of immersion of Ganesh idols in the lake and persuade them not to use this lake for immersion of Ganesh idols. This may to some extent reduce the pollution of water of this languishing urban lake.

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M. VIKRAM REDDY*
A. VIJAY KUMAR

*Department of Zoology,
Applied Ecology Laboratory,
Kakatiya University,
Warangal 506 009, India
*For correspondence
e-mail: mallapureddymv@yahoo.com*

Predation of water bug *Sphaerodema rusticum* Fabricius on the snail *Pomacea bridgesi* (Reeve), introduced in India

Being a native of Peru, Bolivia, Brazil and Paraguay[1,2], the ampullariid snails *Pomacea bridgesi* are now thriving well in Florida[3], Hawaii[2] and in the countries of south-east Asia[4–6], including India[7]. They are a serious threat to taro[2] and paddy plants[8,9], and to gastropod fauna[4] of the introduced areas. Also, the fact that they may be involved with the spread of human diseases is of grave concern[10]. Therefore, attempts are being made to prevent their spread furthermore, and to keep the population density in check. Though voracity of *P. bridgesi* is on record[11,12], reports on the organisms devouring them are still wanting, with a view to develop the control strategy. Accordingly, we investigated the same by offering *P. bridgesi* to the water bug *Sphaerodema rusticum*, the most effective predator[13,14] of the endemic freshwater gastropod species experimentally, in the laboratory.

The required number of plastic containers (each 135 mm in diameter and 32 mm in depth), containing 250 ml pond water, laboratory-reared *P. bridgesi* belonging to the size-groups, 2.5–4.5 mm (the newly hatched snails range from 2.3 to 2.7 mm in shell length), 5.0–7.0 mm, 7.5–9.5 mm, 10.0–12.0 mm and 12.5–14.5 mm in shell length, and pond-collected adult *S. rusticum* were considered for the experiment. In all cases, 15 snails were exposed to a single water bug in a container, for a period of 24 h. Initially, experiments were performed with the snails with regard to their size-group, separately. Since the water bugs failed to capture the snails belonging to 10–12 mm and 12.5–14.5 mm size-groups, we finally supplied individuals belonging to the remaining 3 size-groups together in different combinations, taking at least 2 individuals of a size-group, to the predator to note the preference if any, for the specific sized prey individuals. Observations were continued for 6 consecutive days in the former and 39 days in the later experiments. *S. rusticum*, essentially a sucker of the visceral mass of *P. bridgesi*, sometimes consumed it completely (evident from dropping of empty shell from the rostrum) and sometimes, partially (evident from dropping of shell containing a portion of visceral mass). It is to be mentioned that, in cases of complete consumption a small amount of fibre-like material, following dropping of the shell, was seen hanging from the tip of the rostrum of *S. rusticum*. These fibres were, sometimes consumed or left in the water by the bug. Killing of the snails by such types of feeding was termed as ‘destruction’. Data were recorded accordingly, with respect to the feeding types, regularly, at the end of every 24 h. The snails were fed with lettuce and the water of the container was changed daily, adding fresh pond water. In all cases, mean and standard error (SE) were calculated to present the data. One-way analysis of variance (ANOVA)[15] was applied to ascertain whether the size of the prey individuals has significant impact on predation.

S. rusticum was seen to penetrate its rostrum into the visceral mass, suddenly when the snail opened its operculum. The snail tried to close the operculum, but failed to operate the same due to the strong barrier created by the predator by pushing its head into the shell cavity of the prey-snail trapped. The water bug required 25–186 min (average 81 ± 9.07 SE) ($n = 18$) to predate a single snail. A *S. rusticum* destroyed 3–9 snails, consuming 0–4 (completely) and 2–6 (partially); and 1–5 snails, consuming 0–3 (completely) and 0–3 (partially) daily, in single and mixed sized-group experiments, respectively. The average predation rates are shown in Figure 1 *a* and *b*. In mixed size-group experiments, irrespective of trials, the water bug destroyed 18.92, 36.03 and 45.05% *P. bridgesi* belonging to 2.5–4.5 mm 5.0–7.0 mm and 7.5–9.5 mm size-groups, respectively. ANOVA tests indicate that the rates of destruction as well as consumption of prey snails by *S. rusticum* differ significantly ($P < 0.05$) with the size of the snails offered. Also, it is evident that the rate of destruction of the prey by the predator differs significantly ($P < 0.05$), when offered different size-groups, groupwise or together.

