Insight on Morphology and Biology of land snail, *Trachia vittata* (Mueller)- A classical view

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ABSTRACT

The present investigation is an attempt to exhibit a notable variations observed in the morphology and shell pattern of *Trachia vittata*, remaining an unexplored land snail, collected from semi arid plain habitat of Tamil Nadu, This study aims to assess its morphological difference in banding pattern of shell and shape, ecology, biology, distribution and its taxonomic account were presented in this paper and discussed in details .

keywords : *Trachia vittata*, Taxonomic account, Semi arid, Shell pattern .

INTRODUCTION

The Phylum Mollusca is probably the second most largest important animal group after arthropods in terms of abundant number with more than one lakh described species (Lydeard *et al.*,2004). Snails belong to the class Gastropoda, a group of invertebrate animals with soft unsegmented bodies. Land snails are considered to be good indicators of areas of conservation importance and endemicity when compared to widely distributed groups such as vertebrates(Moritz *et al.*,2001). Ecological observations such as survey, population dynamic, movement and mode of dispersal of various land snails have been studied by various researchers (Bishara *et al.*, 1968; Daoud 2004; El -Deep *et al.*, 1996,2004; El -Okola,1984; Metwally *et al.*, 2002; Ramzy, 2009). Unfortunately, majority of land snails remain undiscovered or under described with insufficient exploration (Emberton,1995). Very little studies were fragmently published in localized reviews focusing on land snail occurrence in southern Tamil nadu (Tonapi and Mulhekar,1963; Tonapi 1971; Subba Rao and Mitra, 1979, 1986; Madhyastha *et al.*, 2003, 2005; Mavinkurve *et al.*, 2004b, in press; Sandhya *et al.*, submitted). The present study has been taken up to gain information on under described terrestrial snail species, *T.vittata*, inhabited in semi arid plain of southern Tamil nadu highlighting its ecological and biological information with its taxonomic accommodation.

MATERIALS AND METHODS

Data collection

The study area was visited often by a core research team, during the period of July 2017 to December 2017 on a stretch of semi arid plain, terrestrial snail habitat of Tamil Nadu. Transect was laid on the habitat, based on the availability of species. Its starts specifically from Thirumangalam (9.812 oN, 77.997 oE) of Madurai district, along the belt of road side towards south about 6 Km length covering the distribution of the animal. The area is covering diverse plant communities including *Morinda coreia*, *Azadirachta indica* and dense population of *Prosopis juliflora*. About 200 specimens were collected by manually with a skilled persons, The banding pattern of each specimen was recorded in observation records using hand lens.

Fig-1 Map showing a location of study area covering arid plain of *Thirumangalam* and Peraiyur of Madurai district

Based on the banding pattern of collected specimens were grouped in to 20 according to the similarity. The thickness and length of each band on every shell were also recorded for analysis. Ecology and description of *T.vittata* specieses were studied based on the published literature such as *Fauna of British India* and observations were made on collected captive specimens brought the laboratory separately.

CLASSIFICATION ACCOUNT

The collected specimens were identified followed by the description of K.C.Vaught (1989) and its systematic position is given below.

Kingdom : Animalia
Subkingdom : Metazoa
Phylum : Mollusca
Class : Gastropoda
Subclass : Pulmonata
Order : Stylommatophora
Family : Camaenidai
Genus : *Trachia* (Albers, 1860)
Species : *vittata* (Müller, 1774)

RESULTS AND DISCUSSION

DISTRIBUTION

According to "A classification of the living indian molluscs" by K.C.Vaught (1989) *T.vittata* was placed under Genus *Trachia* Albers, 1860 which accommodates 14 species including *T. vittata* and distributed in peninsular India, Andaman Islands, Bihar, Delhi, Kerala, Madhya Pradesh, Maharashtra, Orissa, Pondicherry and Tamil nadu. (Fig. 2) *T.vittata* are distributed in southern arid plain of Tamil Nadu, widely distributed in South India and Kerala. The conservation status is Endemic and Abundant.

DESCRIPTION AND BANDING PATTERN

T.vittata (Mueller), is one of the species which prefers the salty environment and inhabit the bushy patches in the vicinity of coastal areas and wet bushy area and climbing over the thorny plants. The empty shells remain strewn on the dry sandy stretches (Mitra *et al.*,2005).

T. vittata shell morphology shows fairly large, thick and distinct globally conformed in nature. Colour banding pattern exhibited yellowish to white with brown shell bands of the different numbers (1 to 9). Completely white shells without bands also occur. Deep chocolate colour appeared inside the aperture covering peristome and columella. This species is distinct for its globose shape and deep chocolate aperture. The apical whorls pattern has shown often blackish brown. The band with variable thickness can be categorized very thin to thick and broad. The bands are wide at the base, near the margin of the operculum and gradually tapering to the tip. Apical whorls are obliquely striate, spire convex, suture faIrly impressed. Usually whorls 4 1/2 5 are convex above, but last whorl shown broad and globosely rounded.

