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- 12 Large, mature specimens of *L. indigo* contain hardly any latex and only small amounts of pigment, which we found quite intractable.
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The jump of *Orchestia cavimana* Heller, 1865 (Crustacea, Amphipoda, Talitridae)

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Summary. The saltatory locomotion of the Talitrid (Crustacea) *Orchestia cavimana* Heller, 1865, was studied by high frequency cinematography (1000 fps). The jump lasts about 350–400 msec and covers a distance of 18 cm due to an average acceleration of 300 m/sec². About 4–6 somersaults are performed in the course of each jump.

The conspicuous locomotory jumps of the beachhopper, *Orchestia cavimana* (Talitridae, Amphipoda), first mentioned in 1879², were studied by high frequency cinematography at 1000 frames/sec (figure 1).

In getting ready for the jump, the 7th pereopods stretch fully and the thorax bulges upwards. The abdomen is lifted off the ground so that the urosome, so far flexed under the body, can be stretched downwards at an angle of about 45°. At the end of stretching, the 7th pereopods, and also the tips of uropods 1–3, touch the substratum.

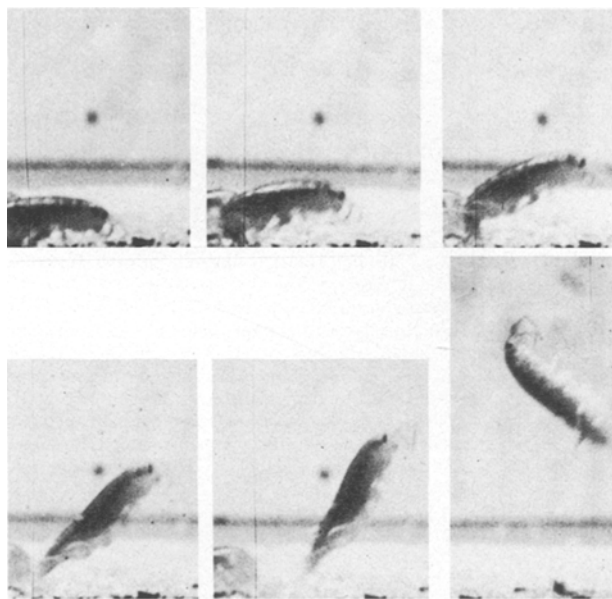


Fig. 1. *Orchestia cavimana*, take-off. Frames 0, 2, 4, 6, 8, and 18 of a film taken at 1000 frames/sec. Frame 18 shows the beginning of the somersault movement.

Thus, in the launching phase (figure 2), the bent metasome is increasingly stretched and the uropods are pressed against the ground, serving as a catapult. Immediately before take-off, the 6th and 7th pereopods are clear off the ground, and only the 5th pereopods give lateral support to the body. A jerking and stretching movement of the metasome pushes the animal into a ballistic trajectory along which 4–6 somersaults tail over head are performed. Depending on the animal's posture at take-off, additional rotations around its longitudinal axis occur ('Schraubensalto').

The jump lasts between 350 and 400 msec varying with height and distance. The average angle of take-off is 43°, and the average distance is 18 cm. Initial acceleration is brought about by 2 thrusts (figure 3b): a 1st one by

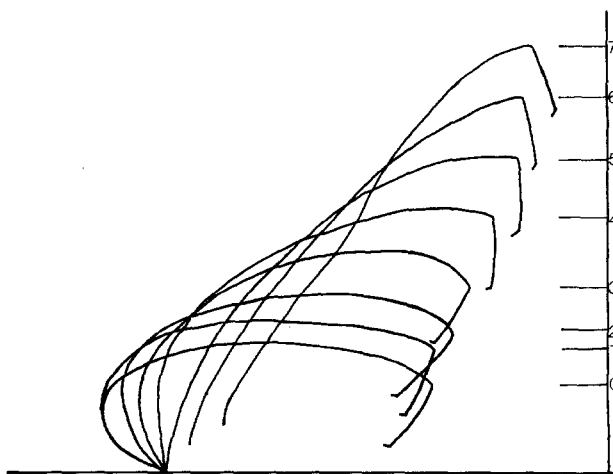


Fig. 2. Profiles of *O. cavimana* from the same film from which figure 1 is taken. Frame numbers are shown on the right.

