

## CONSERVATION COMMENTARY

### Evaluation of the Global Decline in the True Shrikes (Family Laniidae)

REUVEN YOSEF<sup>1</sup>

Archbold Biological Station, P.O. Box 2057, Lake Placid, Florida 33852, USA

The first International Shrike Symposium was held at the Archbold Biological Station, Lake Placid, Florida, from 11-15 January 1993. The symposium was attended by 71 participants from 23 countries (45% North America, 32% Europe, 21% Asia, and 2% Africa). The most exciting participation was that of a strong contingent of ornithologists from eastern Europe. In this commentary I present the points stressed at the Symposium and illustrate them with several examples as presented by the authors.

The Symposium was convened to focus attention on, evaluate, and possibly recommend methods to reverse the worldwide decline of shrike populations. Many of the 30 species are declining, or have become extinct locally. Studies have focused mainly on the five species found closest to places where ornithologists live: Northern/Great Grey Shrike (*Lanius excubitor*), Red-backed Shrike (*L. collurio*), Loggerhead Shrike (*L. ludovicianus*), Lesser Grey Shrike (*L. minor*), and Woodchat Shrike (*L. senator*). Other than anecdotal observations, little is known about the other 25 species. A common theme of the Symposium was that most long-term studies of previously robust populations of shrikes have documented drastic population declines, mostly in the late 20th century. For example, Rothhaupt (1993) estimated that most central European countries have lost over 50% of their breeding populations of shrikes within the last 15 years.

**Regional status and declines**—In post-war Switzerland shrike populations plummeted as human population increased from 4,700,000 in the 1950s to almost 6,500,000 today (Bassin 1993). Rapid economic development paralleled this demographic growth. In 1960, rural agricultural landscapes were still dominated by traditional livestock-breeding and cultivation methods, but extensive land-use changes have occurred following the adoption of modern mechanized practices. These changes resulted in sweeping landscape modifications that prevented populations of resident Northern Shrikes from rebounding after the severe winters of 1962-1963, 1983, and 1985-1986. Breeding populations of all four species of shrikes found primarily in rural areas have declined, and today in Switzerland only the Red-backed and Woodchat shrikes nest. The last nest of the Lesser Grey

Shrike was found in 1975, and of the Northern Shrike in 1987. In Switzerland, these two species have officially been declared extinct.

In Sweden, Olsson (1993) and Carlsson (1993) have attributed the decline (over 80% between 1970 and 1990) of the Red-backed Shrike to the destruction and deterioration of suitable habitats. Olsson (1993) observed a large reduction of pastures in the last two decades, and considers the Swedish law requiring planting of unused pastures and fallow lands with conifers as unfavorable for shrikes. He also stated that nitrogenous and acid rain pollutants have influenced vegetation composition and insect populations, both of which in turn have affected shrikes negatively. In the Swedish Bird Population Monitoring Program, the numbers of Red-backed Shrikes declined from a high index of 100 in 1975, to a low of 60 in 1981.

In southern Sweden, results of standardized, long-term trapping of fall migrant Red-backed Shrikes reveal a continuing decline. A mean of 199 birds were caught in the autumns of 1970 and 1980, but decreased to a low of 42 in 1991. The decline was first noticed in the number of juvenile birds and later in adults, suggesting that the cause of the decline is possibly a low reproductive rate. Several factors may alter these rates. In a northern country like Sweden, climate and adverse weather can be major factors determining breeding success. In southeastern Sweden, Olsson monitored a population of about 10 pairs of Northern Shrikes for over 10 years and found the number of fledged young per brood to be  $3.86 \pm 0.60$  of 2.0 in two bad years (1988, 1991), and  $4.94 \pm 1.00$  in three good years (1989, 1990, 1992). In wet years, fledging mortality was high and, consequently, recruitment into the breeding population declined in the following year. Further evidence of declining trends were presented by Przemyslaw Busse, who heads the "Operation Baltic" research program that monitors autumn migrants at three field stations on the Baltic coast of Poland. Most species of small passerine migrants show a trend of declining numbers (Busse 1993). However, the greatest decline is that of Northern Shrikes (regression coefficient for 30 years = -0.517). A severe decline occurred at the end of the 1970s and in the 1980s when the average number trapped was only 4.2% that for the 1960s. The Red-backed Shrike exhibits a comparatively moderate decline (regression coefficient = -2.89), and levels for 1984-1990 equal 44% of those for the 1960s.

<sup>1</sup> Present address: International Ornithological Center, P.O. Box 774, Eilat 88600, Israel.

