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Etologia. — *Effect of some socio-sexual conditions on the reproductive cycle of* Asellus aquaticus *females* (*). Nota di FLORA VALENTINO, LUCIANA MIGLIORE e GIOVANNA VITAGLIANO TADINI, presentata (**) dal Socio G. MONTALENTI.

RIASSUNTO. — In relazione alle condizioni socio-sessuali di allevamento, le femmine di *Asellus aquaticus* mostrano diversi tipi di comportamento: 1) la muta intermedia viene indotta, nella maggioranza degli individui, tramite un effetto gruppo dagli individui dello stesso sesso; 2) la muta partoriale e la deposizione delle uova dipendono principalmente da stimoli dovuti all'accoppiamento; 3) in una piccola percentuale di femmine la muta intermedia, quella partoriale e la deposizione delle uova avvengono invece indipendentemente dalla presenza o dall'assenza di individui dello stesso o dell'altro sesso.

In Isopod Crustacea there has been observed a parallelism between ovarian activity and development of external sexual characters. This is true also for *Asellus aquaticus* (freshwater Crust. Isop.) a gonochoric and not parthenogenetic species [1]: during mating, females undergo a breeding moult (BM), forming an incubator pouch called the " marsupium ". This is a temporary sexual character in which *Asellus* lays eggs. After the larvae deposition through an intermediate moult (IM), the marsupium is lost. This cycle is repeated several times.

In the northern races there is a period of stasis: in this period females do not exhibit the breeding moult.

Ovariectomy and X-ray irradiation experiments on females permit us to attribute to " clear " follicular cells of ovaries, an endocrine role with elaboration of the hormone indispensable to marsupium formation and egg laying [2].

Oogenesis could be under neuroendocrine control, as seen in *Nereis* [3]. This system is also influenced by socio-sexual factors such as " group effect " and " mating " (or courtship).

The influence of these factors has been found also in other Arthropods. Cassier [4], in *Locusta migratoria migratorioides*, observed that isolation of individuals causes an increase of endocrine activity of *corpora allata*, determining persistency of ventral glands even after metamorphosis. In *Actias selene* (Lepidoptera) Benz [5] observed the existence of two factors acting synergetically on oogenesis: a pheromone released by antennal contact during courtship and a stimulation due to mating. Davis [6], in his work

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on the reproductive physiology of Cimicidae, defines the mating-dependent oogenesis as "sexual anautogeny" and the independent one as "sexual autogeny".

We thought it would be interesting to establish if in *Asellus aquaticus* also, variations of socio-sexual conditions can influence the female reproductive cycle.

We did experiments on *Asellus aquaticus* females in the same physiological conditions (egg in the marsupium) as the southern race (which has no sexual rest) coming from the Sarno river (Naples) as follows:

Exp. A) 250 females were kept isolated, one per bowl;

Exp. B) 250 females were kept in groups of ten individuals, without males;

Exp. C_1 and C_2) 500 females were kept in groups of ten individuals, with one or ten males respectively. The males could have no physical contact with the females, being separated from each other by a thin net.

On the other hand, controls were kept in groups of ten females and ten males and one female and one male (400 females).

TABLE I

	♀	♂	30th day			Died	60th day			Died
			IM^-	BM^-	IM^+BM^- IM^+BM^+		IM^-	BM^-	IM^+BM^- IM^+BM^+	
Exp. A . .	250	0	33 (17)	75 (39)	84 (44)	58 (23)	23 (18)	92 (71)	14 (11)	63 (33)
Exp. B . .	250	0	8 (5)	104 (65)	48 (30)	90 (36)	8 (7)	89 (78)	17 (15)	46 (29)
Exp. C_1 . .	250	25	6 (2)	156 (66)	75 (32)	13 (5)	3 (2)	114 (89)	11 (9)	109 (46)
Exp. C_2 . .	250	250	6 (3)	112 (58)	74 (39)	58 (23)	2 (2)	99 (90)	9 (8)	82 (43)
Control . . .	400	400	—	38 (11)	306 (89)	56 (14)	—	38 (14)	233 (86)	73 (21)

(percent in brackets)
IM^- = no intermediate moult; BM^- = no breeding moult; IM^+ = intermediate moult effected; BM^+ = breeding moult effected.

In Table I we summarized our results:

A high percentage of isolated females (Exp. A) have total blockage of the moult cycle: they do not undergo the intermediate moult and maintain the old marsupium. We see this kind of behaviour after 30 days in 17 % of

females, whereas 39 % succeed in effecting the intermediate moult. 44 % also experience the breeding moult. In the females which live a till the 60th day, the distribution into the 3 categories is much more evident, showing a further increase in females with a total moult block.

– Females of experiments B, C_1 and C_2 show no significant differences from each other. In these 3 experiments the percentage of females showing a total moult block is extremely low, whereas there is an increase in females effecting the intermediate, but not the breeding moult. This increase is further evident in the females on the 60th day.

– The controls show 100 % intermediate moult. 89 % (on 30th day) and 89 % (on 60th day) effect the breeding moult.

From the analysis of the data reported in Table I we can conclude:

1) the breeding moult and egg laying do not seem to depend on a sexual pheromone released by the male into the environment. This is demonstrated by comparing the results of experiments A and B with those of C_1 and C_2. The comparison also shows that the effect of males in the breeding water is neither quantitative nor qualitative. These results suggest that the breeding moult and egg laying depend on mating stimulations. These stimulations are effective also after 30 days of isolation and probably they prime a series of neuroendocrine mechanisms. In *Asellus aquaticus*, however, the mating is a very important moment of the reproductive cycle. It lasts a week, on the average, and in this period females undergo the breeding moult that allows fertilization.

2) The significant difference between the percentage of isolated and grouped females shows that in this species there exists an intrasex group effect that acts positively on the intermediate moult.

3) Some females, with different values in the various experiments, show that they are completely dependent, for all the moults, on inter and intrasex effect. Other females are completely independent of those effects and lay eggs all the same, showing that the population has a high variability in respect to this character. We can end by saying:

– oogenesis and breeding moult depend on mating in the majority of individuals. Thus the species may be classified as anautogenic (sensu Davis);

– some females undergo the intermediate and the breeding moults and egg laying independently of the presence of males or females. So the species has a low percentage of autogenic individuals;

– the intermediate moult is induced by the presence of individuals of the same sex. The species feels an intrasexual group effect.

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