REC. ZOOL. SURV. INDIA
66 (1—4) : 31—35, 1972.

REACTIONS TO LIGHT IN WOODLICE (ISOPODA)

By

(MRS.) M. GUPTA

Zoological Survey of India, Calcutta

I—INTRODUCTION

In spite of various inherent limitations due to their grade of organisation, woodlice are able to lead a terrestrial life as a result of modifications in their behaviour. Morphological features have not changed much since their marine ancestors (Pearse, 1916). Edney (1954) concludes that woodlice are not conspicuously adapted to terrestrial life. The negative response to light has been studied by few workers in the past. Some controlled experiments were carried out to elucidate the acclimatisation of woodlice to light and the influence of temperature on phototaxis.

II—EXPERIMENTS

(a) Reaction of Normal Woodlice to Light

Method.—Experiments were carried out with fresh animals in a choice-chamber apparatus which consisted of a glass container about 15 cm. in diameter and 7 cm. in height. The vessel was divided into two compartments by a piece of hardboard leaving a narrow space at the bottom through which the animals could just pass. The apparatus was covered above by a piece of black hardboard. Half of the apparatus was painted black on all sides so that no light from outside could affect that part. The floor was covered by two equal pieces of wet filter paper. A 40 watt bulb was fitted with a resistance box by which the intensity of illumination could be changed when required. The light was placed at a distance of 38 cm. from the unpainted side. A piece of cardboard 20 cm. x 25 cm. was fixed by a clasp in front of the light. A hole (5 cm. x 5 cm.) through which light could pass, was made on the upper part of the cardboard. A sheet of heat-proof glass was fitted across the hole. Thus one half of the chamber was illuminated whilst the other half was in darkness. The light intensity in the illuminated side of the arena was measured with an Avo light meter which gave a reading of 15 lumens per square foot. On the dark side 3 lumens per square foot were recorded.

Five adult males and five adult females of *Oniscus asellus* Linnaeus were placed in the choice-chamber. Females were marked with white paint so that they could easily be distinguished. The number of each sex in each half of the arena was recorded at intervals of fifteen minutes. These animals were then replaced by ten fresh animals and a further observation was made after fifteen minutes. The procedure was repeated until ten readings had been taken, so that the results of 100 animals were obtained. A similar series of experiments was carried with *Porcellio scaber* Latr. It was found that

26% of the position records of *O. asellus* and 29% of the position records of *P. scaber* were on the light side of the choice-chamber. No significant difference was noted between the behaviour of the two sexes in the intensity of their responses to light.

(b) Reaction to Light of Woodlice Acclimatised to Bright Light

A number of *O. asellus* and *P. scaber* were placed in a glass container 15 cm. in diameter and 7 cm. in height. A 60 watt bulb at distance of 60 cm. above was turned on for four days. The intensity of light on the floor of the container was 40 lumens per square foot (measured by an 'Avo' light meter). The reaction to light after acclimatisation to light was studied by the method described above for normal animals. At the beginning of the experiments, few animals were found to be photopositive but as soon as they had found the dark side, they aggregated there. Ten readings were recorded using ten animals at a time, over a period of fifteen minutes. This procedure was continued until the results of 1000 different animals had been obtained. These experiments showed that 72.8% of *P. scaber* and 57.4% of *O. asellus* were statistically (P=0.05) significant.

Hence it may be assumed that both *O. asellus* and *P. scaber* do not become acclimatised to bright light or if they do so, this conditioning does not persist for long.

The structure of eye of these animals have been studied in detail and findings will be published elsewhere (as it is beyond the scope of this paper). But it may be stated that pigment migration does not occur in the eye of these animals when exposed to bright light.

(c) Influence of Temperature on Phototaxis

The animals were placed in a large conical flask containing humus. The humidity of the air inside the flask was measured by cobalt thiocyanate paper (Solomon, 1957) and varied between 60% to 70%. The flask was closed with a piece of cotton wool. It was placed inside an incubator at a constant temperature of 30°C for 48 hours.

The reaction to light was now studied in exactly the same way as in the previous experiment. All conditions of the experiments were also exactly the same. The results of 1000 different animals showed that 49.6% of *O. asellus* and 52.1% of *P. scaber* remained on the dark side which was not significant statistically.

After exposure to a temperature of 30°C, therefore, no significant difference was obtained between the number of animals present in light or dark in each species. In other words, the woodlice became less photonegative at higher temperatures. This behaviour of *O. asellus* and *P. scaber* seems to be similar to that of *Armadillidium vulgare* (Latreille), according to Henke (1930).

Thus it is concluded that the reaction to light depends upon various factors and previous exposure to higher temperatures is one of them.

III—Discussion

That woodlice are normally photonegative is corroborated in the present study. Fraenkel and Gunn (1940) have described the reactions of woodlice to light in different categories, such as, tropotaxis,

light compass reaction, unilateral blinding and circus movements, skototaxis etc. They also criticised the studies of workers.

Abbott (1918) found both *O. asellus* and *P. scaber* to be photonegative in general. He also noticed that some animals became photopositive after previous exposure to bright light. His observation was not based on strict experimental studies. However, Müller (1925) observed that *Cylisticus convexus* and *Trichoniscus pusillus* did not become photopositive after long exposure to light. The explanation of similar behaviour in *O. asellus* and *P. scaber* is due to the fact that *pigment migration does not occur in the eye* when exposed to bright light for prolonged period. This phenomenon has not been studied before.

Regarding the influence of temperature on phototaxis, Henke (1930) found that *Armadillidium vulgare* (Latreille) might be photopositive after previous exposure to higher temperature. The similar phenomenon with *O. asellus* and *P. scaber* has been observed in the present series of experiments.

IV—ACKNOWLEDGEMENTS

My thanks are due to Prof. J. L. Cloudsley-Thompson for his supervision during this work. This work was undertaken while the author was a postgraduate student of the London University. My thanks are also due to Dr. A. P. Kapur, Director, Zoological Survey of India, for his encouragement to publish this paper.

V—SUMMARY

Oniscus asellus L. and *Porcellio scaber* Latr. are negatively phototactic animals. They do not become acclimatised to bright light and no pigment migration occurs in their compound eyes. They become less photonegative when they have previously been exposed to higher temperature.

VI—REFERENCES

ABBOTT, C. H. 1918. Reactions of land isopods to light. *J. exp Zool.*, **27** : 193-246.

EDNEY, E. B. 1954. Woodlice and the land habitat. *Biol. Rev.*, **29** : 185-219.

FRAENKEL, G. E., and GUNN, D. L. 1940. *The orientation of animals*, Oxford.

HENKE, K. 1930. Die Lichtorientierung und die Bedingungen der Lichtstimmung bei *Armadillidium cinereum* Zenker. *Z. Vergl. Physiol.*, **13** : 534-625.

MÜLLER, A. 1925. Über Lichtreaktionen von Landasseln. *Zool. Vergl. Physiol*, **3** : 113-44.

PEARSE, A. S. 1916. An account of the crustacea collected by the Walker expedition to Santa Marta, Columbia. *Proc. U.S. nat. Mus.*, **49** : 531-36.

SOLOMON, M. E. 1957. Estimation of humidity with cobalt thiocyanate papers and permanent colour standards. *Bull. ent. Res.*, **48** : 489-506.