OXFORD JOURNAL
OF STUDENT
SCHOLARSHIP

Bulbuls beyond their Native Ranges: A Literature Review of the Introduced Red-Whiskered and Red-Vented Bulbuls

Shuyun Qian
shuyunoli@gmail.com

ABSTRACT

A bird sighting confirms presence, but does not tell us whether an introduced population will persist, spread, or affect other species. Monitoring introduced species requires evidence of both population change and ecological effects.

This literature review compares studies of the Red-whiskered Bulbul (*Pycnonotus jocosus*) and Red-vented Bulbul (*Pycnonotus cafer*), two birds native to southern Asia. It examines their introduction, establishment, and spread in Hawaii, Florida, Texas, and California, while also considering studies from Australia, Réunion, eastern Spain, and New Caledonia for comparison. Table 1 summarizes ten regional sources by species, location, introduction history, establishment, range expansion, habitat association, ecological effects, evidence type, and major limitations. Primary studies support ecological interpretations, while secondary reviews provide context.

The populations did not follow the same pattern after establishment. On O‘ahu, Red-vented Bulbuls expand their range faster than Red-whiskered Bulbuls, despite the study detecting no statistically detectable difference in their count-based population growth rates. Florida’s Red-whiskered population remained localized during early monitoring, while later Houston records documented a wider Red-vented distribution. Negative associations with native bird abundance in New Caledonia provide evidence relevant to ecological effects, although causation remains unresolved. Citizen-science records can help locate such patterns and guide further work on bulbuls and other introduced birds. Estimating population trends and ecological effects still requires consideration of survey effort and complementary field studies.

INTRODUCTION

A species is introduced when people transported it beyond its native range, either intentionally or unintentionally. A population becomes established when it reproduces and persists without further releases (Blackburn et al., 2015). Blackburn and colleagues describe four stages: birds are transported to a new region; they enter the wild through release or escape; some survive and reproduce to establish a population; and some established populations spread into additional areas. “Introduced” and “invasive” therefore describe different concepts: “introduced” describes a species’s arrival outside its native range, whereas the USDA definition of “invasive” includes environmental, economic, or human health harm

(U.S. Department of Agriculture, 2026). Some ecological frameworks may use invasion terminology to describe establishment and spread. This review therefore specifies the outcome supported by each study and evaluates evidence of harm separately for each region.

Bulbuls are songbirds in the family Pycnonotidae, and several species have established populations far beyond their native ranges following human-mediated introductions. Two particularly well-documented examples are the Red-whiskered Bulbul (Pycnonotus jocosus) and the Red-vented Bulbul (Pycnonotus cafer). They are originally native to southern Asia; the Red-whiskered Bulbul's native range extends from the Indian subcontinent into Southeast Asia (Mo, 2015). Their varied diets and use of several habitat types make them useful for studying how human activities change bird distribution. Their distinctive plumage and calls also make them recognizable to birdwatchers contributing to citizen science (Mo, 2015; Sullivan et al., 2009). Both species have established populations in human-modified habitats beyond their native ranges.

The two species have some similar ecological characteristics but remain distinct monitoring targets. The Red-whiskered Bulbul has a black crest, white throat, and a red cheek patch, whereas the Red-vented Bulbul's red patch is beneath the tail. Both species use gardens, parks, and other human-modified areas, where fruit provides an important food source (*Red-vented Bulbul - eBird*, n.d.-a; *Red-whisked Bulbul-eBird*, n.d.-b). Both bulbul species have been introduced beyond their native ranges through the cage-bird trade, followed by escapes or deliberate releases. Although globally assessed as Least Concern on the IUCN Red List (BirdLife International, 2024), their global conservation status does not indicate whether an introduced population is increasing locally or affecting native species in a particular region. These local population trends and ecological effects therefore need to be evaluated separately within each introduced range.

In eastern Spain, Bernat-Ponce et al. (2024) found that Red-whiskered Bulbuls preferred suburban habitats and were more abundant near their original release site and in areas with fruit orchards. In New Caledonia, Thibault et al. (2018) reported negative associations between Red-vented Bulbul occurrence and the abundance of several native birds. These patterns warrant further study, but the observations alone cannot show whether competition caused the abundance differences. The successful establishment of an introduced species population also depends on how many birds arrive and how often the releases occur. Together, these factors are referred to as propagule pressure, indicating that a group of birds started by a larger count of individuals, or repeated introductions, will in most cases have a greater number of chances to survive the early losses and reproduce (Blackburn et al., 2015). Environmental differences may also contribute to variation among introduced populations. Amiot et al. (2007), for example, found differences in body proportions between Red-whiskered Bulbuls from the wetter windward side and the drier leeward sides of Réunion, with differences in bill size.

