SUCCESSFUL REPRODUCTIVE CYCLE STRATEGY (Extra-Pair Copulations In Nicrophorus Germanicus (LINNAEUS, 1758)) (NICROPHORUS KIRBY ; SILPHIDAE, COLEOPTERA)

Original Research Article

ISSN : 2456-1045 (Online)
(ICV-ENTO/Impact Value): 3.08
(GIF) Impact Factor: 2.174
Publishing Copyright @ International Journal Foundation
Journal Code: ARJMD/ENTO/V-20.0/I-1/C-10/DEC-2017
Category : ENTOMOLOGY
Volume : 20.0 / **Chapter**- X / **Issue** -1 (DEC-2017)
Journal Website: www.journalresearchijf.com
Paper Received: 30.12.2017
Paper Accepted: 11.01.2018
Date of Publication: 20-01-2018
Page: 44-46

Name of the author:

Sergey Viktorovich Pushkin

North Caucasus Federal University, Institute of Living Systems, Department of General Biology and Biodiversity, 355009 Russia.

Citation of the Article

Pushkin S.V. (2017) *Successful Reproductive Cycle Strategy (Extra-Pair Copulations In Nicrophorus Germanicus (Linnaeus, 1758)) (Nicrophorus Kirby; Silphidae, Coleoptera); Advance Research Journal of Multidisciplinary Discoveries. 20.0,C-10 (2017) 44-46*

ABSTRACT

The parent instincts male burying beetles, Nicrophorus spp. are put under doubt when, conspecific females invade on a substratum prepared for oviposition. Though females provide males with padding possibilities of pairing, they put under threat a survival of the male's brood of "parent". To research sexual answer of the parent's males to females, which invade in their nests, we added the virginal beetles (female) to nest conspecific a steam, which already have initiated to care of descendants. Half of the females (invader) were inseminated by males the parents in trials, with *Nicrophorus germanicus* (Linnaeus, 1758). In work the author reduces the experimental data obtained during laboratory learning of genesial cycle and the sexual ratioes for the beetles of a genus Nicrophorus Kirby *Nicrophorus germanicus*. Extra-pair copulations for Coleoptera are poorly investigated. In work this act for *N. germanicus* for the first time is featured. In work we shall try to give an explanation to the obtained outcomes.

Keywords :

Extra-Pair Copulations, *Nicrophorus germanicus* (Linnaeus, 1758), Parental Care, Brood-Care Behavior, Burying Beetles.

I. INTRODUCTION

Despite the urgency, studying of instinctive forms of behavior now leans against the methods developed by followers' classical ethological of school [19]. As shown in: [18, 24] the behavior of animals in particular Coleoptera, is much more difficult than classical schemes. Males in a nest often couple with other females. When the important behavioral certificate - care of posterity, ability of males to couple with females at Nicrophorus is limited to a monogamy of the last [5]. Males-parents copulate with females from other nests, which do not take part in care of posterity (one of the standard definitions extra-pair copulations) [20]. Extra-pair copulations at birds are known from [25], at others taxons this certificate is a little studied. Similar relations at insects are described [26]; at Coleoptera: [6, 12]. In these works authors consider Nearctic region species. Our researches are devoted studying extra-pair copulations at widespread Palearctic a species - *N. investigator* [9]; *Nicrophorus humator* (Gleditsch, 1767). Earlier by us it is described for *N. vespillo* (L.) [8].

Burying beetles - obligate necrophagy, use corpses small vertebrata for realization of a reproductive cycle [7, 15], and large - as a food source. In the nature a corpse find more than one pair (Nicrophorus), intersexual duels pass, before allocation of parental pair which remains for nest construction (it occurs on small corpses) [7, 22, 23]. Parental steams protect a nest from conspecific individuals, and others necrophages which find out and try to occupy a corpse [3]. Takeovers occurred of a corpse (it is in detail described in work [10] leads to death of descendants (including eggs) [11, 12], reduces quantity of larvae left of eggs, percent of their survival and to replacement of one or both parents from a corpse [13, 21]. On our supervision for *Nicrophorus germanicus* (Linnaeus, 1758) (the Stavropol height, Pushkin, 2005-2014) replacement of parents has occurred in 30 % of the investigated nests (n=110). On the corpses occupied with parental steams, in 50 % of cases takeovers occurred carried out females. In vicinities of a city of Ontario Robertson [11] has established, that takeovers occurred at *N. orbicollis* (Say, 1825) have occurred in 37,5 % from number of the surveyed nests, and half of revolutions was executed by females. Our purpose consisted in whether to establish parents-males will really copulate with females who interfere on prepared for oviposition a corpse and to establish the factors promoting and interfering this certificate.

