

Genital Variation among Connecticut Populations of the Oyster Drill, *Urosalpinx cinerea* Say¹

(Prosobranchia : Muricidae)

BY

JOHN G. HALL² AND S. Y. FENG

Marine Research Laboratory, University of Connecticut, Noank, Connecticut 06340

(1 Plate; 2 Text figures)

INTRODUCTION

THE LIVE-SEXING technique developed by HARGIS (1957) for the oyster drill, *Urosalpinx cinerea* (Say, 1822), is widely used in studies involving muricid gastropods (*e. g.*, MANZI, 1970; MANZI *et al.*, 1971; SHICK, 1972; ZACHARY & HAVEN, 1973). But since its description, problems have developed regarding the use of the presence or absence of a penis as a sexing criterion, especially with the large variety, *U. cinerea follyensis* Baker, 1951 (CARRIKER & VAN ZANDT, 1972; GRIFFITH & CASTAGNA, 1962). These workers have reported the presence of small "vestigial" penises in many females sexed by gonadal smears or other means. Similar observations by others have led to renewed speculations concerning sex reversal in this species, an issue originally raised by COLE (1941) and dismissed. The present study concerns the validity of the live-sexing technique, as applied to Connecticut *U. cinerea*, and presents an alternate, efficient means of sex determination.

MATERIALS AND METHODS

Collections of *Urosalpinx cinerea* were made from 3 intertidal Connecticut locations: Noank, Ram Island (about 1.6 km S of Noank), and East Norwalk. For size-frequency analyses systematic collections were made from the Noank population during periods of spring low tides until the desired number of drills was accumulated (FRANZ, 1971). Drills were maintained in the laboratory in trays of run-

ning seawater at ambient temperatures and fed with live blue mussels, *Mytilus edulis* Linnaeus, 1758, until used.

Shell heights of all snails were measured from the apex to the tip of the siphonal canal to the nearest 0.1 mm, using a vernier caliper. Drills originally were sexed by the presence or absence of a penis (HARGIS, 1957). All animals sexed in this manner were designated males, but some individuals with well developed C-shaped penises deposited egg capsules. Thus, direct microscopical observation of gonadal smears proved to be necessary for positive sex determination. Gonads with both the presence of motile spermatozoa and the absence of vitelline spheroids were designated as males, and those in the obverse conditions were considered to be females.

The present study proposes the use of gross morphology of the gonad as a reliable indication of the sex of *Urosalpinx cinerea*. Although pigmentation of the gonads varied in all populations of the present study, female gonads were consistently granular in appearance, while male gonads were smooth in texture and generally larger (Figure 1). Nearly all animals positively sexed by gonadal smears were reliably differentiated with this technique, which was used for all subsequent sex determinations.

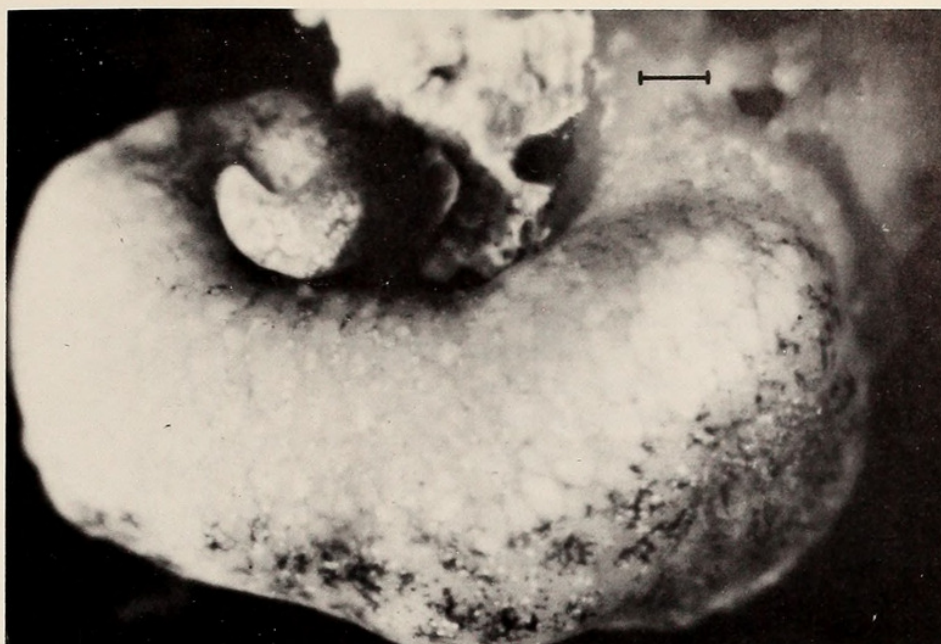
Variability in the relative penis size – the ratio of the base width of the penis to that of the contracted right tentacle – of males and females among populations was ascertained from measurements obtained with a dissecting microscope equipped with an ocular micrometer (CARRIKER & VAN ZANDT, 1972).

