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New data on the chromosome number of the genus Artemia

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SEZIONE III

(Botanica, zoologia, fisiologia e patologia)

Genetica. — *New data on the chromosome number of the genus* Artemia. Nota di CLAUDIO BARIGOZZI e LAURA BARATELLI ZAMBRUNI, presentata (*) dal Socio C. BARIGOZZI.

RIASSUNTO. — Gli autori hanno determinato il numero cromosomico di *Artemia franciscana* e *Artemia sp.* di 19 località in America Sett., Europa, Asia e Australia.

I numeri trovati in saline della Penisola iberica e della Francia meridionale (*Artemia* bisessuata e partenogenetica) formano serie eteroploidi di grado pari, fenomeno non mai riscontrato finora nel genere. Mescolanze di poliploidi di diverso grado sono anche state trovate in alcune località.

The chromosome numbers found in the genus *Artemia* up to 1980 were 42, 44, 63, 84 and 105; 42, 63, 84 and 105 correspond to ploidy steps, while 44 is that of the species *A. persimilis*.

More recently Abreu-Grobois and Beardmore (1982) published the chromosome numbers of Artemia from several localities not studied before, finding the same numbers quoted above.

As a conclusion of their work, only polyploidy exists, apart from the heteroploid species *A. persimilis*.

The present investigation, based on the determination of the chromosome numbers in mitoses of the nauplius, confirmed some data, but also provided clear indications of heteroploidy in several populations.

MATERIAL AND METHOD

Dry cysts from *Artemia franciscana* and *A. sp.* (1) were used the latter denomination being used to indicate both bisexual and parthenogenetic brine shrimps not belonging to *A. franciscana* and to *A. persimilis*—although it cannot be excluded that further investigations (especially on the genetic barrier between populations) may lead to splitting *A. sp.* into sibling species.

The localities from which the cysts came are indicated together with the results.

Cyst samples were kindly supplied by the Artemia Int. Reference Center (Ghent, Belgium) and Dr. P. Amat i Domenech (Torre de la Sal, Spain).

(*) Nella seduta del 25 novembre 1982.

(1) *Artemia sp.* may correspond to the old name *A. salina*.

The preparation of the freshly hatched nauplii was as indicated in the paper by C. Barigozzi and L. Baratelli Zambruni (1982). For the present investigation the only stain used was orcein.

Results

The chromosome numbers found for each locality are indicated, followed in brackets by the number of nauplii analyzed. The data are grouped geographically, in order to facilitate the discussion.

A. franciscana (bisexual)

North America

United States of America:

San Francisco Bay (California)	42	(39)	
Great Salt Lake (Utah)	42	(28)	
Macau (Brazil)	42	(21)	

This population originated from San Francisco Bay cysts was inoculated in the Macau saltwaters.

A. sp.

Europe

Italy:

Tarquinia (Latium)	42	(23)	bisexual
Poetto (Sardinia)	42	(35)	bisexual
Margherita di Savoia	42	(12)	parthen.
(Apulia)	84	(22)	parthen.
		(34)	

France:

Salin de Giraud	42	(34)	parthen.
	44	(5)	
	46	(1)	
		(40)	

Spain:

Gerri de la Sal (inland Catalonia)	40	(9)	parthen.
	42	(18)	
	44	(1)	
	46	(1)	
		(29)	
Saelices (inland Castile)	84	(19)	parthen.

Calpe (Alicante)	42	(11)	parthen.
	44	(4)	
	46	(6)	
	48	(2)	
	50	(3)	
	56	(1)	
	63	(2)	
		(29)	
Barbanera (Andalucia)	42	(19)	bisexual
	44	(4)	
	46	(2)	
	48	(1)	
	50	(1)	
		(27)	
Ayamonte (Andalucia)	42	(16)	parthen.
	63	(1)	
	84	(2)	
		(19)	
Portugal:			
Alcochete	42	(8)	parthen.
	44	(2)	
	46	(6)	
	48	(2)	
	52	(1)	
	54	(1)	
		(20)	
Asia			
Israel:			
Eilat	63	(34)	parthen.
India:			
Tuticorin	63	(60)	parthen.
China:			
Tien–Tsin	42	(57)	parthen.
	84	(3)	
		(60)	
Australia			
Shark Bay	42	(44)	parthen.

Discussion

The chromosome numbers found in 19 localities belonging to four continents make it possible to discuss the following points:

1) Heteroploidy is described systematically for the first time in Artemia. The phenomenon seems to be restricted to the west part of the Mediterranean Sea.

Only even numbers have been found, both in parthenogenetic and in bisexual individuals.

Unfortunately, crosses between the different heteroploid and diploid bisexual populations could not be effected so nothing can be said about the existence of a genetical barrier between the populations.

This is particularly interesting, because *Artemia persimilis*, which exhibits 44 chromosomes, is a different species.

In the material living at Gerri de la Sal (Spain), in 9 individuals out of 29, 40 chromosomes instead of 42 were found. This observation can be interpreted in two ways: either the mitoses of this population tend to loose chromosomes, or there are some individuals characterized by 40 chromosomes. The first interpretation (which we favour for the moment) does not attribute any particular significance to this chromosome number. The second interpretation should consider 42 as a hyperdiploid number. Since to date no other comparable data have been found, this interpretation does not seem convincing. Heteroploidy has not been found by Abreu–Grobois and Beardmore (1982). The discrepancy is not easy to explain.

2) The presence of more than one ploidy degree in the same biotope is confirmed for Margherita di Savoia. Other cases are those of Ayamonte (Spain) where, together with a majority of diploid individuals, a minority of tri—and tetraploids have been found, and of Tien-Tsin (China) where a minority of tetraploids (84 chromosomes) live together with a majority of diploids.

3) Triploidy is confirmed for Eilat (Israel) and Tuticorin (India, Kerala) (Abreu Grobois and Beardmore, 1982).

4) The chromosome numbers listed in this paper permit a comparison with the size of the cysts, which were measured by Sorgeloos (1980). The conclusions which can be drawn point to a complex relationship between chromosome number and cyst size, indicated as maximal surface (equatorial section) of the cyst considered as a sphere. In fact the largest cysts (of nearly the same size) are those from Tuticorin, India (triploid, 63 chromosomes) and Margherita di Savoia, Italy, which are mainly tetraploid (84 chromosomes) with fewer diploids (42 chromosomes). The cysts of the Great Salt Lake, Utah U.S.A. are of different size, although there have invariably 42 chromosomes. These observations are in agreement with those by Barigozzi (1940), who found different sizes of the nuclei of the intestine epithelial cells in different parthenogenetic invariably tetraploid lines.

LITERATURE

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