

Breeding management of Four Tanager Species in a Mixed Species Exhibit at the San Diego Zoo

by Amy Kendall and Ed Lewins
San Diego, California

The K.C. Lint Hummingbird Aviary at the San Diego Zoo offers the visitors a close up view of a wide variety of small colorful birds in a lushly planted environment. Although the concentration of 27 species of birds coexist peacefully most of the year, the breeding season presents many challenges for optimal management. During this period, competition for territories, nests, and speciality food items changes the population dynamics of the enclosed environment. By modifying our management techniques, we have improved the breeding success of four species of tanagers: Turquoise Tanager (*Tangara mexicana*), Silver-throated Tanager (*Tangara icterocephala*), Spangle-cheeked Tanager (*Tangara dowii*) and Golden-masked Tanager (*Tangara larvata*).

In addition to the tangara species, other tanagers in the aviary include Yellow-throated Euphonia (*Euphonia hirundinacea*), and Golden-browed Chlorophonia (*Chlorophonia occipitalis*). Also present are several species of finch (*Tiaris*, *Sporophila* spp.), plover (*Pluvianus* spp.), Pink-eared Ducks (*Malacorhynchus membranaceus*), two species of sunbirds (*Nectarinia* spp.), and eight species of hummingbirds (*Amazilia* spp., *Myrtis*, *Anthracothorax*, *Campylopterus*, *Metallura* and *Rhodopsis*).

The Hummingbird Aviary is a walk-through, open-air enclosure measuring 64 feet by 24 feet by 16 feet 5 inches. The dome framework is covered by 1/2 inch by 1 inch 12 gauge wire mesh. There is a covered side-

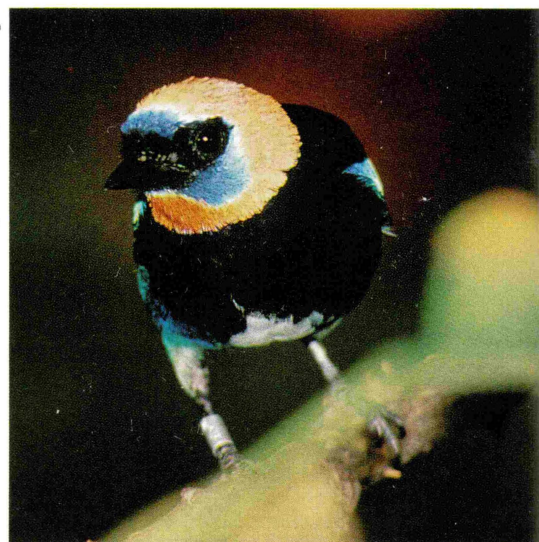
walk on one side of the enclosure which provides visitor viewing. Except for the summer months, three quarters of the top is covered with a translucent plastic tarp to provide shelter from inclement weather.

The enclosure contains a wide variety of tropical plants which provide the birds with a naturalistic habitat. The flora of the enclosure includes Bromeliad spp., Fuschia hybrids, Impatiens hybrids, fern spp., and palm spp., along with several species of flowering vines (*Passiflora morifolia*, *P. incense*, *Thunbergia mysorensis*,) and a mandavilla. The wide selection of tropical plants provides year round blossoms for visitor appeal and environmental enrichment for the birds.

Their diet consists of a soft fruit mix of apples, pears, papaya, grapes, cooked rice and Ziegler low iron pellets, large pieces of avocado, banana, papaya, apple, orange, soaked fig, and chopped greens. Small crocks with soaked monkey biscuits and Nekton Lory (Nekton) are placed in the pan. A finch seed mix and mealworms (*Tenebrio molitor*) are also provided. Blair's Superpreen is sprinkled on the soft food for a vitamin and mineral supplement and Roxanthin as a color agent.

Nektar Plus (Nekton) is provided in the morning throughout the aviary in hummingbird bottles (Planit Enterprises). In the afternoon, the nectar is replaced with sugar water in a four part water to one part sugar ratio, because the Nektar tends to spoil

Photo by Ron Garrison © Zoological Society of San Diego



Golden-masked Tanager adult.

Photo by Roy Tolt ©



Silver-throated Tanager tending nest with newly hatched youngster.

Photo by Roy Tolt ©



Silver-throated Tanager feeding youngster.

