

Biological Profile

Japanese White-eye, *Zosterops japonicus*

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Order- Passeriformes

Family- Zosteropidae

Description- Head (excluding chin and throat) back, scapulars, rump and upper tail-coverts olive green, brighter on rump, more yellowish on crown, chin, throat and under tail-coverts pale to bright yellow. Under parts dull white, becoming dusky brown on sides and flanks. Feathered white eye-ring broken in front of eye by black feathers of lore continues distally as black margin along bottom half of eye. Black lore bordered above by yellow supraloral stripe. Nine functional primaries. Bill, legs and feet black in mature birds. Iris brown. Monomorphic. Weight 9.75- 12.75 g. Length 11-12 cm.

Eleven subspecies recognized. Nominate *Zosterops j. japonicus* native to main Islands of Japan and present on Hawaiian Islands. Taxonomy of family in flux. Some authors believe *Z. japonicus* along with *Z. palprobrosa* and *Z. meyeri* constitute a super species.

Distribution- eastern China, Taiwan, Japan, including Ryukyu Islands to north Philippine Islands; migratory northern populations winter in S.E. Asia (Burma, Vietnam, Hainan Island). Introduced to Hawaiian Islands several times beginning in 1929; now established on all main islands from Ni' ihau eastward.

Habitat- Open forest, mangrove thickets, plantations, gardens and urban areas. Joins mixed-species feeding flocks of up to 200+ birds July-February.

Food and Feeding Habits- Insects, fruit and nectar. Forages throughout vegetation at all levels and density of foliage. Feeds on insects by gleaning over and under leaves and flowers, probes bark for larvae. Obligate nectivore utilizing many species of flowering plants and tree sap.

Behavior- Arboreal, strong flight, seldom spends time on ground. Extremely gregarious. Allopreening very common, especially during courtship. Inter-specific allopreening observed in captivity. Forms large, nonbreeding mixed-species flocks outside of the breeding season. Sibling and family groups roost tightly together. Sleeps with head tucked in back feathers, often on one leg. Several threat displays identified during establishment of dominance hierarchy within the flock without regard to sex. Wing flicks exposing underwing coverts, wing flutter vibrating remiges, open beak and beak snaps common. Territory established by males singing loud, high-pitched, melodious advertising song from conspicuous perch. During breeding season, males sing primary song 20-40 minutes at sunrise and sporadically through out the day. Dueting and counter-singing are unknown. Of 61 territories measured, the smallest was 0.12 ha, the largest 305 ha. Territories defended from other white-eyes nesting or singing, but

trespassing occurs regularly to pirate nesting material. Trees in fruit or nectar are not defended. Permits other avian species to nest within territory without aggression.

Breeding- Note: Information from field data of Hawaiian population. Breeding season extends from territory establishment in January-February to formation of winter flocks in July-August. Nests recorded from April- August.

Nesting- Monogamous pairs choose nest site, usually in terminal clumps of vegetation 1-30 meters from ground. Both sexes construct nests in 7-10 days. Nest materials variable, usually consisting of moss, spiderwebs, lichens, or mammal hair. Nest is semi-pendant and cup-shaped. Average cup diameter 56.2 mm. Average depth 41.7 mm. Nests generally used once, up to three successful nests completed per season. Very early nests and very late nests may not be completed.

Eggs, incubation, hatching, growth and development - Eggs white, smooth and elliptical. Clutch size 2-5, usually 3-4 eggs laid at a rate of 1 per day. Both sexes incubate, brood patches evident in both sexes. Nest attentiveness 70-100% during incubation. Incubation period 11-12 days. Pipping of egg begins up to 24 hrs. before hatching. Hatches generally synchronized. Altricial. Eyes closed. No egg-tooth present. Bill and gape yellow. Chick mass about 1.1 grams at hatching, gain about 1 gram per day to 7 days of age. Chicks average 8.3 g. at fledging. Both adults share brooding and feeding equally. Feeding rates increase from 1-2 feedings per hour per chick on first and second day post-hatching to as many as 14 feedings per hour per chick at fledging. At one observed nest, insects fed exclusively on first and second day. At six days of age, fruit composed entire observed diet of young. Nest sanitation described as complete, fecal sacs eaten and carried from nest by both parents. Eyes open by 5 days of age; feather tracks (spinal, femoral, ventral, humeral and wing) visible in skin by second day post-hatching. Young partially bald or still in pinfeathers on head at fledging. Fledging occurs 10-12 days past hatching. Chicks usually unable to fly for 1-6 days after leaving the nest. Eye ring full at 23 days, indistinguishable from adults by 30 days of age. Chicks remain with parents for 15-20 days, after which the parents begin new nests and actively chase brood away from territory. Juveniles form flocks until the following season when they form pairs. Age at first nesting attempt 1 year. Cooperative breeding has been reported in this species both in captivity and in the wild only occasionally.

