

## Inverted flight of White-winged Scoters during courtship flight

*With a discussion of its possible causes and purposes.*

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IN THE SPRING OF 1977 I photographed two formations of White-winged Scoters (*Melanitta deglandi*) that contained some participants in the inverted attitude. Both photographs were taken, on different days, from the beach at the base of the Montauk Light, Long Island, N.Y. (41° 03' N, 72° 00' W) while the birds were in flight over Block Island Sound. It was by chance that inverted flight was recorded on film because at neither time was I then aware that these events were occurring within the formations. In the seven years of observing scoter (*M. spp.*) congregations in Block Island Sound, I had never before knowingly observed this occurrence.

On both occasions the scoters' behavior during the inverted flight was courtship related. Each formation was, by its composition, a courting party, and its activity was courtship flight.

Comprised of a lone hen with three or more drakes, the White-winged Scoter courting parties are similar in composition to, and tend to be larger than the Black Scoter (*M. nigra*) courting parties described by Gunn (1927) and McKinney (1959).

There is scant reference in literature to scoter courtship flight (Brooks, 1945; Rawls, 1949; Bengtson, 1966). Brooks (1945) described in one sentence the wheeling courtship flight of Black Scoter. Rawls (1949) recounted a three-bird chase over the breeding grounds by White-winged Scoters that could very well have been the behavior of pursuit flight as defined by Johnsgard (1968) for waterfowl. Bengtson (1966) observed that little is known about Black Scoter courtship flight. To my knowledge no published description exists of the court-

ship flight of White-winged Scoters that occurs during winter and early spring.

MY OBSERVATION is that during courtship flight White-winged Scoters are in courting parties; their formations are bunched rather than single file and they appear well above the horizon rather than low over the water. The formations tend to be large, numbering at times 15 or more drakes. Their flight appears erratic, with abrupt turns and steep climbs and dives; the appearance is that of a ball of birds whose flight path is a weaving and undulating trace. There are also brief periods of slow fluttering flight.

The inverted White-winged Scoters, in both photographs, were executing the same climbing-diving maneuver as their courting parties. This maneuver begins with a heading into the wind, followed by a steepening climb that generally reaches about 30° of inclination. Reduced flapping frequency and amplitude signal that the peak of the climb is near. Typically the legs deploy the spread webbed feet astride the spread tail. In many cases the legs are splayed wide. At the peak of the climb, with straightened wings, the birds pause momentarily, then dive. The photographs of inverted flight were taken of the birds at or near the peak of this climb.

From either single photographic frame it is impossible to discern whether the inverted scoters continued their roll until upright, or accomplished a portion of their descent in the inverted attitude. In one frame (not shown) a single bird is completely inverted at the terminal point of the climb, its legs pointed skyward. The frame shown depicts two scoters ro-

tated approximately 125° about their longitudinal axes, but "nose down" starting into the dive.

I CAN CONCEIVE of three possible reasons for the inversion maneuver. One could very well be that it is a variation of courtship flight, a male displaying to the female (Ruppell, 1975:133). For the next two possibilities it is necessary to assume that the inverted attitude is maintained during some portion of the descent. For the second possibility then, a scoter could use the faster descent of inverted flight (Ruppell, 1975: 124, 126) to gain the lead over those in free fall or a gliding dive. Finally, perhaps the most speculative theory is that White-winged Scoters at the peak of the climb, their control probably quite tenuous, invert to improve their aerodynamics. They are seen to slow down near the climb's termination; as their forward speed drops so too does the lift-generating airflow over their "control surfaces." Since lift is directly proportional to the square of air flow speed, the responsiveness of a high-speed bird's control surfaces rapidly diminishes with dropping airspeed. Anticipation of this reduced responsiveness could be the reason why White-winged Scoters deploy their open webbed feet, thereby increasing surface area which may result in additional control, while still in the climbing phase of this maneuver. At this point they must make the transition from climbing to diving. Their rolling into an inverted attitude may restore the lift-generating airflow to the convex wing surfaces more quickly than by passing through the arc, from "nose up" to "nose down."

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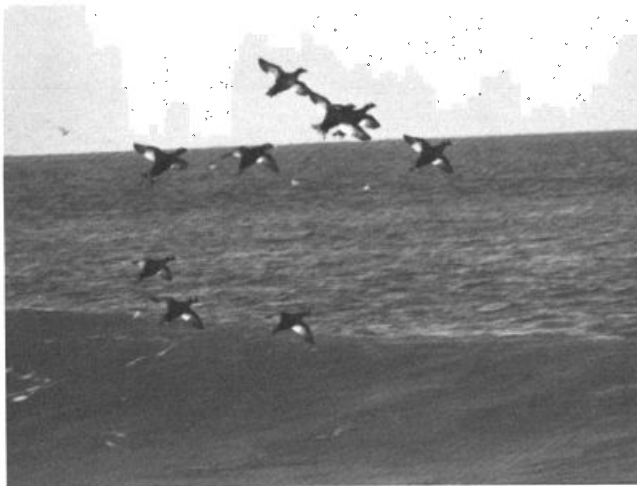
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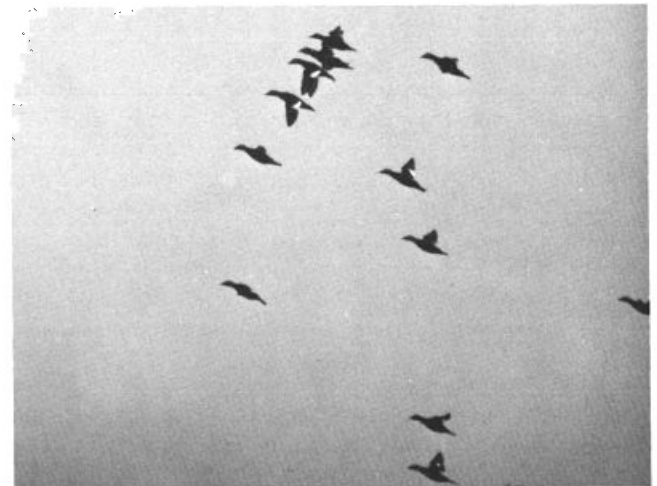
Two inverted White-winged Scoters (top of courting party) at the peak of the climbing-diving maneuver.



Nearing the peak of their 30° climb members of the White-winged Scoter courting party selectively deploy their spread webbed feet.



The lone hen (lacking the drake's white eye crescent) is at the top of the formation.



A White-winged Scoter courting party executing the 30° climb prior to deploying the feet.

On the downward phase of their climbing-diving maneuver birds in a White-winged Scoter courting party still deploy their feet.



White-winged Scoter courting party. All photos by the author.