Data from the North American Breeding Bird Survey indicate a general decline in Loggerhead Shrike populations during 1966-1991 (Peterjohn and Sauer 1993). At the continental level, shrikes declined at an average rate of 3.5% per year (average regional declines 3.1-4.4% per year). These declines were prevalent in most states, provinces, and physiographic strata. Severe winter weather during 1976-1979 may have contributed to this decline in the eastern one-half of the continent. This combined with other factors during the winter and breeding seasons that have been implicated in the rangewide decline of this species. Because recent studies have concluded that breeding habitats are not limiting shrike populations, and that reproductive success has been normal, Peterjohn and Sauer (1993) suggested factors within the winter range may be limiting shrike populations. This idea concurs with that of Temple (1993), who postulated that many shrike populations are below the carrying capacity of their breeding habitat, and are limited primarily by the carrying capacity of their nonbreeding habitat. Conclusive evidence for this theory has yet to be presented.

The idea that changes in breeding habitat have caused decline is supported by some on-going studies in Alberta, where Collister and Henry (1993) found that reduction of suitable breeding habitat is an important factor in the declines of Loggerhead Shrikes. In the prairie and aspen parklands of Alberta, 39% of unimproved pasture and up to 79% of presettlement grasslands were lost between 1946 and 1986. The majority were converted to cultivation. An examination of occupied versus apparently suitable but unoccupied shrike territories in southeastern Alberta clearly demonstrated that no suitable Loggerhead Shrike habitat was unoccupied.

For southern Quebec, Laporte and Robert (1993) judged that the region is less suitable for breeding Loggerhead Shrikes than it previously was because of the disappearance of pastures, the larger areas under cultivation, the predominance of corn fields, the gradual removal of shelterbelts, and the return of poor agricultural lands to forest. The mid-20th century change from subsistence farming to commercial production resulted in a gradual decline in the number of small farms. Marginal farmland reverted to forest or was urbanized, and mechanized corporate farms have increased in size. Most corporate farms are devoid of trees or shelterbelts. Thus, the mosaic of small fields, used equally for pasture and crops, has been replaced by large fields and, today, pastures represent less than 15% of the total cultivated areas. All these factors may have contributed to the decline of Loggerhead Shrikes in southern Quebec.

Data presented by Woods (1993) for Idaho provided further evidence for the effects of human land-use practices on shrike populations. Several territories of Loggerhead Shrikes were destroyed by sagebrush-eradication practices, and by horse and cattle grazing

on private and public lands. Woods suspected that habitat limitations may force shrikes to breed closer together than they would otherwise.

In Japan, Haas and Ogawa (1993) found that Brown Shrikes (*L. cristatus*) were declining faster than Bull-headed Shrikes (*L. bucephalus*) in Hokkaido. The two species have different breeding habitats, and the resources used by Brown Shrikes may be declining more rapidly than those used by Bull-headed Shrikes. Alternatively, the Brown Shrike also may be suffering high mortality on the wintering grounds or during migration, which the sedentary Bull-headed Shrike avoids. Brown Shrikes are caught in large numbers for food during their fall migration and on their wintering grounds in Southeast Asia. Additionally, their wintering grounds are undergoing rapid habitat destruction (Severinghaus and Liang 1993).

Data from the previously inaccessible East European countries indicate that avian censusing is not widely practiced and was done mainly during 1982-1986, when ornithologists collected data for the Atlas of Breeding Birds of Europe. Gorban and Bokotj (1993) from Ukraine, Malik (1993) from Czechoslovakia, and Kurlavicius (1993) from Lithuania reported that populations of Red-backed, Northern, and Lesser Grey shrikes exhibit declining trends.

*Stable or increasing populations.*—Two exceptions to the general pattern of declining regional populations came from Belarus and Poland. Nikiforov et al. (1993) observed an increase in the population of Northern Shrikes in southeastern Belarus, in areas that were evacuated by humans following the nuclear accident at Chernobyl in 1988. Since the Chernobyl incident, shrikes have been observed breeding in abandoned villages and agricultural areas; however, biologists were unable to collect data on the ecological effects of radiation on the breeding population.

Lorek (1993) reported a stable population of Northern Shrikes in rural Poland. Compared to neighboring countries, there is a lower rate of agricultural mechanization and pesticide use in his study area, which is attributed to the economic problems of Polish farmers. He speculated that modern agricultural practices have led to a reduction in large invertebrates, thus adversely affecting shrike populations in most of western Europe. This idea is corroborated by the findings of Esselink et al. (1993), who reported that large insect species are the most endangered group of invertebrates in the Netherlands. Lorek (1993) stated that global warming may have caused the recent mild winters in Poland with temperatures rarely below freezing, little precipitation, and abnormally short periods of snow cover. As a result of warmer winters, Northern Shrikes may have easier access to rodents and better winter survival.