Basic Husbandry Guidelines Japanese White-eye, *Zosterops japonicus*

The Japanese white-eye, along with several species within the genus *Zosterops* has had a long history as one of the most inexpensive, available, peaceful and hardy of the passerines in aviculture. While the above adjectives are true to one degree or another, these same traits have at times contributed to this species being regarded as aviary fillers which are easily replaced. The continued desirability and popularity of these birds is evidenced by the Passeriformes Taxon Advisory Group Regional Collection Plan and the recent collection of specimens on Oahu, Hawaii for North American zoos. The species profile and basic husbandry guidelines are intended to aid in fostering a serious consideration of this species requirements, worthy of proactive management.

Acquisition and acclimation- Whether acquiring white-eyes to establish the species or augmenting the numbers of specimens in the collection, groups are preferable to single specimens. Being monomorphic and very gregarious, the chance of potential pair formations are increased with a group of birds, as is the eventual exhibit value as visitors are presented with a more accurate representation of the species natural behavior. White-eyes should never be kept singly except for brief isolation due to medical issues, a minimum-sized quarantine enclosure would be 3 ft. x 2 ft. x 2 ft. for one pair of birds. Otherwise, enclosures need to be large enough to accommodate small to large groups permitting flight and avoiding overcrowding. Large walk-in type enclosures with appropriate-sized spacing between the mesh and wire are ideal. Recommended mesh or wire spacing ½ inch x 1 inch. Solid-sided enclosures are not necessary. Provide cover in the form of dried grasses and cloth screens in front of perches. Plastic plants are inexpensive, easily cleaned and can be manipulated to provide perching and cover. Live potted plants provide refuge and foraging opportunities as well as contributing to humid microhabitats. Sufficient airflow is essential. Although generally peaceful, white-eyes can display extreme aggression. Intraspecific agonistic behavior is often expressed subtly. Repeated gaping and beak snapping and appeasement display (feathers fluffed, mock begging) are cause for concern. Excessive allopreening resulting in feather loss (usually around the head and neck) may indicate the enclosure is too small or has too few perching or hiding areas for the number of individuals housed. If behavior problems persist, the birds may be kept in two smaller groups then reintroduced once they are transferred to a larger, more enriched environment.

Banding and Weighing- Being small, monomorphic and gregarious, identifying individuals even in smaller enclosures is difficult. If the birds are banded at acquisition, plastic numbered bands should be added in combinations that facilitate identification from a distance. Accurate weights are essential to aid in health management. Securing the bird in smooth cloth bags or small tube and placing it safely on a digital scale is one effective method, less intrusive methods include digital letter scales. If a small container of food is placed on the scale and the weight recorded in grams, an individual's weight can be read when it lands on the scale.

Temperature- The maximum preferred temperature is unknown. Initially, white-eyes should be maintained at 80-85 degrees Fahrenheit. White-eyes most certainly benefit from a heated light source provided they have free access to and from a basking area. Sunbathing has not been recorded from the wild, but in captivity individuals have been observed basking under warm light. A study measuring physiologic response of two species of passerines during simulated translocation suggests thermal support in the form of heat lamps increased survival of *Z. japonicus*, particularly during the night. Interestingly, a species of *Zosterops* from Australia employs nocturnal hypothermia to reduce energy expenditures (decreased metabolic rate from day to night up to 50%; body temperature fluctuated > 5.5 degrees Celsius). Temperatures can gradually be lowered during quarantine to 70-85 degrees Fahrenheit. Some authors state that once acclimated,

Z. japonicus can temporarily withstand environmental temperatures as low as 20 degrees F as long as they have access to heated shelters.

Light- Access to full, unfiltered light is beneficial but has not been studied in detail. Intensity and duration certainly influence health and behavior. White-eyes can benefit from exposure to bright illumination for the first 24-30 hours after arrival, particularly for specimens received late in the day after a long transit. This prolonged exposure to light facilitates eating and drinking and allows familiarization with the immediate environment. This is especially important when birds are housed in large enclosures with multiple feeding stations and cover.