It was dilated and steeply descending towards in front. Aperture oblique, subovate in nature and peristome broadly expanded and reflected. The basal part of the shell margin is found to be nearly straight. Columella strongly reflected and concealing the perforation. *T.vittata* is appeared to be distinct in globose shape and its deep chocolate colored aperture.

FEEDING

T.vittata feeds on the fungal rich detritus available in bushes and damp soil.It is generalist feeder on varied diet. *T.vittata* diet chart covers dead organic matters such as flesh of dead animals including snails, papers and polythene bags. They act as scavengers by choosing dead and live degraded leaves and on the bark decayed matter.It also common to the places such as fungal rich detritus available in bushes and damp soils,tree trunks,canopy of small herbs. According to Cain(1977) shell shape has a role in appropriate feeding on different surfaces, it may be vertical or horizontal. A series of teeth used for scraping and arranged in a manner that ribbon like fashion-the radula.The shape and structure of teeth and its row shown a high degree of variation. The feeding behaviour of *T.vittata* exhibits a correlation with a theory which implied that similarity in diet leads to the behavioural adaptation in order to minimize the competition (Mitra *et al.*,2005).

RESPIRATION

In general, respiration of *T.vittata* was effected by using a network of thin walled blood vessels in the mantle cavity under shell.To avoid loss of water while breathing, a thick fold of skin in the mantle and often it closes the cavity in order to conserve water, During breathing, a stream of air passed through a pair of pores called pneumostome and animal can control its activity using its muscle action. Breathing takes place by opening and closing the pneumostome and also handled by raising and lowering the floor of the mantle cavity. While its adverse condition,they try to search for a hidden place to wait until favourable situation. The vision of *T.vittata* is highly developed with eyes on a long pair of tentacles.The second pair of small size seems to be used as feelers (Mitra *et al.*,2005) .

REPRODUCTION

T.vittata is a hermaphrodite in nature and also shown incompatibility in sexual interaction. Reproductive cycle of *T.vittata* covers five phases such as courtship, copulation, nest building, egg laying and embryonic development followed by egg hatching. Courtship for matting behaviour begins while humidity is high (Ahmed sallam, 2005). Mating behaviour was aided at night, frequently on the soil surface. *T.vittata* required introductory behaviour (foreplay) with reciprocal lactile, oral contact and curving turns to reach on optimal position with respect to the genital opening of opposite sex mate.This is followed by dart shooting, penetration of a calcareous dart into the mating partner of body. Copulation is reciprocal and spermatophore is transferred after simultaneous intromission.

The reproductive system of this terrestrial snail is highly complex. Soft calcareous eggs were laid in a gelatinous mass. *T.vittata* prefers places such as loose soil with moisture, wet houmous, decomposed plant materials and underneath of stones for egg laying.When rainy season is on, breeding behaviour will also start. The number of eggs laid in egg mass was ranging from 150 per individual in a life span of time. However, *T.vittata* showed a wide range of reproductive strategy and survival rate in this habitat. The rate of survival in laboratical condition was found to be 50 % to 80%. But in natural habitat, aestivation linked mortality is a chief constraint that also taken into account for calculating survival rate.

AESTIVATION

Aestivation is a period of dormancy of an animal in a condition. During aestivation, *T.vittata* prefers sheltered condition is common and favoured in such as leaf litter, under stone, branches and bark of trees, herbs as well. The period of aestivation ends with return of sufficient humidity level and favourable condition.In our observation, three to four months span was common in *T. vittata* (Chandran *et al.,* 2018). Raut and Ghose (1984) reported that eleven month aestivation period was recorded for the species *A. fulica* .

CONCLUSION

The above study has thrown a light on an unexplored species on its ecological, biological information to an extent. In ecology of the species is correlated with weather condition of the habitat. Climate match profiles predict the significant expansion potential for *T.vittata* in to Southern Tamil Nadu. However, efforts are being made to find out the genetic basis for its variation on the shell pattern, endemicity and polymorphic characteristics exhibited by this animal as in *Cepaea nemoralis* which is used as a model and a thrust area for the research.

Fig 1. Dorsal views of land snail *Trachea vittata* with colour bands

REFERENCES

[1] C. Lydeard, R. H.Cowie, W. F. Ponder, A. E. Bogan, P. Bouchet, S. A.Clark, K. S. Cummings, T. J. Frest, O. Gargominy, D. G. Herbert, R. Hershler, K. E. Perez, B. Roth, M. Seddon, E. E. Strong, and F. G. Thompson. The global decline of non-marine molluscs. Bio Sci., 54 (2004) 321–330.

[2] C. Moritz, K.S. Richardson, S. Ferrier, G.B. Monteith & J. Stanisic. Biogeographical concordance and efficiency of taxon indicators for establishing conservation priority in a tropical rainforest biota. *Proceedings of the Royal Society of London B.* 268 (2001) 1875–1881.

[3] S.I. Bishara, M.S. Hassan, A.S. Kalliny (. Studies on s ome land snails injurious to agriculture in U.A.R. Revue de zoologieet de botaniqueafricainesLxx VII (3-4): 239-252. Braz. J. Biol., 68 1968) 837-842.