*Climatic factors affecting shrike populations.*—LeFranc (1993) considered climate to be the most significant factor contributing to continentwide declines of Lesser Grey Shrikes. He noted that low temperatures

(<17°C) combined with heavy or persistent rains reduce drastically the survival of young shrikes and limit food availability for adults. LeFranc has observed adult birds near starvation cannibalize their young in order to survive. These weather-related effects are corroborated by Barbara Diehl in Poland, and Berry Pinshow in Israel. Both observed that cool and wet spring weather resulted in fewer shrike pairs initiating breeding, probably because of a lack of invertebrate prey.

*Biological factors affecting shrike populations.*—Cade (1993) pointed out that most shrike species have a rather high reproductive rate (i.e. they lay large clutches, rear large broods compared to most other passerine species that nest in open cup nests, re-nest quickly and frequently after nest failure, and sometimes raise two or more broods per year). However, few breeding populations of shrikes appear to reach the potential carrying capacity of their ranges, and the shrikes are either patchily distributed within large tracts of apparently suitable habitat, or they are thinly dispersed over the available habitat. This suggests that environmental variables associated with nesting habitat usually are not limiting, and that factors from the nonbreeding period, either migration or wintering, also should be investigated as causes of population decline.

Cade stressed the importance of studying migratory routes by citing Walter's (1979) account of predation by the colonial nesting Eleonora's Falcon (*Falco eleonorae*), which describes how approximately 10,000 breeding falcons and their young feed almost exclusively on migrating birds that fly across the Mediterranean to Africa. Walter estimated that falcons caught one to two million migrants annually, out of a total migration that Moreau (1972) considered to be on the order of 5 billion birds in the 1960s. Consequently, the overall impact of the falcons' predation was assumed negligible. However, three species of shrikes (*L. collurio*, *L. minor*, and *L. senator*) make up 15 to 20% of all birds taken (i.e. about 200,000–400,000 shrikes per year). At most sites, shrikes ranked as the first, second, or third most frequently taken species, despite the fact that some of the other commonly taken Old World warblers and flycatchers numbered in the 100s of millions of individuals per species (Moreau 1972). Unfortunately, no estimates are available for the number of shrikes that cross the Mediterranean, but the proportion taken exceeds their relative abundance in migration. Moreover, shrikes also have to contend with Sooty Falcons (*F. concolor*) nesting at the same time in the Sahara Desert and islands in the Red Sea, as well as with numerous other bird predators on their nonbreeding grounds in sub-Saharan Africa (Cade 1993).

The Lesser Grey Shrike is another example of a species that probably is affected on its wintering grounds. They migrate through the Middle East, where extensive hunting by humans is common. More se-

rious threats arise from drought in the eastern Sahel Zone. Unlike most other shrike species, which do not store much premigratory fat, but instead prey on weakened passerines during migration. Lesser Grey Shrikes rely mostly on insects as prey. In addition, their wintering area is much smaller than the breeding range (about 1.50–1.75 million km<sup>2</sup> vs. 8 million km<sup>2</sup>) and, thus, adverse conditions on the wintering grounds could be magnified because of their high density (LeFranc 1993).

The decline of the Red-backed Shrike is a good example of a scenario in which governing factors causing drastic declines are not clear. In the 1850s, the Red-backed Shrike bred throughout England and Wales. The population declined during the next 100 years, with a particularly rapid decline over the past 40 years. In 1989, for the first time, no breeding was recorded in England and Wales (Peakall 1993). Climatic change has been the cause most frequently cited for the decline, and egg collecting and habitat destruction may have been important locally. The possibility of losses caused by hunting in the Mediterranean countries was raised, but no data are available. The limited information available does not suggest that competition on the wintering ground is a serious problem. The reasons for the demise of the Red-backed Shrike in Britain remain unclear.

Cade (1993) also suggested several intrinsic characteristics that may increase the vulnerability of shrikes to extinction. The first concerns patterns of dispersal. Shrikes apparently lack a strongly developed philopatry, and young birds do not breed near their natal sites. Although adult males tend to have well-developed nest-site or nest-area tenacity, females frequently do not (Yosef 1992). Females often change territories when they re-nest in the same season, and have little tendency to return to the same area from one year to the next, especially in migratory populations. These patterns of behavior could accelerate a population's decline once a regional population has started to break up into isolated demes as a result of habitat fragmentation (Carlson 1993). A greater randomness is involved in finding a suitable breeding area and a mate with this pattern of dispersal than with a pattern involving strong philopatry and nest-site tenacity in both sexes.

