Effect of administration of synthetic ecdysone on the moulting of *Palamnaeus bengalensis*

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Summary. Synthetic analogue of ecdysone, 3β, 14α-dihydroxy-5β-cholest-7-en-6-one did not bring the scorpion *Palamnaeus bengalensis* to moult. It also failed completely in stimulating the scorpion to produce any change related to moulting.

Moulting hormones of insects and crustaceans are fairly well understood[2-12]. However, in arachnids, no such hormone affecting moulting has yet been described. In the present communication, the effect of administration of a synthetic analogue of ecdysone on various age groups of *P. bengalensis* to initiate moulting has been described.

Materials and methods. A synthetic analogue of ecdysone viz. 3β, 14α-dihydroxy-5β-cholest-7-en-6-one, was kindly supplied by Prof. M.N. Galbraith, CSIRO, Australia. The analogue was found most active in the *Calliphora* test.

In order to observe the effect of this, synthetic analogue of ecdysone on the *Palamnaeus bengalensis,* varying quantity up to 5 µg of the synthetic analogue dissolved in physiological Ringer prepared specially for the scorpions, was injected to batches of scorpions of different age groups by a microsyringe (Hamilton Co. Inc. Whittier, California).

Techniques of cold microtomy (on a cryocut, American Opticals) and phase contrast microscopy (Carl Zeiss, Jena) were used for preliminary detection of mitoses in integumentary epidermal cells; and for confirmation Feulgen reaction was employed.

Observations and discussion. It was observed that the synthetic analogue could not bring the scorpions to moult. It also failed completely in stimulating *Palamnaeus bengalensis* of any age group to produce even any change related to moulting, e.g. mitosis in integumentary epidermal cells, deposition of new cuticle etc., attributed to the moulting hormone of insects and crustaceans[13-20]. Thus, the possibility of a different moulting-initiating hormone of arachnids cannot be ruled out.

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Effect of administration of synthetic ecdysone on the Indian scorpion *P. bengalensis*

Amount of ecdysone administered in each scorpion	Weight range* of the batch** of scorpions	Effect of ecdysone on integumentary epidermal cells and mortality, recorded after															
		24 h		48 h		72 h		96 h		120 h		144 h		168 h		90 days	
		A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
0.5 µg	a	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	b	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	c	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1.0 µg	a	–	–	–	–	–	–	–	+9	–	+1						
	b	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	c	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1.5 µg	a	–	–	–	+10												
	b	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	c	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2.0 µg	a	–	–	–	+10												
	b	–	–	–	–	–	–	–	–	–	–	–	+6	–	+4		
	c	–	–	–	–	–	–	–	–	–	–	–	+3	–	+7		
2.5 µg	a	–	–	–	+10												
	b	–	–	–	–	–	–	–	+8	–	+2						
	c	–	–	–	–	–	–	–	–	–	–	–	+9	–	+1		
3.0 µg	a	–	+8	–	+2												
	b	–	–	–	–	–	–	–	+8	–	+2						
	c	–	–	–	–	–	–	–	–	–	+8	–	+2				
3.5 µg	a	–	+9	–	+1												
	b	–	–	–	–	–	+9	–	+1								
	c	–	–	–	–	–	–	–	–	–	+9	–	+1				
4.0 µg	a	–	+9	–	+1												
	b	–	–	–	–	–	+9	–	+1								
	c	–	–	–	–	–	+6	–	+4								
4.5 µg	a	–	+10	–	–												
	b	–	–	–	+10												
	c	–	–	–	+2	–	+8										
5.0 µg	a	–	+10														
	b	–	+10														
	c	–	+9	–	+1												

*Weight range: a 0.2–1.00 g b.wt, b 1.0–2.5 g b.wt, c 2.5–4.5 g b.wt. **Each batch contained 10 scorpions of the same weight range. A, Effect of administration of ecdysone on mitosis in integumentary epidermal cells. B, Effect of administration of ecdysone on mortality of scorpions.

