is a species of gastropods belonging to the family Achatinidae¹. Achatinidae (New latin, from Greek “agate”) is a family of medium to large sized tropical land snails, terrestrial pulmonated gastropod molluscs from Africa. Wellknown species include Achatina achatina the Gaint African snail, and Lissachatina falica the Gaint East African snail. As of 2022, there were 105 genera recognized within the family Achatinidae. (“Family summery for Achatinidae.” Animal Base, last change 24-11-2007, accessed 3 August 2010.). The local forms of Zootecus (Gastropoda: Pulmonata: Subulinidae) of Pakistan: an archaeomalacological case study by Alberto Girod, Antoia Balzarini in 2017.³

**Systematic Position**

Kingdom: Animalia  
Phylum: Mollusca  
Class: Gastropoda  
Subclass: Heterobranchia  
Order: Stylommatophora  
Superfamily: Achatinidea  
Family: Achatinidae  
Genus: Zootecus  
Species: insularis  

**Binomial name**  
*Zootecus insularis*  
(Ehrenberg, 1831)
The Study Area:

India, a country that occupies the greater part of South Asia. Rajasthan is situated in the north-western region of India. It covers 342,239 square kilometers. Hanumangarh is a city and municipal council in the Indian state of Rajasthan, situated on the banks of the river Ghaggar also identified as ancient Saraswati river. Soils in this zone are alluvial deposits calcareous, high soluble salts. District Hanumangarh comes under agroclimatic zone Ib (irrigated North-Western plains) of Rajasthan. It lies between 29°5’N to 30°6’N latitude and 73°3’ to 75°3’ longitudes (Fig. 1). In Hanumangarh district, found hot summer, cool winter, unreliable rainfall and great variation in the temperature. The rainfall mostly restricted to rainy season. The monsoon normally comes in the first week of the September.

![Map of India and Hanumangarh](image)

**Fig.1. LOCATION OF THE STUDY AREA**

### Methodology:

#### Collection:

Total about 45 living and some dead empty shells of *Zootecus insularis* were collected from a garden of Government Nehru Memorial College, Hanumangarh (Rajasthan) India in a rainy monsoon season. Specimens were collected through hand picking and some by forcep in petridish beside this soil sample was also collected in polythene pouches. The soil was humid moist with algal attachment.

#### Physical-Chemical Analysis:

Soil samples were brought in laboratory and were examined through naked eyes and bull lens. After this soil samples were analysed for physical and chemical parameters like pH, EC, TDS, Alkalinity, Chloride (APHA-AWWA-WPCF. 1981. Standard methods for the examination of water and waste water. 15th Ed. APHA, Washington D.C). From this soil sample living molluscan forms were picked up mechanically. Live healthy specimens were wiped with absorbent paper to remove the water adhered on the surface.

#### Identification:

Identification of the species of genus *Zootecus* on the basis of morphology (Safi Ur Rehman Qamer, Arfa Saif, Javaria Altaf, J.Bio. & Env. Sci. 2017, studied identification of the species genus *Zootecus* on the basis of morphology).

#### Morphology:

For Biometry of shells measurements were recorded though vernier caliper including shell height, shell diameter and operculm length and width in mm. Shell length was also measured by using standard scale in cm. Murthy & Balaparameswara Rao (1978) have studied effect of environment on the shell shape of the tropical estuarine snail, Neritina violacea. Singh (2000) observed biometric measurement of gastropod with relation to their simultaneous growth. Yasmin Khanam and Yogender Singh studied about biometry of some prosobranch snails in desert waters at Bikaner, Rajasthan (2012). Beside this shell whorls were also counted.
Locomotion:
Crawling rate (locomotion) measured by stop watch in c.m./minute.

RESULTS AND DISCUSSION:
In present study gastropod species Zootecus insularis (A land pulmonate snail) live specimens and some empty shells were found in the month of August 2022, in July 2023 and March 2024 in a rainy humid season just after a rain in the garden of Government Nehru Memorial College.

Fig.2: Location of study site (Garden of Govt. N.M. P.G. College, Hanumangarh)

Hanumangarh, Rajasthan (Fig.2). S Khanam, Q B Kazmi & F Iqbal studied Local dispersal of land snail Zootecus insularis shells in mangrove of Karachi, Indian Journal of Gec Marine Sciences, Dec. 2020 (9) This college garden area covers total 1148 square meter area with boundary planted with several plant species. As Zootecus insularis is a terrestrial species, Jassima.A L-Khayat studied First records of five terrestrial snails in the state of Qatar in 2010 (10).

