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Wilson Bull., 102(1), 1990, pp. 160-162

Sarcosporidiosis observed more frequently in hybrids of Mallards and American Black Ducks.—American Black Duck (*Anas rubripes*) populations are declining (Kirby 1988). In part, this decline can be traced to the eastward range expansion of the Mallard (*A. platyrhynchos*) (Johnsgard 1961). Additionally, Mallard numbers in the eastern United States have increased through game farm releases (Heusmann 1974). Mallards and Black Ducks hybridize whenever they come into contact (Goodwin 1956, Johnsgard 1967, Heusmann 1974, Ankney et al. 1986), suggesting that these ducks are races of the same species. The lack of behavioral reproductive isolating mechanisms (Johnsgard 1960) is consistent with this interpretation. Black Duck hens, when courted by Black Duck and Mallard drakes, choose Mallards (Brodsky and Weatherhead 1984, Brodsky et al. 1988). Because hybrid drakes tend to exhibit Mallard drake plumage characteristics (e.g., some green on head, white-edged speculum) and because bright plumages among males of *Anas* species presumably evolved through sexual selection (Ankney et al. 1986, Heusmann 1974), it follows that hybrid drakes may be preferred by Black Duck hens over Black Duck drakes. If such preferences exist, then the hybrids pose a special problem for the integrity of the Black Duck phenotype because outcrossing often results in hybrid vigor. Black Duck × Mallard hybrid backcrosses are apparently as fertile as the parental types (Phillips 1915).

Fertility notwithstanding, disease or other factors could reduce hybrid fitness. Here we present retrospective observations that are consistent with this notion. We recorded the occurrence of sarcosporidiosis (a protozoan parasite) in 55 adult (older than 1 year) ducks collected by hunters on three New Jersey state game management areas (Great Bay Management Area, Tuckerton; Dix Management Area, Fairton; Fortescue Management Area, Fortescue) during the hunting seasons of 1986-1988. Juvenile ducks were excluded from

TABLE 1
 FREQUENCY OF *SARCOCYSTIS* BY PHENOTYPE IN 56 DUCKS COLLECTED IN NEW JERSEY
 DURING 1986-1988

Phenotype	Parasitosis	No parasites	Total
Mallard	0	11	11
Hybrid	5	6	11
Black	1	32	33
Total	6	49	55

our sample because advanced sarcosporidiosis is rare among young birds (Cawthorn et al. 1981).

We chose to study *Sarcocystis* for several reasons. First, severe infections are easily identified. Second, the parasite is common in wild duck populations (10% of all individuals, Cornwell 1963). Third, severe sarcosporidiosis could negatively affect fitness (Springer 1984, Box and Duszynski 1978, Tuggle 1987).

Our sample included 33 Black Ducks (17 hens, 16 drakes), 11 Mallards (six hens, five drakes), and 11 drakes that exhibited both Mallard and Black Duck plumage characteristics (i.e., otherwise Black Duck plumage with clearly observable green metallic coloration around and behind the eyes and white-edged speculum). These ducks also had bright yellow bills and orange feet similar to those of Mallard drakes. The 11 drakes with mixed plumage were operationally defined as phenotypic hybrids between the two pure strains (Johnsgard 1968). No clearly identifiable females with mixed plumage characteristics were observed. All ducks were examined for grossly visible *Sarcocystis*, defined as rice-like cysts (2-4 cysts/cm²) in all surface muscle tissue (i.e., breast, neck, esophagus, and thigh).

The occurrence of *Sarcocystis* by duck phenotype is given in Table 1. There was a significant association between phenotype and parasitosis ($\chi^2 = 16.88$, $df = 2$, $P < 0.001$) (Conover 1980). To calculate the relative risk of parasitism for hybrids, we compared hybrid phenotype versus the combined frequencies of the pure strains. The relative risk (i.e., odds ratio or cross products ratio) of a hybrid having sarcosporidiosis was 36.27 times that of a non-hybrid. The odds ratio is useful in this context because it is a measure of risk of experiencing an outcome (parasitosis) when an antecedent condition (hybridization) is present (Fleiss 1973).

We speculate that one or more factors could account for our observations. Phenotypic hybrids in our sample may have originated in a location with a high incidence of sarcosporidiosis (relative to those of Mallards and Black Ducks). This explanation seems relatively implausible since the ducks were collected from three widely dispersed areas over the course of three hunting seasons. Another possibility is that phenotypic hybrids may be able to survive parasite loads that kill Mallards or Black Ducks. Finally, and contrary to the notion of hybrid vigor, it is possible that phenotypic hybrids are more susceptible to parasitism. If so, then parasitism may represent a selective pressure against hybridization between the Black Duck and Mallard phenotypes.

Acknowledgments.— We thank N. J. Bean, M. A. Adams, and D. A. Marshall for allowing us to examine their ducks. Preparation of this manuscript was supported by a cooperative agreement between the Monell Chemical Senses Center and USDA/APHIS/ST. M. L. Avery, B. Bryant, M. R. Friedman, and R. A. Dolbeer provided valuable comments on an earlier draft.

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