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Correlation of song frequency and body weight in passerine birds

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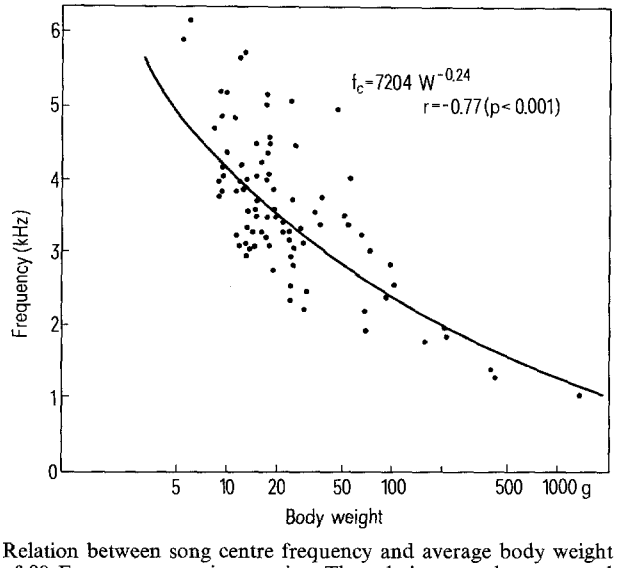
Summary. Frequency analysis of the songs of 90 European passerine species shown a correlation with body weight. In a number of species a dependence on habitat was found.

Various physiological parameters of homeothermic vertebrates such as heart beat, respiratory and metabolic rates exhibit a strong dependence on body weight[1]. A similar relation was suggested for the vocalization of birds by Schwartzkopff[2]. This problem area was examined in a comprehensive study of the song frequencies of European passerine birds.

Material and methods. The songs of 90 passerine species recorded in the open field on UHER and NAGRA tape recorders were analyzed using a 1/3-octave filter (TOA 111) thus yielding species-specific vocalization spectra. At least 3 song sequences of each individual and of 3 individuals of each species were analyzed. Species-specific centre frequencies were found by calculating the geometric mean of each spectrum. These frequencies were compared with the body weights of the species. Mean body weights were taken from larger samples in the literature[3].

Results. The figure 1 illustrates the relation found between song centre frequency and average body weight of the species studied. Frequencies range from 1.25 kHz *(Corvus corax)* to 6.13 kHz *(R. regulus),* b.wt from 5.3 g *(Regulus ignicapillus)* to 1400 g *(Corvus corax).* The relation between centre frequency and body weight may be expressed by the regression function $f_c = 7.204\ W^{-0.24}$ (f_c in kHz and W in g). The correlation coefficient r has the value 0.77. This value is significant with $p < 0.001$.



Relation between song centre frequency and average body weight of 90 European passerine species: The relation may be expressed by a regression function with high significantly correlation.

A closer analysis shows certain marked disparities for which ecological factors appear to be responsible. Thus species living in open habitats (field and meadow) exhibit higher frequencies than expected whereas the converse true for species occupying homogeneous habitats (rush)[4].

Discussion. The relation found between mean song frequency and body weight shows that bird vocalization is highly dependent on constitution. As vocalization depends to a high degree on anatomical factors (length of trachea, resonance capacity etc.) as well as physiological factors (respiratory ratel) such a correlation is to be expected. It is interesting to note in this context that the value found for the exponent of the regression function (−0.24) corresponds closely to values for the regression functions for heart beat rate (−0.21 to −0.25[1,5,6]) and respiratory rate (−0.26[1]) over body weight in homeothermic animals; it would appear that a general relation exists.

Birds also have the capacity to adapt their vocalization to ecological factors. Studies reported previously, however, express one-sided points of view: body weight is either totally[7] or partly[8] ignored thus giving ecological factors priority in the selection process, or as in the case of other authors[9] it is assumed that only body weight influences vocalization. Ultimately a synthesis of both points of view must emerge.

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