[4] M.I.A. Daoud. Ecological and morphological studies on some terrestrial snails in Dakahlia Governorat. M.Sc. Thesis, Fac. Agric., Al-Azhar Univ., pp. (2004)170.

[5] H.I.E. El-Deeb, M .El-Ghamry, N. El-Hwashy, N. Essa. Relative abundance of s ome land snails in c ertain governorate of Egypt. Journal of Agricultural Science, Mansoura University,21 (1996) 2977- 2983.

[6] H.I. El-Deeb, A. Abdel-Halim, I. Koutb, F.K. Khidr, N.M. Edress. Studying some ecologic al aspects associated with the prevalent land snails at Kafr El-Sheikh governorate. Journal of Agricultural Science, Mansoura University,29 (2004) 2847-2853.

[7] M.K. El-Okda.Land mollusca infestation & chemical control in El-Ismaelia G overnorate. Agricultural Research Review, Egypt 62 (1984) 87-92.

[8] A.M. Metwally, H.A. Zedan, A.B. El-Saeid, T.M.M. El-Akra. Ec ological studies on c ertain land snails in Monofia&Gharbia Governorate. Proceedings of 2nd International Conference, Plant Protection Research Institute, Cairo, Egypt: pp. (2002)65-79.

[9] R.R. Ramzy. Biological and ecological studies on land snails at Assiut, Egypt.M.Sc. Thesis, Faculty of Science, Assiut University, Egypt, pp. (2009)164.

[10] K.C. Emberton,. Land snail community morphologies of the highest diversity sites of Madagascar, North America and New Zealand, with recommended alternatives for height diameter plots. Malacologia, 36 (1995) 43-46.

[11]G. T. TONAPI, and' MuLHERKAR' and LEELA. On the freshwater molluscs of Poona, J. Bombay nat. Hisl. Soc., 60 (1963) 104-120.

[12]G. T. TONAPI. Studies on the freshwater and amphibious Mollusca of Poona with notes on their distribution-Part II. J. Bombay nat. Hist. Soc., 68 (1971.) 115-126.

[13]N. V. Subba Rao, and S. C. Mitra.. On the land and freshwater molluscs of Pune district, Mahasrastra. Rec. zool. Surv. India, 75(1979) 1-37.

[14]N. V. Subba Rao, and S. C. Mitra. Molluscs of the Silent Valley. Rec. zool. Surv. India, 84(1986.) 185-189.

[15]N. A. Madhyastha, R. G. Mavin~urve and P. S. Sandhya. Land snails of Western Ghats. In ENVIS Bulletin: Wildlife and protected areas, Conservation of Rainforests in India, A. K. Gupta, Ajith Kumar and V Ramakantha (Eds.), 4(2003) 143-152.

[16]N. A. Madhyastha, G. M. Rajendra, and P. S. Sandhya. Banding polymorphism in Trachia vittata. Zoos' Print Journal, 20(2005) 1821-1822.

[17]R. G. Mavinkurve, P. S.Sandhya and Madhyastha. Non-marine molluscs of Western Ghats: A status review. Zoos' Print Journal, 19(2004b) 1708-1711.

[18]P. S. Sandhya, R. G. Mavinkurve, and N. A. Madhyastha (submitted). Diversity -and distribution of micro gastropods in Western Ghats of Karnataka (India).

[19]K. C.Vaught. A Classification of the living Mollusca. (Eds. R. T. Abbott and K.J. Boss). American Malacologists, Melbourne, Florida (1989) 32902, USA.

[20] O. F. Müller. Vermium terrestrium et fluviatilium, seu animalium infusoriorum, helminthicorum, et testaecorum, non marinorum, succincta historia. *Havniæ (Copenhagen) & Lipsiæ (Leipzig), Heineck & Faber.* 1(1774) 1-214.,

[21]J.C. Albers. [posthumous work edited by E. von Martens]. *Die heliceen nach natürlicher Verwandtschaft systematisch geordnet*, ed.2. Leipzig: Engelmann. xviii + (1860) 359 pp.

[22]S.C. Mitra, and A. Dey, and RalTIakrishna, Land and freshwater ITIolluscs of Andhra Pradesh. Fauna ~l Andhra Pradesh, Slate Fauna Series, 5(2005.) 175-253. Zool. Surv. India.

[23]Ahmeed sallam and Nebil El-wakeil. Biological and ecological studies on land snail and their control. In book:Integrated pest management and control-Current and future tacties. *IAEES publication*, (2012) 413-444.

[24]A.J. Cain. Variation in the spirie index of some coiled gastopod shells, and its evolutinary significance, philossophical transactions of the royal scciety of london B,277 (1977) 377-428.

[25]I. Malachelvi and M. Chandran. Polymorphic characteristic of terresrial snails *Trachea vittata* in semi arid micro habitat. *IJSRR*, 6(2018) 175-180

[26]S.K. Raut and K.C.Ghose Pestiferous land snails of India. Technical monograph No. 11 Zool. Surv. India. (1984) p151.