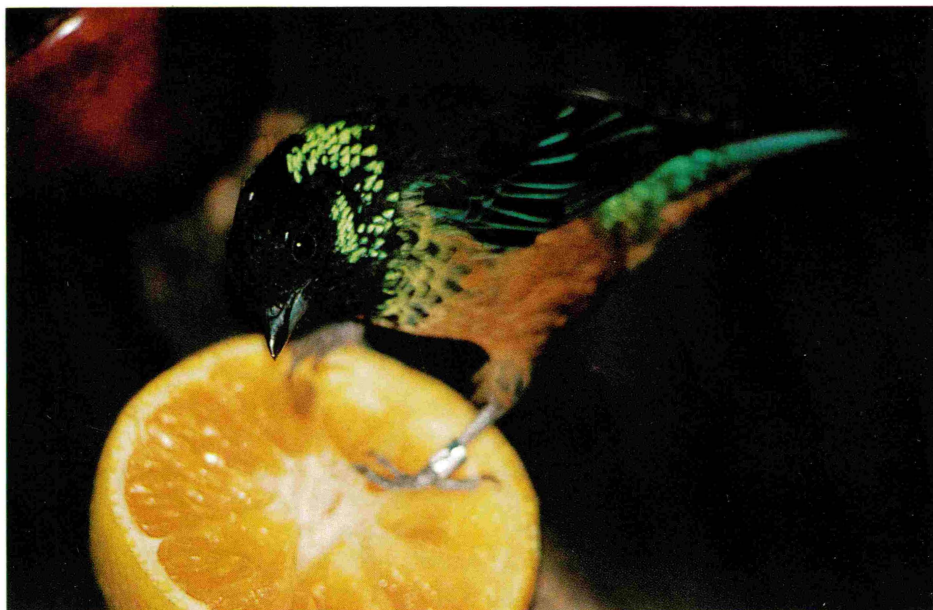
more quickly in warm weather. Nekton Bio (Nekton) is added as a vitamin and mineral supplement. The exception to this is in cooler weather when Nektar Plus is given both morning and afternoon. Live fruit flies (*Drosophila melanogaster*), wax moth larvae (*Galleria mellanella*) and spiders (*Phocus phalangoiodes*) are distributed three to four times a day.

A variety of small open cup and domed wicker nests are placed at a variety of heights within the aviary. Raw packing cotton, sphagnum moss, Spanish moss, spider webs, burlap strands and floss silk seed pods (*Chorisia speciosa*) are provided throughout the exhibit for nest building. The birds also use leaf litter occurring naturally on the ground.

Both the female and male of all four Tangara species in the aviary have been observed to gather and carry nesting material. With the exception of the Spangle-cheeked Tanager, which has been observed in nest-building, it has not been determined if the males actually help with the building or simply provide material to the female.

The tanagers appear to exhibit a species specific pattern to the nest type and location within the aviary. Despite the provision of open baskets, the Silver-throated Tanagers build their own shallow, open cup nest, usually at mid level in the aviary, under plant leaves. The Spangle-cheeked Tanagers consistently burrow a nest in the sphagnum moss of fuschia planters hanging two to three feet from the ceiling. The sides are built up under the foliage creating a deep, open cup nest. Turquoise and Golden-masked Tanagers add materials to the open nest cups provided. Mosses and cotton are added by the birds to the sides creating a domed nest with a side entrance. These two species nested within inches of the roof.

After completion of the nests, the pairs of tanagers have been observed to exhibit more intense courtship behavior, consisting of mate feeding, wing fluttering and bowing. Within a couple of days, the first egg is laid in the nest, followed by a second the next day. The eggs of all four species are off-white with brown speckles concentrated at the broad end of the egg. Female tanagers are solely responsible for incubation and leave



Spangle-cheeked Tanager adult.



Turquoise Tanager chicks five weeks of age.



Turquoise Tanager adult.

the nest for only short periods of time. The males of the four species have no direct role in incubation but are in close attendance feeding the female at the nest. Incubation is 14 days beginning after the clutch is complete.