RESULTS

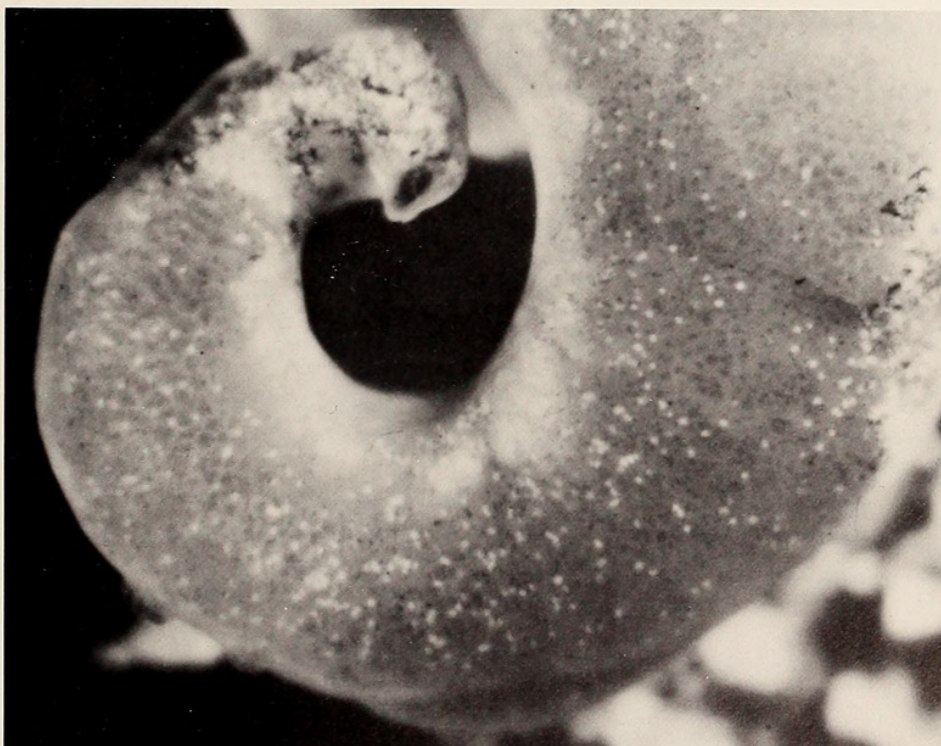
Noank population samples collected at several seasons of the year did not show any significant deviations from the

¹ Contribution No. 110 from Marine Research Laboratory, University of Connecticut

² Present address: P. O. Box 600, Bar Harbor, Maine 04609. Address all reprint requests to Dr. S. Y. Feng