A second intrinsic factor is their relatively poor flying ability, which increases their vulnerability to predators and collisions with vehicles (Cade 1993). Shrikes are fast, short-distance dashers and are very persistent, but not very maneuverable. Their long-distance flight appears labored, which when combined with a conspicuous plumage, makes them especially attractive targets. An example of a high rate of predation on shrikes is that by Little Owls (*Athene noctua*) on fledgling Northern Shrikes in Israel (Yosef 1993a). We lack data on annual mortality of first-year shrikes, which may be crucial for determining recruitment rates in breeding populations.

In Poland, Barbara Diehl studied Red-backed Shrikes for over 29 years on a 44-ha meadow plot, where various stages of forest succession form a mosaiclike landscape. During the study period (1964–1992), the population of Red-backed Shrikes went through dramatic changes. Three periods were distinguished: (1) 14 years of stability (1964–1977) with a maximum mean of about 8 pairs/10 ha; (2) 6 years of rapid decline (1978–1983); and (3) 9 years of partial recovery (1984–1992). Although Diehl (1993) found a positive association between successional changes in vegetation structure and shrike population density, nest predation, rather than habitat changes, accounted for the rapid decline between 1978 and 1983. The decline was initially observed around 1974; European Jays (*Garrulus glandarius*) and pine martens (*M. martes*) were identified as the most important predators.

**Management possibilities.**—Several researchers (D. van Nieuwenhuysse in Belgium, G. Rothhaupt and M. Schon in Germany, R. Yosef in Israel and USA) have independently reached the conclusion by experimentation that structural features of shrike habitat exert limiting effects (e.g. Yosef 1993b, Yosef and Grubb 1992, 1993). Hunting perches, especially those associated with hedge rows, fences, and other elevated structures in agricultural landscapes, are often lacking in areas otherwise apparently suitable for shrikes.

Rothhaupt (1993) found that Northern Shrikes preferred perches 3 to 10 m high, with a minimum between-perch distance of 25 m. Thirteen of 24 investigated habitats show perch densities between 5 and 15/ha. The average density was 15.2 perches/ha (range 1.7–35.5 perches/ha). According to Holzinger and Schon (1987), typical distances between perches are 15 to 20 m, and Bassin (1981) calculated an average of 15.4 perches/ha.

The importance of perches to shrikes has been further illustrated by Carlson (1985), who found improved detection of prey and nest predators from higher perches by Red-backed Shrikes. In addition, Yosef and Grubb (1992) found that perch density affected nutritional condition of nonbreeding Loggerhead Shrikes, and Yosef (1993b) further established that Northern Shrike territory size and configuration could be manipulated by the introduction of appropriate hunting perches.

**Conclusions.**—The true shrikes are a rather uniform group of 30 species of small- to medium-sized passerines that combine insectivorous and carnivorous modes of feeding. Because declines in shrike populations in Eurasia and North America have been concurrent and because we have a desire to think globally these days, it is perhaps tempting to look for a single cause or set of related causes underlying all changes in shrike numbers. However, it is certain that the causes will prove to be multiple and varied for different species. The following are probably the four most important causes of declines in shrike populations: (a) human land-use changes (expansion of cul-

tivated areas; intensive monocultures; disappearance of meadows, unfertilized grassland, and fallow lands; decrease of environmental diversity, due to the elimination of isolated trees, hedges and thickets; draining of marshes); (b) diminished diversity and quantity of available prey caused by habitat alterations, and use of fertilizers and pesticides (fewer large insects; elimination of small vertebrate prey); (c) climatic variation coupled with decrease of prey populations; and (d) decreased environmental heterogeneity (reducing availability of optimal nest sites, shelters, and hunting perches).

**The future.**—The rapporteur, Uriel Safriel, summed up the Symposium by stressing that shrikes offer excellent opportunities to address basic problems in ecology and conservation biology. Also, their behavior of impaling prey in conspicuous places makes them interesting subjects for studies in behavioral, evolutionary, and chemical ecology. Safriel (1993) stressed that, although many researchers have documented drastic declines and even local extinctions in breeding populations, no one has established whether the declines are within the bounds of potentially expected population dynamics. In addition, no one has successfully calculated "minimum viable population" sizes for the various species. Safriel suggested a monitoring program wherein coordinated international collaboration would be the key to success.

This monitoring program is now being implemented and researchers are collecting data on shrikes in a coordinated fashion. Hopefully, this international effort will allow us to make recommendations to reverse shrike declines and will be a model of cooperation and conservation of other wildlife groups that are also threatened by human actions.

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