Citizen-science databases can extend observations across areas and time periods that would be difficult for a single research team to survey continuously. For example, eBird links birdwatchers' checklists into a research resource, linking observations to locations, dates, and information about observation effort (Sullivan et al., 2009). iNaturalist provides community-identified observations that can help corroborate

occurrences, especially when supporting media are available (*iNaturalist*, n.d.). The Great Backyard Bird Count encourages worldwide participation for four days each February, providing repeated opportunities to document bird occurrences across locations, while the more local Christmas Bird Count organizes annual counts within designated circles across the Americas and Pacific (*Great Backyard Bird Count, n*.d.; *Christmas Bird Count,* n.d.). Local birding groups can interpret database records by contributing knowledge of nearby habitats and past sightings. Complete checklists that record all the species an observer identifies during a visit. Analyses of eBird data became more reliable when researchers used complete checklists and accounted for differences in observation effort, such as survey duration, distance traveled, and detectability (Johnston et al., 2021).

For bulbuls, repeated sightings across multiple breeding seasons, together with supporting image documentation, offer more convincing evidence that the birds persist within a given region. At the same time, specially designed survey efforts remain necessary so that their abundance can be estimated and the influence they exert on other organisms can be studied. In addition, records submitted from different platforms need to be checked for duplicates of the same sighting, uncertain identifications, or captive birds. Citizen-science data can identify populations and distributional changes that warrant targeted field investigation.

This review examines the introduction, establishment, spread, ecology, and monitoring of Red-whiskered and Red-vented Bulbuls in the United States, focusing on Hawaii, Texas, Florida, and California. International studies provide comparisons of habitat associations, morphological divergence, and ecological effects. For each study, the central question is what its observations can show: birds' persistence, reproduction, range change, population trends, and ecological impact. The final section considers how citizen science can address gaps in this evidence and where field studies are still needed. It is a U.S.-centered comparative review rather than a comprehensive inventory of introduced bulbul populations worldwide.

METHOD

This narrative review used Google Scholar with the common names of both bulbuls and the terms "non-native," Hawaii, Florida, Texas, and California; international studies provide comparison cases. 34 records added from 1 August to 27 September 2026. Dated cited publications span 1975 to 2026.
Google Scholar searches during July-October, 2026 included ("*Pycnonotus jocosus*" OR "Red-whiskered Bulbul" OR "*Pycnonotus cafer*" OR "Red-vented Bulbul") AND (introduced OR invasive OR establishment OR "citizen science") AND (Hawaii OR Florida OR Texas OR California), followed by title and DOI checks. Sources were not restricted by publication year. The limitation of only English-language sources addressing either Red-whiskered and Red-vented in an introduced population. Studies confined to native populations or lacking relevant regional information were excluded. Papers on invasion biology and citizen science were kept as supplementary information for interpreting the regional studies.

Of the manuscript's 27 cited sources, 10 contribute to Table 1. These are bibliographic audit counts,

not reconstructed PRISMA screening totals or documented reasons for original rejection. Ecological interpretations rely on empirical studies, with reviews and historical accounts supplying context and introduction histories. Official websites provide definitions and background on identification, conservation status, management history, and observation platforms. A website record of a species' presence is not used to infer a population trend or a causal ecological effect.

Following Snyder (2019), the review groups sources by species, region, study design, main finding, and reported limitation. Occurrence, persistence, reproduction, range change, population trends, and ecological effects were assessed separately. Findings were compared qualitatively because study designs and response variables differed. Limitations include incomplete historical search documentation, English-language coverage, uneven regional evidence, potentially missed grey literature, and lack of a comprehensive global search.

GLOBAL HISTORY AND PATHWAYS OF INTRODUCTION

The cage-bird trade has transported both bulbul species outside of their native region, and escapes or deliberate releases have allowed some populations to establish (Mo, 2015; Thibault et al., 2018). Their arrival dates are often less certain than a timeline of first sightings suggests: birds may have lived in an area before anyone recorded them, and some accounts rely on later recollections (Williams, 1983). These histories therefore reconstruct events from incomplete records; and the distinction between transport, introduction, establishment, and spread helps explain why escaped birds may be observed without ever becoming part of a self-sustaining population (Blackburn et al., 2015). The following cases illustrate how the introduction outcomes can vary with location, timing, and release circumstances.

Mo’s (2015) review synthesizes earlier records of Red-whiskered Bulbuls introduced to Australia, Japan, Singapore, the southernMalay Peninsula, the United States, and a number of islands in the Indian Ocean. In particular, Australia provides several examples of different outcomes following introduction, ranging from populations that became established to ones that failed to persist. The earliest record was documented in Sydney in 1865, where later releases contributed to an established population. Releases began in Melbourne in 1915, but an establishment was not recognized until several years later. Other populations appeared around Coffs Harbour and Mackay, whereas records from South Australia did not show a persistent population (Mo, 2015).

