

Chromosome numbers of *Steinernema* and *Heterorhabditis* species

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SUMMARY

Chromosome number is conserved amongst species within the genera *Steinernema* ($n = 5$) and *Heterorhabditis* ($n = 7$), with the exception of the *Steinernema* sp. NC 513 group of isolates ($n = 3$). Interbreeding data and chromosome numbers indicate that the *S. glaseri* and *Steinernema* sp. NC 513 group of isolates should be considered separate species. Absence of pre-zygotic mating barriers, similar geographic distribution and similar morphology suggest that *Steinernema* sp. NC 513 may have evolved from a population of *S. glaseri* by chromosome fusion events. There is no difference in the ability of these species to grow, reproduce and retain the primary form of *Xenorhabdus nematophilus* subsp. *poinarii* NC 513 bacteria in the infective stage.

RÉSUMÉ

Nombres chromosomiques chez les espèces de Steinernema et Heterorhabditis

Le nombre de chromosomes est constant chez les espèces appartenant aux genres *Steinernema* ($n = 5$) et *Heterorhabditis* ($n = 7$), à l'exception des groupes d'isolats « *Steinernema* sp. NC 513 » ($n = 3$). Les données fournies par les essais de croisement et les nombres chromosomiques montrent que *S. glaseri* et *Steinernema* sp. NC 513 devraient être considérés comme des espèces

Table 1
Chromosome number, geographic origin and source of species of nematode

Species/Isolate	Chromosome number	Geographical origin	Source*
<i>Steinernema</i> sp. NC 513/NC 17 A	3	North Carolina, USA	W. M. Brooks
<i>Steinernema</i> sp. NC 513/NC 18 A	3	North Carolina, USA	W. M. Brooks
<i>Steinernema</i> sp. NC 513/NC 19 A	3	North Carolina, USA	W. M. Brooks
<i>Steinernema</i> sp. NC 513/NC 20 B	3	North Carolina, USA	W. M. Brooks
<i>Steinernema</i> sp. NC 513/NC 513	3	North Carolina, USA	W. M. Brooks
<i>Steinernema</i> sp. ED/1	5	North Carolina, USA	A. T. Drooz
<i>Steinernema</i> sp. NC 270	5	North Carolina, USA	CSIRO
<i>Steinernema</i> sp. C 85011	5	South China	GEI
<i>Steinernema</i> sp. C 2 B 2	5	North China	CAAS
<i>Steinernema</i> sp. C-Zuhai	5	South China	GEI
<i>Steinernema</i> sp. CWL 05	5	South China	GEI
<i>S. affinis</i> /DAN	5	Denmark	A. E. Pye
<i>S. anomali</i>	5	USSR	S. Spiridonov
<i>S. bibionis</i> /T 335	5	Tasmania	CSIRO
<i>S. carpocapsae</i> /ALL	5	Florida, USA	K. V. Deseo
<i>S. glaseri</i> /KG	5	North Carolina, USA	H. K. Kaya
<i>S. glaseri</i> /NC 32	5	North Carolina, USA	CSIRO
<i>S. glaseri</i> /NC 34	5	North Carolina, USA	CSIRO
<i>S. glaseri</i> /NC 40	5	North Carolina, USA	CSIRO
<i>S. glaseri</i> /NC 50	5	North Carolina, USA	CSIRO
<i>S. glaseri</i> /NC 52	5	North Carolina, USA	CSIRO
<i>Heterorhabditis</i> sp. D 1	7	Northern Territory, Aus.	CSIRO
<i>Heterorhabditis</i> sp. NZ	7	Auckland, New Zealand	W. Wouts
<i>Heterorhabditis</i> sp. V 16	7	Victoria, Aus.	CSIRO
<i>Heterorhabditis</i> sp. HW 79	7	Netherlands	W. R. Simons
<i>Heterorhabditis</i> sp. NC 162	7	North Carolina, USA	CSIRO
<i>H. heliothidis</i>	7	North Carolina, USA	W. Wouts
<i>H. bacteriophora</i>	7	South Australia, Aus.	W. Wouts
<i>H. megidis</i>	7	Ohio, USA	T. Jackson
Undescribed genus P., Q 1	5	N. Queensland, Aus.	CSIRO
Undescribed genus P., Q 617	5	N. Queensland, Aus.	CSIRO