Foods and Feeding- Due to their inquisitive nature the nutritional needs of white-eyes are easily met. Wild-caught specimens have been observed eating commercial pellets within an hour of capture. While white-eyes are obligate nectivores, they are also generalists and accept almost all commercially available insects of appropriate size as well as pelleted foods, fruit and nectar. Perhaps as important as the diet is its presentation. Being almost entirely arboreal, white-eyes seldom descend to the ground. Food and nectar should be offered in elevated tubes, cups and platforms in multiple locations. Ideally, servicing of food, nectar and water should be accomplished from outside the quarantine enclosure to minimize disturbance. Fruit should be diced and pellets may be moistened. Some evidence suggests that color plays a factor in food selection in at least some species of *Zosterops*. In captive trials, red-colored foods were favored. The size of the food item can be a factor determining acceptance. Some commercial pellets can be ground and sprinkled over the diced fruit. Sliced banana, orange, pear, papaya etc. can be spiked on perches throughout the enclosure. Hibiscus blossoms can be added similarly. Pesticide-free ornamental plants with aphids can be offered in addition to *Drosophila*, *Musca* larvae, small mealworms, wax worms and crickets. A maintenance diet of pellets, diced fruit and nectar should be offered twice daily. Insects should be fed sparingly outside of the nesting and breeding season; they can be used to condition and influence behavior while making management easier. During chick rearing, a constant supply of small insects is essential. Plan ahead to identify sources and ensure an adequate supply. The nutritional value of commercially available insects is marginal. One effective method of delivering calcium and other minerals to small birds involves lightly spraying vegetable oil on the insects and dusting them with powdered supplements, another more time consuming method is injecting liquid supplements directly into individual insects with needle and syringe and offering them to the birds. Monitor nectar consumption closely. Uneaten nectar is a reservoir for bacteria colonization especially at higher temperatures. Some evidence suggests *Zosterops* feather coloration can fade without sufficient carotenoids available in the diet. Though anecdotal and not studied, this condition can be avoided simply by supplying a varied diet with regular vitamin and mineral supplementation. White-eyes enjoy bathing and multiple shallow water dishes can be provided as well as birdbaths attached the sides of the quarantine enclosure. White-eyes quickly learn to use water features as communal baths. Some aviculturists advocate restricting bathing opportunities for new acquisitions to avoid chilling. Modified feed traps can be incorporated into one or more food stations

on the quarantine cage, the birds quickly learn to enter for preferred food items and can be individually captured for weighing, banding ect. with minimal stress.

Housing and General Environmental Considerations - Although a list of compatible species that can safely be kept with Japanese white-eyes is not included, the peaceful nature and modest requirements of these small generalists permits the aviculturist a high degree of latitude when choosing potential cage mates and exhibit space. Although pairs of white-eyes can thrive and even reproduce in smaller enclosures with dimensions similar to those recommended for quarantine, few if any collection managers have the luxury or inclination to devote exhibit space exclusively to this species. Although very large walk-through, planted, mixed-species aviaries present specific challenges, the various enriched microhabitats these spaces provide allow Japanese white-eyes to display their full range of behavior. In more modest-sized walk-in flights and glass-fronted enclosures, a small mixed group of carefully selected species including Japanese white-eyes can be surprisingly engaging. If adequate landscaping and nesting opportunities are provided, successful nesting can result. Obvious advantages of managing these enclosures are ease of detailed observation, introductions and removal of specimens is accomplished directly and competition for nesting and feeding resources with larger more aggressive species is eliminated. One disadvantage occurs when even peaceful species are maintained together in smaller flights, one pair of birds may dominate available resources to the exclusion of others and social dynamics can become quickly strained. Before introducing white-eyes to enclosures with glass, obscure the glass to prevent injuries from collision. Live, vertically-oriented potted plants and or plastic vines should be temporarily placed along the inside front of the glass and removed gradually from the bottom to the top until the birds adjust. Similar precautions should be made during nesting. In larger exhibits, white-eyes can distance themselves from visitors and keepers, disappearing in well planted areas making detailed observations difficult. Birds may choose nest sites at heights within the space that prevent careful monitoring and places any resulting eggs and fledglings at risk. One possible solution that should be considered is the addition of one or more “exclusion” or “micromanagement” cages to larger aviaries. Two inch square plastic-coated wire formed into a two-foot square cage can be easily mounted at manageable heights and concealed to maintain aesthetics. These exclusion cages allow easy keeper access from one side of the cage that is cut to have a flip up door. Such devices can be utilized as safe havens from larger, more aggressive species and allow small birds like white-eyes to feed and possibly nest without interference. White-eyes quickly learn to exploit exclusion cages to their advantage. Modifying these cages for nesting and chick rearing can be accomplished by placing small gauge wire on the bottom and lower portion of the sides. When introducing white-eyes to free flight aviaries, “howdy” type introduction cages should be utilized. The length of time birds are kept inside the introduction cage, of course, depends on the behavior of both the resident species and the individuals being introduced. White-eyes, being curious, quickly learn the location of commercial feeding stations and are not shy about approaching them, even in the presence of much larger conspecifics. Careful consideration should be given to the timing of introducing white-eyes into an established collection. Avoid introductions during active nesting periods. White-eyes in their

gregarious efforts to explore the new environment may disrupt nesting attempts of shy and valuable species.