The Indian Ocean islands provide further examples of population establishment and management. Red-whiskered Bulbul populations were established on Réunion, Mayotte, and several other islands in the Indian Ocean (Mo, 2015). On Assumption Island in the Seychelles, six birds released in 1977 established a population of several thousand individuals (Mo, 2015). However, an eradication program began in 2011 following conservation managers’ concerns that the introduced birds could reach nearby Aldabra Atoll and threaten the native bird community. The Seychelles Islands Foundation reported the removal of the remaining Red-whiskered Bulbuls during the following years (*Seychelles Islands Foundation*, n.d.).

The Red-vented Bulbul has also been widely introduced, particularly on islands, following its widespread transport as a cage bird from the early twentieth century onward. Thibault et al. (2018) summarize an earlier review that reported successful establishment in at least 36 of 46 known introduction locations, comprising 27 islands, two continental islands, and seven continental areas. Established populations occur across many Pacific archipelagos and in places such as Hawaii, Fiji, French Polynesia, and New Caledonia. In New Caledonia, a French Pacific archipelago, Red-vented Bulbuls were introduced near Nouméa, the capital city on the main island of Grande Terre, around 1983. The population subsequently expanded to nearly 100 km beyond the original release site (Thibault et al., 2018). These figures represent the introductions in the literature and may therefore underestimate the true number, particularly because unsuccessful, small, or unrecorded populations may be missed.

For both species, the cage-bird trade created opportunities for introduction, while conditions at the release site influenced subsequent survival and establishment. Gardens, irrigation, and ornamental fruiting plants can maintain food and vegetation through much of the year in urban and suburban areas (Bernat-Ponce et al., 2024; Brooks, 2013; Mo, 2015). Reduced predation near human settlements may have provided an additional advantage, although this remains a proposed explanation rather than a demonstrated general effect (Bernat-Ponce et al., 2024). Larger or repeated releases generally improve the chance of establishment by reducing the risk of early losses (Blackburn et al., 2015). Even then, climate, food availability, habitat connectivity, behavior, and chance can influence whether a population survives and spreads.

ESTABLISHMENT AND SPREAD IN HAWAII, FLORIDA, TEXAS, AND CALIFORNIA

The four U.S. states examined in this review show different patterns of introduction history, habitat use, dispersal, and monitoring effort. Among the regional studies reviewed, O‘ahu provides the clearest direct comparison of established populations of both species. The first Red-vented Bulbuls were reported on O‘ahu in 1966 at widely separated sites near Waipahu and Fort Shafter, with additional observations soon afterward (Williams, 1983). Williams considered multiple releases possible, but neither their origin nor release circumstances could be confirmed. Later sightings alone cannot resolve that early history.

On O‘ahu, Red-whiskered Bulbuls remained concentrated mainly in wetter, higher-elevation valleys around Honolulu, whereas Red-vented Bulbuls occupied a broader area that included lower and drier parts of southeastern O‘ahu (Williams & Giddings, 1984). From 1977 to 1982, the Red-vented Bulbul's recorded range grew roughly three times than its earlier extent, while the Red-whiskered Bulbul’s distribution changed little. Using the Honolulu Area Christmas Bird Count data through 1982, a long-running community-based bird survey, Williams and Giddings (1984) found no statistically significant difference between the species’ population-growth rates. Therefore, the faster range expansion of the Red-vented Bulbul could not be explained simply by faster population growth. Instead, the authors emphasized habitat affinities and the arrangement of suitable areas. This distinction between local abundance and geographic spread is central to citizen-science interpretation: more records may represent population growth, range expansion, increased observer effort, or a combination of all three.

Florida provides an example of a more localized Red-whiskered Bulbul introduction history. In the summer of 1960, several captive Red-whiskered Bulbuls escaped in Kendall, then part of Dade County, and breeding was documented the following year. Accounts estimated that approximately five to ten breeding pairs founded the population. By the winter of 1969–1970, researchers estimated roughly 250 birds and an average annual increase of approximately 33–40%, yet the population remained concentrated in a suburban area of only a few square miles (Carleton & Owre, 1975). Abundant ornamental fruit, a suitable climate, and social roosting were identified as key factors supporting their persistence. At the same time, attachment to established roosts and sedentary behavior may have slowed outward movement. The Florida case therefore shows that a population can increase for years without expanding rapidly into surrounding areas.

