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SEX RATIOS AT EMERGENCE OF TWO SPECIES OF HIGH-ARCTIC *Aedes* (DIPTERA: CULICIDAE)

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Abstract

Can. Ent. 105: 647-651 (1973)

Sex ratios at emergence of *Aedes impiger* and *A. nigripes* in the Hazen Camp area (81°49' N., 71°18' W.), northern Ellesmere Island, N.W.T., are given from trap records, mainly for 1963.

There is a marked predominance of females in trap catches from temporary ponds, and an overall slight predominance of females (but with marked pond-to-pond variation) in permanent ponds. The nature of these inter-pond differences favours the inference that, before emergence, males normally survive less well than females, especially under the conditions existing in temporary ponds as they dry up.

Introduction

The adult sex ratio of aquatic insects can be assayed by traps which sample adults as they emerge through the water surface. Such assays are most meaningful if the sampling continues throughout the annual emergence period, a procedure facilitated in the arctic where this period is short.

This paper considers the sex ratios shown by emergence-trap captures of two species of mosquitoes from Hazen Camp (81°49' N., 71°18' W.), Ellesmere Island, N.W.T.: *Aedes* (*Ochlerotatus*) *impiger* (Walker) and *A. (O.) nigripes* (Zetterstedt).

These mosquitoes are univoltine. Eggs laid during the short summer hatch at snowmelt in a subsequent year. Larval development is then rapid and most emergence normally takes place 3-4 weeks after the thaw, over a period of 7-10 days (Corbet and Danks, in press).

Methods

Aquatic habitats in the Lake Hazen area have been described, and designated by numbers, by Oliver and Corbet (1966). Only certain shallow ponds from which mosquitoes emerged are considered here.

Adults were trapped from several ponds in 1963 by surface emergence traps (Corbet 1965), placed in marginal areas of emergent sedge in each pond. Traps in a few ponds were not moved during the emergence season. Most traps were moved one or two (or rarely up to five) times during the period of mosquito emergence (less than 10 days in most ponds), in order to maintain a constant depth of 5-10 cm of water beneath them as the water level fell. Traps were also operated in a small number of ponds in 1962-66.

Traps were normally emptied daily throughout the emergence season, and each day's catch preserved immediately in 70% ethanol.

Results

The sex ratio normally changes through the emergence period because the greatest emergence of males occurs 1-3 days before that of females (Corbet and

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Table II. Number of adults and percentage of males of *A. impiger* emerging from ponds at Hazen Camp in 1963

Temporary ponds			Permanent ponds		
Pond No.	No. trapped	Males (%)	Pond No.	No. trapped	Males (%)
24	94	21.0	23C	716	59.5
2	936	21.7			
27	134	23.0			
26	220	32.3			
66	602	34.7			
45	245	43.3			
TOTAL	2,231	28.7		716	59.5
Mean (ponds)		29.3			
Standard deviation		8.9			

The usual primary sex ratio in mosquitoes is apparently unity (see Clements 1963, p. 21) although genetically determined distortions of sex ratio in *Aedes aegypti* (Linnaeus) have been detected in field-collected strains (e.g. Craig *et al.* 1961) and in the laboratory (e.g. Hickey 1970; see also Christophers 1960; Clements 1963; Young 1922). However, these uneven ratios normally favour males (and not females, as at Hazen Camp); moreover, strain differences alone cannot account for the fact that marked pond-to-pond differences occur in a restricted area at Hazen Camp.

A predominance of females in the primary sex ratio might be produced by parthenogenesis. However, regular parthenogenesis has never been detected in mosquitoes, although sporadic parthenogenesis — resulting in very small numbers of larvae from large numbers of unfertilized eggs — has occasionally been reported (see Clements 1963; Das *et al.* 1968); nor have studies by one of us (P.S.C.) on the reproduction of *A. impiger* and *A. nigripes* yielded evidence that parthenogenesis occurs — so this explanation remains unlikely (but contrast the conclusions of Oliver and Danks (1972) for chironomids from the same area).

If (as therefore seems very likely) the primary sex ratio at Hazen Camp is near to unity, differential mortality in the aquatic stages is the most probable cause of the observed predominance of females. By the same token, differential mortality

Table III. Year-to-year differences in percentage of males emerging from two ponds at Hazen Camp

Pond No.	Year	<i>A. impiger</i>		<i>A. nigripes</i>	
		No. emerging	Males (%)	No. emerging	Males (%)
1	1962	0	—	717	28.4
	1963	0	—	266	47.4
	1964	0	—	632	32.9
	1965	0	—	(3)	—
	1966	0	—	(8)	—
2	1962	309	35.0	0	—
	1963	936	21.7	216	23.1
	1964	555	24.1	16	(6.6)
	1965	20	(35.0)	(1)	—
	1966	294	8.8	388	20.1

Acknowledgments

Logistic support for the work at Hazen Camp was provided by the Defence Research Board of Canada. Preparation of this paper was assisted by a National Research Council of Canada Operating Grant No. A6586. We thank Dr. A. Wilkes of the Entomology Research Institute, Ottawa, for his valued comments on the manuscript.

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(Received 1 February 1973)