II. MATERIAL AND METHODS

Nicrophorus germanicus (Linnaeus, 1758) collected with the using trap baited with the beef forcemeat in vicinities of Stavropol. For experiment copies are used grown up in 2010-2014 in laboratory conditions. Males and females contained separately, in plastic corfs in the size 20:25:30 the sm., covered with a kapron grid. As ground river sand, chernozem, wood humus, in proportions is used: 1:1:2. One week prior to experiment to beetles in control corfs spread corpses of mouse (*Mus musculus* (L., 1758)). Females were with a corpse within 5 days to guarantee, their virginity. After them removed in new corfs with fresh corpses of mouse. In 2 days males from control corfs sat down. All steams have buried corpses, have constructed nests and through 3 (±0.2) days have postponed eggs. In a day the virgin (intruder) from a control corf has been placed to steams with the postponed eggs. Beetles have been divided into 2 groups: 1 added virgin females whose pronotum was <more than on 0,1 mm of parents; to 2 - females at which pronotum was> on 0,11 mm (tab. 1). Intruder marked edge cutting off elytrum. 10 parental steams (20 copies) participated in experiment and 10 copies takeover. Takeover remained with parents in one corf, within 3 days. When takeover left a nest of parental pairs, then checked on damages and placed in bank of 0,5 l, filled with a ground with a corpse of the mouse, for reproduction continuation. For the analysis spermathecs used a binocular microscope (MBS-2) at 70x increase. Average weight of food object (Mus musculus) 20 (±0,9). Weighing spent on scales (Waga-Torsyjna-WT-T5). Results of experiment are processed in software package Statistica 6. Experiment series compared Fisher's method. Distinctions between selective averages and experiment series were considered authentic at $P \leq 0,05$. As the big size gives advantage for intruder in takeovers attempts, we put forward a hypothesis, that males would refrain from extra-pair copulations with intruder more largely them to prevent destruction of the posterity. An alternative hypothesis – males- parents will copulate with females of the smaller size since they the corpse after unfortunate attempt of takeover is left.

III. RESULTS AND DISCUSSION

From 10 intruders 5 have postponed eggs directly in a corf. In 5 cases occurrence of larvae was observed later in 0,5 1 bank - confirming, that extra-pair copulations have occurred. Damages have not been registered for intruder and parents (*Nicrophorus germanicus* (Linnaeus, 1758). Weight of a body, size pronotum beetles *Nicrophorus germanicus*, participating in experiment, it is presented tab.1. Correlation dependence between the sizes and weight of a body of beetles, as the precondition to extra-pair copulations is established. Correlation factors are essential at $P \leq 0.05$ (tab. 1). Value (t) has made deviations 1,73, thus, in 91,64 % of cases extra-pair copulations depends on size and weight of a body of beetles. Experiment (tab. 1) testifies that males-parents couple with females- intruders mainly at the smaller sizes of the last. Supervision in the nature (2012) has shown, that ≈ 20 % of parental females are replaced intruder. The care of posterity of males is reduced, when they combine some females with the subsequent creation of a new family. However, uniparental the care from females is observed as an everyday occurrence. It increases, if the inseminated females are involved in a nest pheromones the lonely male [2]. In this case females, on our supervision (for beetles in corfs), can participate in deducing of posterity of the male.

Table 1: Experiment

Parameter	♀ parents (n=10)	♂ (n=10)	♀ invader (n=10)
pronotum (Mm):			
M	60.2	67.6	60.4
Min	50.0	55.0	50.0
Max	71.0	79.0	80.0
±	7.83	7.46	11.35
Weight of a body (gramme)			
M	1.51	1.74	1.48
Min	1.01	1.31	1.02
Max	1.89	2.15	2.22
±	0.29	0.23	0.41
Corpse (gramme) M ± Δ R ♂ weight pronotum	20 (± 0.9) 0,19 0,41	20 (± 0.9)	20 (± 0.9) 0,92 0,92

Nests parents (n=10); nests invader (n=5); EPC: F= 5; P= 0.01

By consideration of the reasons leading extra-pair copulations, it is necessary to underline, that N. investigator unlike other species of a genus differs high number of population. On the Stavropol plateau - a mass species burying beetles. A parity ♀ to ♂ Nicrophorus humator (Gleditsch, 1767) 1:0,65. It is possible to assume, that extra-pair copulations are observed in populations with deficiency of males, however, the most important difference, the scheme of reproduction of a species (tab. 2) in our opinion is. For oviposition uses small corpses. Takeovers in this case are not interfaced to an expense of the big efforts and energy.

Table 2: Dependence of genesial cycle Nicrophorus germanicus (Linnaeus, 1758) from a mass of a corpse

Mass Corpse	Number Nests	Outcomes Dispersing Variance			
		df	F	P	Dispersion
20±1	78	1	2.026	0.159	0.025
(n =80)	[2]	2			0.01234
30±5	21	1	83.051	0.000	10.51
(n =80)	[59]	59			0.1265
40±5	18	1	88.500	0.000	10.8
(n =60)	[42]	42			0.122

IV. CONFLICT OF INTEREST

In the article, there is no information capable of provoking conflicts of interest, with the exception of information contained in previously published articles by the Pushkin S.V.

