Friends of the Island Fox, Inc.
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Island Fox Research 2008

Island Fox Health

Since 1998, biologists and veterinarians have collected data on all 6 subspecies of island fox in order to establish the populations' general health, to determine the primary and contributing causes of death, to identify diseases that occur among island foxes and to calculate their exposure to infectious agents.

General Health Report

Island foxes live with serious parasites and a variety of health stresses. Despite these challenges some populations, like that on San Nicolas Island, are very robust. In order to understand cause of death, as well as typical and atypical health impacts on the various island fox populations, the bodies of deceased foxes are examined or necropsied. To date, 565 necropsies and 221 biopsies representing all six subspecies have been evaluated.

One focus of inquiry has been whether diseases differ among different island fox subspecies. An example of an island-specific disease is ceruminous gland carcinoma, a form of cancer found only among island foxes on Santa Catalina Island. The causes and influences of this serious disease are under investigation. For more see "Ceruminous Gland Carcinoma" below.

Thyroid disease, on the other hand, is highly prevalent in all island fox subspecies. Adult animals seem to progressively exhibit low thyroid function. The veterinary group recommends further studies to evaluate thyroid function and the possibility of an association with environmental contaminants. Funding is needed to further investigate thyroid, immune and endocrine system function.

Infectious diseases, such as canine distemper (CDV), canine hepatitis (CAV-1) and rabies, continue to threaten recovering island fox populations. In 2007, three raccoons were unintentionally transported to Santa Catalina Island on private boats. Accidental introduction of disease by mainland species poses a serious threat. Continued disease surveillance is recommended for all populations. Necropsy of all deceased foxes will continue. Vaccination against distemper and rabies should be used to protect the majority of foxes on islands with small populations and core populations on islands with stable populations.

For the year 2007-08, vehicular trauma continued to be the major cause of death on the southern islands, while on the northern islands, eagle predation was confirmed in 26 carcasses from Santa Cruz Island and was suspected in other deaths (Munson & Vickers, 2008).

References:

Munson, L. & Vickers, W. (2008, June 24). *2008 update on fox health*. Paper presented at Tenth Annual Meeting, Island Fox Working Group, Ventura, CA.

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The following are summaries of research findings on:

- ✦ Vaccinating Wild Island Foxes
- ✦ Vaccination and Sentinel Foxes
- ✦ Ceruminous Gland Carcinoma in Santa Catalina Island Foxes

Vaccinating Wild Island Foxes

As the collapse of the Santa Catalina Island fox population demonstrated with the introduction of distemper in 1997-98, disease can spread rapidly among these island populations. In order to protect a viable post-outbreak group of individuals that would form a reestablishing population, studies suggest 80-100 animals should be vaccinated on each island (Bakker, Doak & Morrison, 2008).

Current Vaccinated Population

- ✴ San Miguel and Santa Rosa Island: nearly all
- ✴ Santa Cruz Island: plan to vaccinate 50-60 animals
- ✴ Santa Catalina Island: 80% of the estimated population
- ✴ San Clemente Island: 80-100 older animals from past years; vaccination will proceed this fall as recommended at the June 2008 Island Fox Working Group Meeting
- ✴ San Nicolas Island: 140 vaccinated animals

References:

Bakker, V.J., Doak, D.F., & Morrison, S.A. (2008, February 5-7). *Development of adaptive management tools for the island fox (Urocyon littoralis)*. Paper presented at Seventh California Island Symposium, Oxnard, CA.

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Vaccination and Sentinel Foxes

While vaccination for distemper and rabies helps protect wild island fox populations, it can make it harder for biologists to quickly ascertain that a disease has been introduced. Sentinel foxes are individual animals that are randomly chosen to be radio collared and not vaccinated. Because these animals are monitored by radio collar, if they should die, their body can be promptly located and the cause of death quickly determined. If a sentinel fox dies from an introduced disease, managers are aware of the location of the first fatalities and can respond quickly to vaccinate, quarantine or take other measures to save the greatest number of island foxes.

Can these sentinel foxes offer a line of defense for their relatives? In June 2008, two unvaccinated sentinel foxes died near the city of Avalon on Santa Catalina Island. Rapid response on the part of biologists and necropsies performed at U.C. Davis determined that disease was not the cause of death (King, 2008). The swift response to this possible crisis, could not have taken place without the recruitment of sentinel foxes.

A recent study recommends 50-60 radio-collared foxes on each island to provide a monitored population, with half of these being unvaccinated disease sentinels (Bakker, Doak & Morrison, 2008).

References:

Bakker, V.J., Doak, D.F., & Morrison, S.A. (2008, February 5-7). *Development of adaptive management tools for the island fox (Urocyon littoralis)*. Paper presented at Seventh California Island Symposium, Oxnard, CA.

King, J. (2008, June 24). *Catalina Island update*. Paper presented at Tenth Annual Meeting, Island Fox Working Group, Ventura, CA.

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Ceruminous Gland Carcinoma in Santa Catalina Island Foxes

Ceruminous gland carcinoma is a form of cancer connected to tumors in the ear wax glands of island foxes. An unusually high number of ceruminous gland tumors, both adenomas (benign but with potential to become cancerous) and carcinomas (cancer) have been detected in foxes on Santa Catalina Island. Most tumors are confined to the ear canal, but some cancerous tumors invade the skull and metastasize, leading to death. To date, no tumors (adenomas or carcinomas) have been detected in foxes from other islands. Study of this disease is ongoing and the risk factors are being assessed, including: the severity of inflammation, ear mite species and genetics, co-infection, exposure to toxins, and a possible genetic predisposition in this island fox subspecies.

Data has been collected from over 2,000 veterinary exams and 500 necropsies. Random sampling was conducted across Catalina in 2007. Biologists found more than 95% of island foxes from Catalina, San Nicolas, and San Clemente had ear mites. No mites were detected in island foxes from any of the northern islands. All of the islands with ear mites also have known feral cat populations. The feral cats, however, display very few ear mites. The ear canals of foxes with mites on Catalina are substantially more severely inflamed than the foxes from San Nicolas or Clemente. Sixty-four cases of cancer have been identified to date in Catalina foxes and 17 have been identified with tumors that are not yet cancerous. Among Catalina Island foxes over three years of age, approximately 40% show evidence of this disease. Sampling suggests more tumors in females, but this may be because they live longer.

In 2009 - 2010, biologists plan to assess whether reducing ear mites would impact ear canal inflammation (a cancer risk factor). Animals that were captives and previously treated for the mites appear to have been slower to develop tumors once they are released, but the reason is unknown. Ear mites appear to be transferred from animal to animal, including from parents to offspring. Very few Catalina Island foxes are mite-free (Vickers & Munson, 2008).

References:

Vickers, W. & Munson, L. (2008, June 24). *Ceruminous gland carcinoma in Catalina Island foxes.* Paper presented at Tenth Annual Meeting, Island Fox Working Group, Ventura, CA.