Wax moth larvae is the primary food during the nestling and weaning period. The larvae are dusted with calcium carbonate and Blair's Superpreen. Both parents feed the young. Spangle-cheeked Tanagers and Silver-throated Tanagers collect spiders placed in the aviary. Spangle-cheeked Tanagers have been observed to also hawk and glean fruit flies when feeding chicks. Nectar and pieces of soaked monkey biscuit are also favored. When the chicks are about 10 days of age, the parents begin to feed avocado, banana and papaya. Close to fledging, both parents seem to encourage the chicks to leave the nest by carrying wax moth larvae and vocalizing from nearby perches. Chicks of the four species fledge at 12

to 14 days.

The greatest risk of death or injury to a young tanager in the Hummingbird Aviary is during the fledgling period. Curiosity and aggression from other birds make it difficult for the parents to simultaneously feed and protect the young. Hypothermia and drowning is a problem due to the pool and the stream. It can be difficult for the parents to locate the youngsters because of the dense foliage and sometimes high ambient noise levels. Additional dangers occur if the chicks fledge into the visitor pathway.

To minimize danger and protect the chicks from injury or death, a fledge management protocol has been developed at the San Diego Zoo over the last two seasons. The protocol affords safety for the tanager families and thus maximizes chick survival.

Two to four days before the expected fledge, certain precautions are implemented. The waterfall is turned off, eliminating the stream running through the enclosure. Depending on the location of the nest, the pond may or may not be drained. A natural barrier of potted bamboo plants is placed in the walkway under or near the nest to encourage the chicks not to fledge into the walkway and to protect the nest from visitors. After these precautions have been taken, careful observations are made in order to catch the fledglings as soon as they leave the nest.

The parents work together to tend the newly fledged young, which makes it easy for the keepers to locate the chicks. This is easily carried out by offering wax moth larvae to the parents who carry the food to the babies. It is then a simple task to handgrab the young off their perch. The chicks are placed in a "howdy cage" — a small portable utility cage 30 inches by 18 inches by 18 inches. This cage, with the newly captured young, is placed within view of the parents inside a safety access to the aviary. The door between the two areas is left open. Within a few minutes the parents locate the vocal chicks, and enter the access area. The door is closed between the access area and the aviary, and the parents are netted. The family unit is then transferred to a weaning cage off exhibit, measuring 10 feet by 6 feet by 8 feet. It is in the safety of this area that the parents raise the chicks to independence. Once the

chicks are stable, and eating on their own for a period of one to two weeks, the parents are returned to the main aviary. The chicks, however, remain off exhibit for several months so that they may become physically mature.

Care must be taken when releasing the parent birds back into the aviary because aggression primarily among tangara species can be especially high upon reintroduction. To alleviate this problem, anytime tanagers are introduced into an aviary where another pair of tanagers is already housed, the new occupants are "howdied" into the aviary. This is a procedure where the birds are placed within the aviary, in a small utility cage as described above, for a period of four to seven days. This allows all the birds to become familiar with one another. The howdy cage door is opened and the birds are allowed to leave on their own. After reintroduction to the aviary it is usually only a few days before courtship and nesting begin again.

Through the development of this protocol, the hatch to independence survivability of the tanager species in the Hummingbird Aviary is 85% for the 1991 and 1992 seasons. We hope that with further refinement of this management technique, survivability will continue to increase.

Acknowledgement

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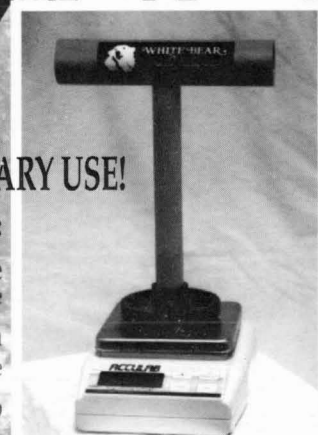
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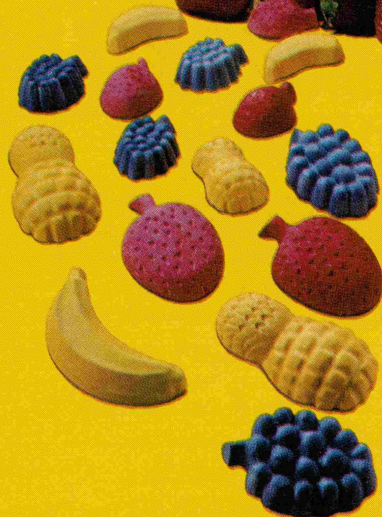
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