Live Z. insularis species were found on semiwet land with crawling apperance (Fig.3,4,5), beside this some specimens were found adhere themselves near roots of a tree (Azadirachta indica, commonly known as neem) attached themselves with soil, sandy small stones, roots and some in 1 cm depth of moist soil. Identification made with Handbook of molluscs (Subba Rao 1989)(11) Some were found climbed on a tree stem up to 3.5 feet height and some found attached on a tree bark holes (Fig.6). That time air temperature was about 33-35°C with humidity after a average rainfall. At the study time precipitation was 10%, Humidity 68%, Temperature 35°C and wind 10 km/h. Study continued 1 to 5 days, that time specimens were found in same pattern with atmospheric temperature 28°C, 30°C, precipitation 39%, 50%, 16% and humidity 87%, 90%, 72% respectively. Mostly specimen were found adhere with wet algal soil floor. Soil pH was 8.0 slightly alkaline, EC was noted 0.196, TDS 99 ppm, alkalinity 190 mg/l, Chloride 28.36 mg/l. Specimen contains a conical elongated shell with maximum 6 whroils (Table 1.). Shell length is measured as 1 cm. (Fig. 10).

Fig.3: Z.insularis species living and empty shells collected from Study Area
Fig: 4. *Z. insularis* species living crawling in mode on wet soil substratum

Fig: 5. *Z. insularis* species attached with wet soil substratum
Fig:6. *Z.insularis* species climbing on a Tree bark
Fig: 7. *Z. insularis* species prefer substratum as plastic disposal cup

Fig: 8. *Z. insularis* species attached with plastic tray
Fig: 9. *Z.insularis* species climbing on wooden table

Table: 1. showing measurements of *Zootecus insularis* and No. of whorls.

<table>
<thead>
<tr>
<th>Local Taxa</th>
<th>Collecting area</th>
<th>Hight (mm)</th>
<th>Diameter (mm)</th>
<th>H/D</th>
<th>Whorls</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Z.insularis</td>
<td>1148 square meter area garden of Govt. N.M.P.G. College Hanumangarh District Rajasthan (India)</td>
<td>10mm (maxi.)</td>
<td>7mm</td>
<td>10/7=1.142</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9mm (Medium)</td>
<td>6mm</td>
<td>9/6=1.5</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7 mm (Minimum)</td>
<td>5mm</td>
<td>7/5=1.4</td>
<td>3</td>
</tr>
</tbody>
</table>
Z.insularis species measurement with simple scale

Fig:10

Beside this this species also prefer artificial substratum and attached themselves with plastic containerlike disposal cup, plastic tray and wooden table (Fig.7,8,9.). They have maximum size 1 cm (Fig.10,11) length.

Fig:11 Shell measurement (Drawn by Yasmin Khanam)

Conclusion:

As above results show that Zootecus insularis species typically survive and active in humid environment with temperature at 30°C otherwise in the absence of rain and in high temperature above 32°C they become dormant and hide themselves under land or soil, (Yasmin Khanam & Yogender Singh, Thermal response to prosobranch snails at desert region of Rajasthan, North India, 2022) (12). Their active and crawling presence depends not only on rain but when any water channel flows through garden their appearance can be seen. It conclude that their (Z.insularis)
availability depend on water presence. Beside this they also show artificial substrate preference also. It also noted that in natural habitat during this study period they prefer bark of Azadirachta indica (Neem Tree).

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COMPETING INTEREST:

Authors have declared that no competing interests exist.

ECOLOGICAL NOTES:

Beside species Z. insularis, their were some plants, trees like Azadirachta indica (commonly known as Neem tree, in which the species were found attached with bark), Tecomella plant (Rohida), Bougainvilla plant, Ocimum tenuiflorum (commonly known as Holi Tulsi),Majorana (Marwa Plant), Crinum latifolium Linn (Sukhdharshan Plant), Platycladus (Morpankhi Plant), Catharanthus roseus (Sadabahar Plant), Ficus religiosa ( Peeple Tree), Jasminym indicum, Nerium oleander (Kaner Plant), Hibiscus (Gudhal Plant), Palm Tree, Cycas revoluta, Clerodendrum inerme, Jacaranda mimitosifolia, Aecia species Plant etc. and some local birds like Crow, Parakeet, Cuckoo, WoodPecker, Small white crane, Great Egret and some migratory birds like Indian Ibis were also seen during study period.

REFERENCES:

(12) Yasmin Khanam & Yogender Singh; Thermal response to prosobranch snails at desert region of Rajasthan (North India), Uttar Pradesh Journal of Zoology. 43(23): 7-11, 2022 ISSN: 0256-971X(P).