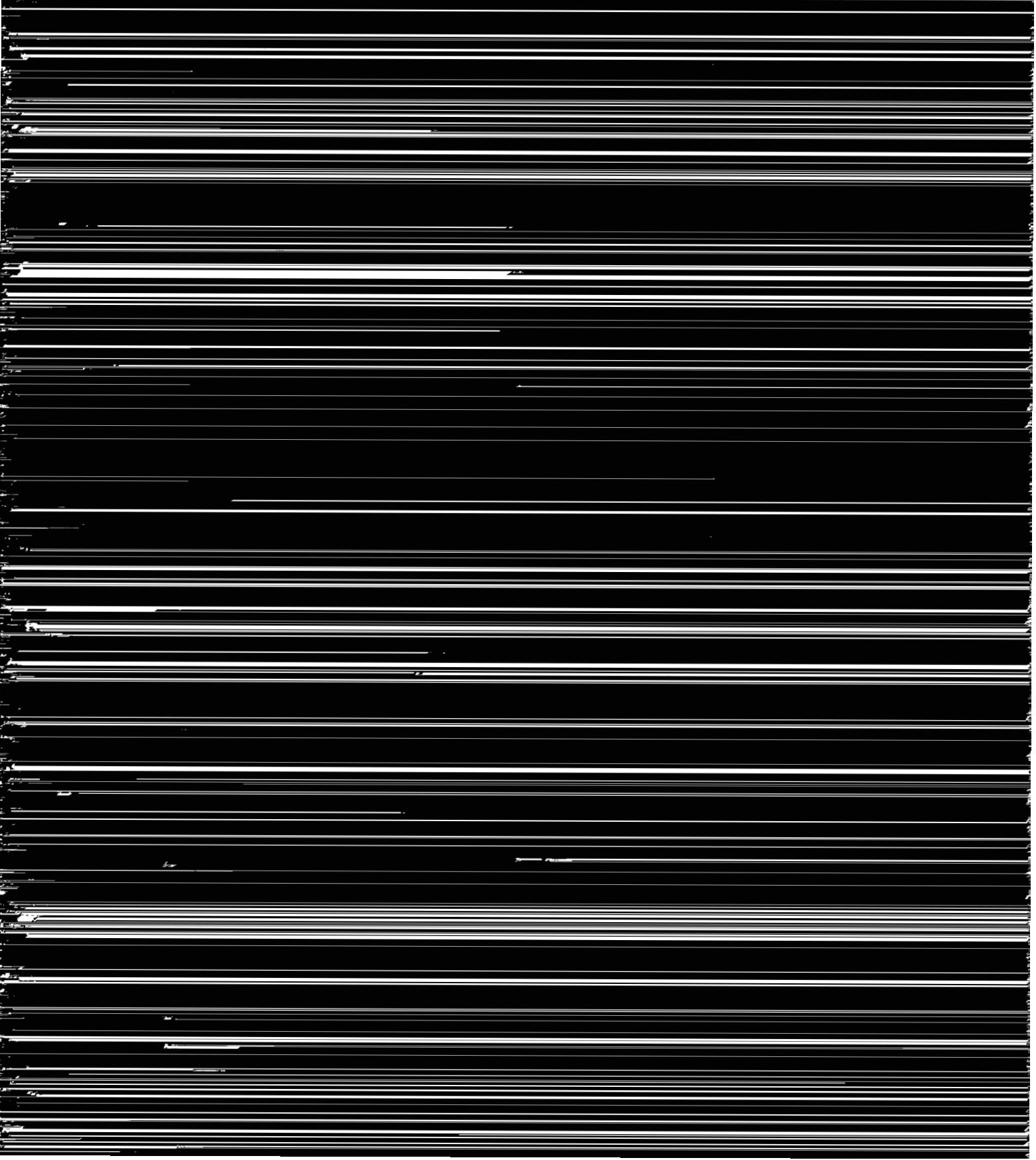
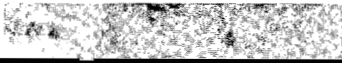
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Species determinations in the genus *Steinernema* were made by the cross-breeding technique of Akhurst and Bedding (1978), with appropriate controls including the injection of single nematodes into *G. mellonella* to test for parthenogenetic or self-fertilizing hermaphroditic nematode isolates.

Results

The chromosome numbers of 31 species/isolates of *Steinernema*, *Heterorhabditis* and an undescribed new

genus of steinernematid (Q 1, Q 617; Bedding, pers. comm.) are presented in Table 1. All *Heterorhabditis* species have $n = 7$; *Steinernema* species have $n = 5$, with the exception of *Steinernema* sp. NC 513 which has $n = 3$. The two species Q 1 and Q 617 of the undescribed genus have $n = 5$. Examples of each chromosome complement are presented in Fig. 1. There was no variation of chromosome number within a species or isolate. Single nematodes of all *Heterorhabditis* isolates injected into *G. mellonella* produced fertile offspring; no progeny were obtained from single nematodes of any *Steinernema* isolate.



occurrence of a chromosome number of $n = 5$ throughout *Steinernema* suggests that $n = 5$ is the base chromosome number for the genus. *Steinernema* sp. NC 513 may have evolved by chromosome fusion events from a population of *S. glaseri*. Interestingly, in the laboratory, both species grow and reproduce with greater than 90 % of the infective stage juveniles retaining the primary form of *Xenorhabdus nematophilus* subsp. *poinarii* NC 513 bacteria. The ability of two separate *Steinernema* spp. to utilize the same *Xenorhabdus* symbiont, without obvious deleterious effects, has not been reported previously (Akhurst, 1983).

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