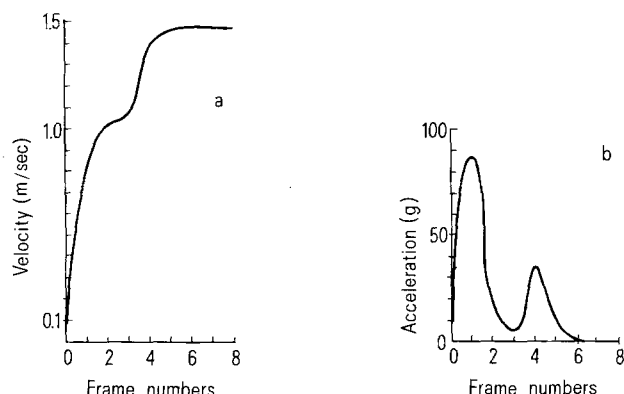


Fig. 3. *O. cavimana*. Velocity and acceleration measured from a film taken at 1000 frames/sec (figures 1 and 2). a Vertical velocity calculated from measured position; b vertical acceleration calculated from averaged velocity.

stretching the metasome yielding the greatest acceleration (880 m/sec^2), and a 2nd one by stretching the urosome adding a definitely smaller amount (360 m/sec^2). Both thrusts total 6 msec. At the end of take-off, the animal's speed is 1.48 m/sec (for comparison: click beetle 3800 m/sec^2 and 2.4 m/sec , flea 1350 m/sec^2 and 1.2 m/sec , springtail 970 m/sec^2 and 1.4 m/sec)³⁻⁵. After take-off, there is no means of correcting body posture or trajectory. At touchdown the animal hits the ground head or tail first on its left or right body side in a statistical distribution.

We are continuing these studies from a comparative point of view on *Orchestia*, *Talitrus* and related genera.

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Protein content of various developmental stages of three strains of the pink bollworm, *Pectinophora gossypiella*¹

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Summary. Comparison of the total body protein of male and female larvae, pupae, and adults of a diapause and 2 non-diapause strains of the pink bollworm *Pectinophora gossypiella* indicated that the protein content of larvae of the diapause strains was significantly higher than of the non-diapause strain.

The pink bollworm, *Pectinophora gossypiella* has a facultative larval diapause in most cotton growing regions of the world, including the United States^{3,4}. A strain of pink bollworm from the southern part of India, when tested, showed no capability to diapause, even under strong diapause-inducing conditions⁵. The concentration of total protein has been reported to increase during the induction and termination of diapause in the pink bollworm⁶. A recent study of the isozymes of diapause and non-diapause larvae has shown differences in several important enzymes⁷. To supplement an investigation on the genetics of diapause in the pink bollworm⁸, a study was undertaken to see if any differences in protein content exist between the diapause and the non-diapause strains.

Materials and methods. 3 strains of the pink bollworm, a non-diapause Indian strain (IS), and 2 diapause strains from Arizona, 1 reared in the laboratory for over 40

generations (AS), and 1 newly acquired (NAS), were maintained on artificial diet under L/D 15:9 h and 25°C ⁹. Under these conditions, none of the larvae enter diapause. 10 insects of each sex from each developmental stage (mature larvae, 1-day-old pupae, and freshly emerged adults) of the 3 strains were used for total protein determination¹⁰. Results were subjected to 3 factorial analysis of variance.

Results and discussion. Comparison of IS and NAS larvae, both of which had been freshly obtained from the fields, indicated that the protein content was higher in the diapause type irrespective of the sex (table). The AS larvae and pupae did not show any significant differences between the sexes and the developmental stages. There was a significant reduction in the protein content of NAS pupae compared to the other 2 strains. No significant differences between the protein content of the adults of the same sex

Total body protein in males and females of 3 strains of the pink bollworm during 3 developmental stages

Strains	Sex	mg protein/g fresh body weight		
		Mature larva	Pupa	Adult
India (IS)	Male	90.4 (1.54)*	89.1 (1.57)	82.3 (1.48)
	Female	89.9 (2.08)	87.8 (1.81)	88.6 (1.03)
Arizona new (NAS)	Male	94.4 (1.52)	79.1 (0.99)	80.3 (2.20)
	Female	104.9 (1.17)	81.9 (1.62)	89.2 (2.29)
Arizona (AS)	Male	96.9 (1.96)	93.6 (1.76)	76.4 (1.77)
	Female	95.9 (2.46)	92.3 (1.36)	88.0 (1.21)

*Figures in parentheses are standard errors of the means.