Though some birds and reptiles are known to feed upon the golden snails in South America[16], no concerted attempt has ever been made to survey the invertebrates and microorganisms that attack them in their native habitats[6]. However, a pyrrochorid bug, *Dindymus pulcher* and the nymphs of firefly, *Luciola lateralis* are known to feed on *P. canaliculata* in the Philippines[6] and Japan[17], respectively. The results of the present investigation clearly indicate that the water bug, *S. rusticum*, is a voracious feeder of juvenile *P. bridgesi* and thereby, is effective in killing more number of individuals, daily. It is most likely that if the

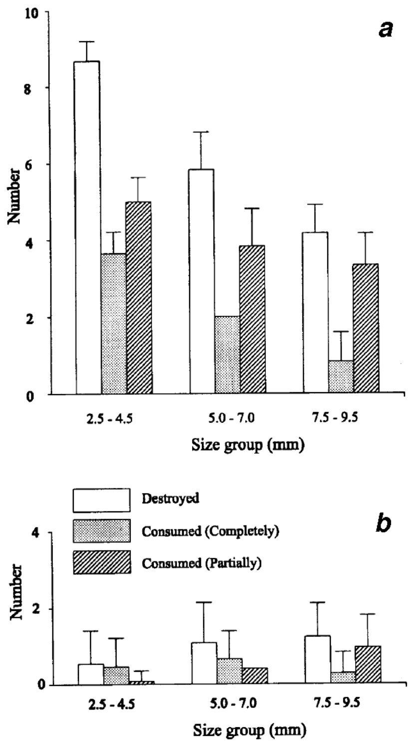

Figure 1. Daily rate (mean ± SE) of predation by an adult water bug, *S. rusticum* on the snail, *P. bridgesi*, when the prey individuals were exposed to the predator separately ($n = 6$) with regard to their size (***a***) and together ($n = 39$), irrespective of their size (***b***). SE bar omitted where value is zero.

snails *P. bridgesi*, ever find their access into the open-air water bodies in India, they would definitely be victimized by *S. rusticum*. Information is available only regarding predation of water bugs on molluscs, confined to non-operculate gastropod species[13,14,18,19]. This is a report of predation of bugs on an operculate species. However, to what extent *S. rusticum* would be effective in regulating the *P. bridgesi* population, if they became the member of the freshwater biotic community of the areas concerned, is left to the future.

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G. ADITYA
S. K. RAUT*

Ecology and Ethology Laboratory,
Department of Zoology,
University of Calcutta,
35, Ballygunge Circular Road,
Kolkata 700 019, India
**For correspondence*
e-mail: jayantadhar@vsnl.net

Epicotyl seed dormancy and phenology of germination in *Polygonatum cirrhifolium* Royle

Polygonatum cirrhifolium Royle (Liliaceae) is an important medicinal plant of temperate Himalaya[1]. The rhizome of this plant constitutes an important ingredient of Astavarga, a group of eight drugs used extensively in Ayurveda mainly as a tonic and aphrodisiac[2]. In trade, its rhizome is known as Meda/Mahameda and its medicinal attributes are ascribed mainly to the presence of steroidal saponins and polysaccharides in the rhizome. The plant is also useful in the preparation of cosmetics, skin tonic and as a vegetable[1,3]. It is being overexploited from the wild habitats for its medicinal properties and hence has been placed in the threatened category[4].

P. cirrhifolium propagates both vegetatively, by rhizomatous root stock and sexually through seeds. In some of the important members of the genus *Polygonatum*, seed germination has been reported to be low and extremely slow[5]. This is true for *P. cirrhifolium* also, as it takes a few years to grow to a full size, beginning with a seed.

We investigated the phenological pattern of seed germination under laboratory and field conditions for three years. The purple-coloured berries were collected from plants growing wild in Lahul and Spiti regions of Himachal Pradesh in October 1998.

Seeds were removed from the berries after 15 days of dehydration at room temperature, thoroughly washed under running tap water with 1 or 2 drops of Tween-20 for 30 min, rinsed twice in sterile distilled water and allowed to germinate in petri dishes lined with moist Whatman filter paper No. 1. Per cent germination, as indicated by emergence