Captive behavior- Most published aviculture accounts of captive white-eyes are general and state their suitability for inclusion in mixed species aviaries, sometimes included are cautions about their aggressive behavior towards other species. Most negative behavior associated with captive white-eyes is intraspecific in nature and most often expressed in the absence of other white-eyes or the presence of too many confined in too small of a space without being provided an appropriate environment. Allopeening is a defining behavioral trait of zosterops and may serve to alleviate stress. Intraspecific allopeening has been observed several times in captivity and rarely causes serious problems. One aviculturist reported a Peter's twinspot and a Pekin robin housed with a pair of Chestnut-flanked white-eyes suffered bald necks as a result of sharing space with this species and cautions against keeping white-eyes with "show birds" (enclosure dimensions and number of specimens was not provided). In many gregarious species, intra specific aggressive behaviors can escalate during courtship and establishment of breeding territories, in the aviary, watch for increased chasing and displacement from preferred perches during this time.

Pair formation nesting and Chick Rearing- Although both species vocalize, only the male Japanese white-eye actually sings a primary song with distinct notes that lasts several seconds and is repeated several times. Although loud, the song can be difficult to distinguish in larger aviaries housing multiple species. Allopeening is known to intensify as pair bonds develop. Keepers should anticipate commencement of nest building and try to influence nest site selection to increase chances of success. Japanese white-eyes can complete entire breeding events from nest building to fledging young in just under a month! Small, open-cup nests manufactured for finches or homemade wire nests slightly larger than the dimensions provided in the species profile can be attached to a forked branch and then secured in a modified exclusion cage at a manageable height in the aviary where breeding may occur. This provides a secure framework for breeding pairs. Choosing a quiet, densely planted area will increase chances of acceptance by the birds. Simultaneously, increase the amounts of small live food and offer a consistent supply of fine nesting material (various lengths of grasses, raffia, coconut fibers, moss, hair, clean burlap fibers etc.) near the site. Keep disturbance to a minimum as Japanese white-eyes often abandon nests before completion. If pairs initially reject these nests, make another attempt the following season in a different location. Make careful observations and let the bird's behavior guide your efforts. If pairs choose to nest in high inaccessible locations, make ready a modified exclusion cage to serve as a fledging cage and frequently check the area for fallen chicks. White-eye chicks leave the nest as soon as 10 days after hatching and are usually unable to fly for several days, making them especially prone to death from exposure and predation. Mounting the cage as high as is practical will influence the adult's attentiveness. Lowering or draining water features in exhibits is recommended at this time

Banding offspring- Japanese white-eyes can be closed banded as nestlings, but this is not recommended as the procedure is very disruptive. Fledglings are easily caught before

they are proficient flyers and later will follow adults into feed traps. Combinations of open metal and colored plastic bands should be placed on the birds, choosing color combinations based on those of the adults to define pedigree.

Management of Juveniles- Call notes first noted at 10 days post hatching. Siblings often perch very close together near their parents and the nest. In the wild, young birds are dependant on the adults for 15-20 days after fledging. Young birds can safely be removed to a new enclosure after it is confirmed they are eating on their own.

Health Management- White-eyes seldom exhibit obvious signs of disease. Established protocols for small passerines should be followed to lessen the possibility of white-eyes introducing pathogens to an established population. Due to their small mass, some invasive veterinary procedures, such as biopsies, are problematic. A series of fecal screening and cloacal and tracheal cultures should be performed. To aid in fecal collection, place a non-absorbent surface, like waxed paper, on the floor of the quarantine enclosure under perches some distance away from feeding stations. If disease is detected, and drug therapy prescribed, treating a group of small birds individually is very difficult. Some medications can be delivered orally by injecting the drug into live food via a small syringe and 23-gauge needle. Ensuring that the bird receives the correct dosage is challenging. Consult your veterinarian to ensure the safety of this method as some medications require specific dosages and can be toxic. It is hoped that the health management data gathered from the birds collected in Hawaii in October 2002 will refine and define health management issues for this species.

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