REFERENCES

[1] **Andersson M.** Sexual Selection. Princeton. New Jersey: Princeton University Press. 1994: 10-80.

[2] **Beeler A, Rauter C, Moore A.** Pheromonally mediated mate attraction by males of the burying beetle Nicrophorus orbicollis: alternative calling tactics conditional on both intrinsic and extrinsic factors. Behavioral Ecology. 1999; 10 (5): 578-584.

[3] **Deloya C.** The necrophilic macro-Coleoptera of Tepoztlan, Morelos, Mexico (Scarabaeidae, Trogidae, Silphidae). Folia Entomologica Mexicana. 1996; 7: 39-54.

[4] **Eggert AK, Muller JK.** Biparental care and social evolution in burying beetles: lessons from the larder. The evolution of social behavior in insects and arachnids. Cambridge University Press. Cambridge: 1997; 216-236.

[5] **Eggert AK, Sakaluk SK.** Female-coerced monogamy in burying beetles. Behavioral Ecology and Sociobiology; 1995. 37; 147-153.

[6] **Fertherston IA, Scott MP, Traniello JFA.** Parental care in burying beetles: the organization of male and female brood-care behavior. Ethnology; 1990. 85: 177-190.

[7] **Pukowski E.** Ökologische Untersuchungen an Necrophorus F. Morph. Ökol; 1933. 27: 518-586.

[8] **Pushkin SV.** Extra-pair copulations of Nicrophorus vespillo (L.) (Coleoptera, Silphidae). Euroasian entomological journal; 2009; 8 (1): 214–216.

[9] **Pushkin SV.** Extra-Pair Copulations in Nicrophorus Investigator (Zetterstedt, 1824) (Nicrophorus Kirby; Silphidae, Coleoptera) // International Journal of Fauna and Biological Studies 2013; 1 (1): 26-28

[10] **Ratcliffe B.** The Carrion Beetles (Coleoptera: Silphidae) of Nebraska. Bulletin of the University of Nebraska State Museum; 1996. 13: 1-100.

[11] **Robertson IC.** Nest intrusions, infanticide, and parental care in the burying beetle, Nicrophorus orbicollis (Coleoptera: Silphidae). J. Zoology. London; 1993. 231: 583-593.

[12] **Robertson IC.** Extra-pair copulations in burying beetles (Coleoptera: Silphidae). J. Kansas Entomological Society; 1995. 67 (4): 418-420.

[13] **Scott MP.** Brood guarding and the evolution of male parental care in burying beetles. Behavioral Ecology Sociobiology; 1990. 26: 31-39.

[14] **Scott MP, Gladstein DS.** Calculating male? An empirical and theoretical examination of the duration of paternal care in burying beetles. Evolutional Ecology; 1993. 7: 362-378.

[15] **Scott MP, Traniello JFA.** Behavioral and ecological correlates of male and female parental care and reproductive success in burying beetles (Nicrophorus spp.). Animal Behavioral; 1990. 39: 274-283.

[16] **Sikes D, Trumbo S.** The genus Nicrophorus (Coleoptera: Silphidae): a rapid radiation in the Oligocene?. 51 Annual Meeting of the Alberta Entomological Society. Athabasca University Athabasca; 2003: 1-4.

[17] **Thornhill R, Alcock J.** The evolution of insect mating systems. Harvard University Press; 1983; 1-60.

[18] **Thorpe WH.** Learning and instinct in animals. London: Methuen; 1963; 1-90.

[19] **Tinbergen N.** The sudy of instinct. Oxford: Oxford press. 1955; 1-100.

[20] **Trivers RL.** Parental investment and sexual selection. Sexual Selection and the Decent of Man. Aldine, Chicago; 1972: 136-179.

[21] **Trumbo ST.** Reproductive benefits of infanticide in a biparental burying beetle Nicrophorus orbicollis. Behavioral Ecology Sociobiology; 1990. 27: 269-273.

[22] **Trumbo ST.** Reproductive benefits and the duration of paternal care in a biparental burying beetle Nicrophorus orbicollis. Behavior; 1991; 117: 82-105.

[23] **Trumbo ST.** Monogamy to communal breeding: exploitation of a broad resource base by burying beetles (Nicrophorus). Ecology Entomology; 1992. 17: 289-298.

[24] **Van Cassel M.** Elements pour l`analyse du cycle parental du forficule Labidura riparia P. (Dermaptera. Labiduriidae). Review comporting animals; 1973. 7 (1): 53-62.

[25] **Westneat DF, Sherman PW, Morton ML.** The ecology and evolution of extra-pair copulations in birds. Current Ornithology; 1990. 7: 331-369.

[26] **Wilson EO.** The Insect Societies. Harvard University Press, Cambridge, MA; 1971; 548.

*****