y/y females is 0.72. Hence the female could be utilising sperm with an efficiency near 70 percent. However, the ratio from homozygous SD bw fathers is 0.01, and if the efficiency of sperm usage remains unchanged, then most of the ejaculated sperm are dysfunctional.

This is in contrast to the results from SD/SD$^+$males for the following reasons. It is known that the lifetime productivity of SD/SD$^+$ males is about half that of SD$^+$/SD$^+$ controls and that the progeny to sperm ratios from these two genotypes are similar. If it is assumed that the efficiency of sperm usage is female determined and is constant between SD/SD$^+$ and SD$^+$/SD$^+$ males (as indeed seems to be the case), and if females use sperm of different genotypes at random, or nearly so, then an SD/SD$^+$ male must transmit mainly SD sperm, in order to satisfy the above experimental data. That this is in fact the case is known from the work of Tokuyasu, Peacock and Hardy (in prep) who have demonstrated that much sperm breakdown (of the SD$^+$ class presumably) occurs within the male, and consequently most ejaculated sperm are SD bearing.

The results that most ejaculated sperm from SD/SD$^+$ males are nondysfunctional, whereas most sperm from SD bw/SD bw are dysfunctional need not necessarily be at variance with each other. A probable explanation may be that when the proportion of dysfunctional sperm in a male is very high, as is the case in SD/SD males where almost all sperm are destined to be dysfunctional, the mechanisms for sperm retention become inefficient, and dysfunctional sperm become included in the ejaculatory contents. The males are literally unable to contain themselves.

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Morphological differences between a pair of sibling species - melanogaster and simulans.

Adults of these two species are morphologically very similar, adult females cannot be distinguished from each other while adult males may be differentiated on the basis of external male genitalia. The posterior process of the genital tergite is rounded in simulans and hook-shaped in melanogaster (Sturtevant, 1920, Genetics 5: 488). Current investigations reveal that pupae and third instar larvae of both the sexes in these two sibling species can be distinguished from each other in several respects. (1) Pupal pigmentation: The pupae of simulans are more heavily pigmented than those of melanogaster. Pupae of simulans appear moderately brown while those of melanogaster only lightly brown. (2) Setae: The two species can be differentiated both on the basis of distribution and size of the setae. Setae were examined on the dorsal side of the pupae. As the outer pupal case is identical with the cuticle of the last larval instar, the following description holds for the third instar larvae. Each segment is incompletely divisible into an anterior part and a posterior part by a system of ridges that run across each segment. The partition separating the anterior and posterior parts shifts posteriorly as it approaches the mid-dorsal line. This posterior shift is in general more pronounced in melanogaster than in simulans. Most of the setae are present in the posterior part and all are pointed posteriorly. The setal band is broader laterally and narrower medially. The narrowing of the setal band is more pronounced in melanogaster. Few setae are present in the anterior part and they appear to be directed randomnly. More setae are present in the anterior part of the simulans than in that of melanogaster. Regarding size, setae in simulans are distinctly larger than those in melanogaster. (3) Intersegmental groove: This also was examined in the pupae. The walls of the groove are thicker in simulans, while the space in the middle is wider in melanogaster.

F_1 pupae (both males and females) obtained in crosses between the two species are more like simulans pupae. To see if mutations affecting bristle morphology in the adult also affect setae in the larva, spineless (ss) pupae were examined. The setae are rudimentary. Setal morphology is now being examined in other groups of sibling species and in other bristle mutants. Setal patterns in melanica and robusta are different from each other and from that in melanogaster. Setal morphology can, therefore, be a useful character in systematics.