stage, with much higher mortality rates observed during the incubation stage than the nestling stage; chats had high mortality throughout the entire nest cycle (Fig. 1). The majority of chat, thrasher, Field Sparrow, and cardinal nests failed before hatching (69%).

The 13% success rate of chat nests at Kennekuk was similar to results from other studies (Nolan 1963, Thompson & Nolan 1973). One possible problem for shrubland birds at Kennekuk is that the primary nesting substrate is Autumn olive (*Elaegnus umbellate*), which is an invasive species, grows in more open, less thorny thickets compared with other species such as blackberry (*Rhubus allegheniensis*). In areas that lack large vegetation patches, chats may nest in autumn olive only because it's abundant. Other shrubland plant species that form dense thickets may be better at hindering some nest predators, such as raccoons (*Procyon lotor*) and opossums (*Didelphis virginiana*), but may not deter snakes (Ricketts & Ritchison 2000).

Differences in nest-defense behavior among species may explain differences in nest survival rates. Chats lack a distraction display, whereas Field Sparrows, Brown Thrashers, and Northern Cardinals all show some sort of distraction display (Sutton 1960, Ficken & Ficken 1962, Taylor 1984, Nealen & Breitwisch 1997). Another possibility, since male Yellow-breasted Chats sing at night, is that nocturnal predators may use nocturnal song as a cue to find chat nests.

Figure 2.
Arrangement of the six antennas on top of the radio tower. Antenna 1 begins at 0 degrees, #2 at 60 degrees, #3 at 120 degrees, etc. A coaxial cable runs from each antenna down to the automatic receiving unit (ARU) located at the base of the tower.

Nocturnal movements of Yellow-breasted Chats

We used an Automated Radio Telemetry System to track the movements of chats at night during the summer of 2008. These systems consisted of a steel tower with an array of six antennas placed on the top (Fig. 2) and a computer at the bottom that collected the data from the antennas. After capturing a bird, we attached a radio transmitter to their central rectrices with heat-shrink tubing (Fig. 3, Alessi et al. 2009). This transmitter then communicated with a computer that was programmed to record the signal strength of each transmitter from each antenna every three minutes. Based on the signal strength at each antenna, we were able to create algorithms to determine the direction

Figure 3.
Electrical heat-shrink tubing was used to attach transmitters to the tail feathers of Yellow-breasted Chats.