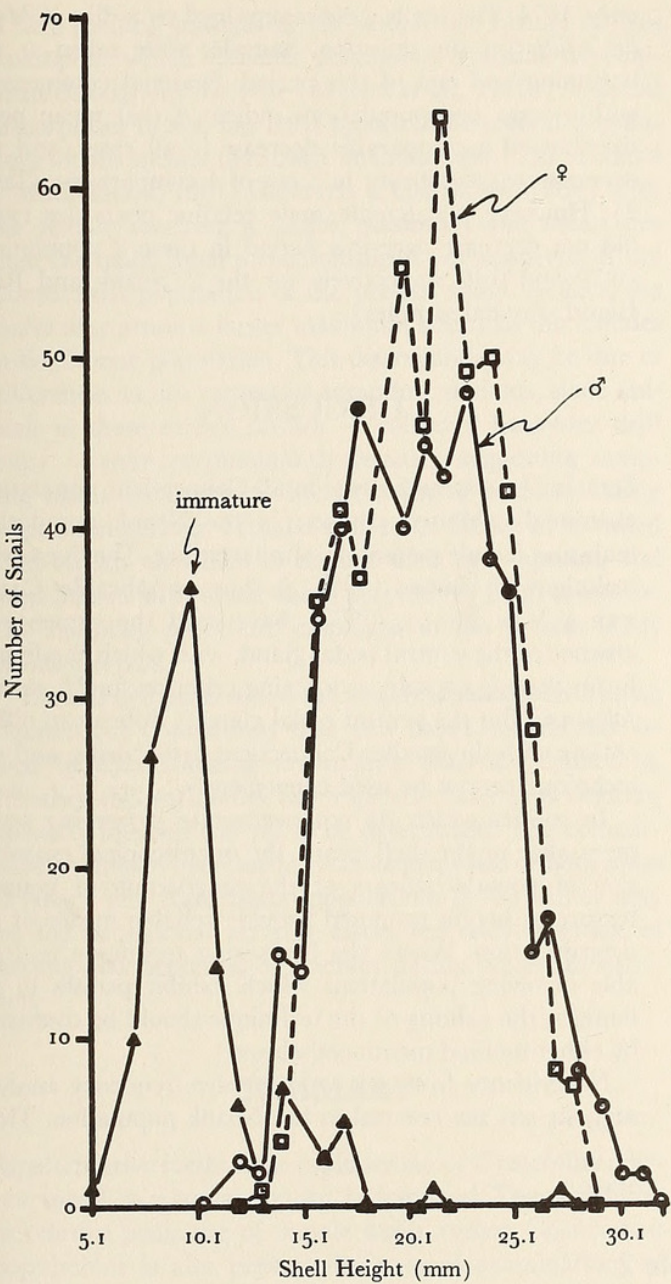


A



B

Sexual Differences of Gonadal Texture in *Urosalpinx cinerea*
A: Female gonad B: Male gonad
Both micrographs are of the same magnification; the bar = 1 mm



expected 1 : 1 sex ratio (Table 1). A collection of 1175 drills made in May, 1974, from the Noank population indicated balanced sex ratios over all size classes. But males did appear to attain larger maximum size than females. In addition, gonads of snails less than about 12mm in height were not developed and therefore could not be sexed by this method (Figure 2).

Since initial observations suggested that the relative penis size of females varied among the populations examined, samples of mature snails (male and female) from each population were taken, and their penises as well as shell heights measured. Low correlation coefficients ($|r| = 0.03 - 0.29$) of relative penis size to shell height indicated that the relative penis size is independent of shell height. For statistical analyses Student t tests were computed not assuming equality of variance (BROWNLEE, 1965).

Intrapopulation comparisons between sexes revealed, as expected, very highly significant differences ($P < 0.001$) in relative penis size in all Connecticut populations (Figure 3). While relative penis sizes of males were not significantly different at the 5% level among these populations, highly significant differences ($P < 0.01$, at least) were found in all comparisons with females (Figure 3).

To determine whether there were seasonal effects upon relative penis size, Ram Island and Noank population samples were isolated in trays of running seawater at ambient temperatures from October, 1973, through Jan-

(← adjacent column)

Figure 2

Sex and shell-height frequency distributions of *Urosalpinx cinerea* collected from Noank, Connecticut, May 1974.

- = females ($\bar{X} = 21.5 \pm 3.3$ mm)
- = males ($\bar{X} = 21.5 \pm 3.8$ mm)
- ▲ = primarily immature individuals

Table 1

Chi-square (χ^2) analyses of sex ratios for several seasonal samples of *Urosalpinx cinerea* from Noank, Connecticut. Immature and questionable individuals are eliminated in the calculations; a 1:1 sex ratio is assumed.

Date Collected	Females	Males	Immatures and Unknown	$\chi^2(1)$	P
July, 1973	65	75	—	0.714	>0.30
October, 1973	220	234	—	0.432	>0.50
April, 1974	186	206	49	1.02	>0.30
May, 1974	524	499	152	0.611	>0.40
Total	995	1014	201	0.181	>0.60



Hall, J G and Feng, S. Y. 1976. "GENITAL VARIATION AMONG CONNECTICUT POPULATIONS OF THE OYSTER DRILL UROSALPINX-CINEREA PROSOBRANCHIA MURICIDAE." *The veliger* 18, 318-321.

View This Item Online: <https://www.biodiversitylibrary.org/item/137755>

Permalink: <https://www.biodiversitylibrary.org/partpdf/97604>

Holding Institution

Smithsonian Libraries and Archives

Sponsored by

Biodiversity Heritage Library

Copyright & Reuse

Copyright Status: In Copyright. Digitized with the permission of the rights holder.

Rights Holder: California Malacozoological Society

License: <http://creativecommons.org/licenses/by-nc-sa/3.0/>

Rights: <https://www.biodiversitylibrary.org/permissions/>

This document was created from content at the **Biodiversity Heritage Library**, the world's largest open access digital library for biodiversity literature and archives. Visit BHL at <https://www.biodiversitylibrary.org>.