Texas represents a more recent example in which citizen-science observations provided substantial evidence about the introduced Red-vented Bulbul population. Brooks (2013) analyzed reports submitted to the Texas Invasive Bird Project from June 2008 to May 2012. Most records included photographs or written descriptions, and the author conducted field verification at fewer than 15% of reported sites. The project mapped 117 sites, all in urban or residential parts of greater Houston. The source of the population remained unknown; possible transport pathways therefore remain hypotheses rather than established explanations. The study also documented persistence, foraging, flocking, and breeding, but found no evidence of expansion beyond the Houston region or serious impacts on agriculture or native birds. That conclusion is limited to the Houston area and the study period, and does not establish that impacts could not develop later.

Houston records covered a larger area in the later study by Leahy and Brooks (2025). The minimum convex polygon around sightings increased from 589 km² before June 2012 to 4,606 km² for June 2012 to May 2022. Separately, 40 surveys along four transects in January to March 2024 produced an estimated mean density of 8.77 bulbuls/km² and about 466 birds in a 53.18 km² core area. The transects were chosen where reports were common, and the calculation assumed that all birds within 25 m on either side were detected. These estimates answer different questions. The polygon shows the area enclosed by records, including places where birds may not occur; the core-area estimate concerns abundance at one later period. Neither measure alone establishes a population trend or an ecological effect.

In Los Angeles County, aviary escapes around 1968 were followed by an effort that removed 47 Red-whiskered Bulbuls, although populations persisted near botanical gardens in Arcadia and San Marino (Mo, 2015). Khanna-Dang and Wood (2026) later surveyed eight walnut woodland sites and recorded five foraging observations of the species all at Elyria Canyon Park. These were feeding events, which may include repeated observations of the same bird. They show use of a remnant native woodland within the city, but cannot establish regional abundance or habitat preference. Together, the examples from the four states show why monitoring must track both occupancy and abundance while documenting breeding, habitat, observer effort, and uncertainty.

DIET, HABITAT, AND CLIMATE ASSOCIATIONS

Dietary flexibility is one of the clearest shared features of the two bulbuls. Both consume fleshy fruits as major foods while also taking nectar, flowers, buds, and invertebrates. For the Red-whiskered Bulbul, reported diets show that plant material made up about 65 percent in the southern part of China, yet in Mauritius fruit accounted for close to 99 percent of the diet. Moreover, insects and other arthropods, including flies, aphids, ants, and moth larvae, were supplementing the diet (Mo, 2015). Such a wide range of dietary resources can, in turn, permit the birds to make use of supplies that peak in different seasons. However, it also complicates impact assessment: the same population group may disperse seeds, feed on or damage cultivated fruits, pollinate or rob flowers, and consume pest insects.

Introduced populations frequently depend on vegetation provided or maintained by human activities. In Florida, Red-whiskered Bulbuls fed heavily on small fruits including Brazilian pepper, figs, lantana, jasmines, and other ornamental or naturalized plants, with insects and nectar providing extra nourishment (Carleton & Owre, 1975). The authors suggested that the suburban landscapes gave fruits and flowers during most months of the year. In Houston, Texas, Red-vented Bulbuls fed on berries, fruits, flowers, buds, and insects across a diverse set of plant species. Among the twenty plant foods that were named, nine were exotic species that also grew in the bulbul's native range, six were other introduced plants, and five were native to Texas (Brooks, 2013). This pattern suggests that familiar introduced plants may facilitate establishment, while the native plants may broaden the population's potential niche.

The relationship between bulbuls and non-native plants can become reciprocal. Frugivorous bulbuls may feed on invasive or ornamental plants and thus may disperse their seeds to new locations. Studies reviewed by Mo (2015) reported associations between Red-whiskered Bulbuls and the spread of non-native plants in Florida, Japan, Mauritius, and Réunion.In Australia, reported associations with African olive, lantana, blackberry, privet, and other weeds remain more uneven and often anecdotal (Mo, 2015). The ecological importance of seed dispersal depends on seed viability, dispersal distance, deposition habitat, and whether dispersed seeds successfully germinate Observing a bird consume fruit documents feeding behavior, but does not by itself demonstrate successful seed dispersal or plant establishment; consequently, monitoring should distinguish feeding records from confirmed seed-dispersal outcomes.

Habitat selection is similarly context dependent. In eastern Spain, Bernat-Ponce et al. (2024) conducted 200 point counts across 784 km² and found Red-whiskered Bulbuls in only 15 sampled squares. Separate abundance analyses used 74 point counts. Red-whiskered Bulbuls were associated with suburban habitat and were more abundant near the original release area and orchards containing fruit trees, while it was not detected in the natural Mediterranean forests, shrublands, or crops that comprised much of the study region. Based on this distribution, Bernat-Ponce et al. (2024) proposed that unsuitable natural vegetation may restrict movement between occupied areas. In contrast, developed areas containing gardens, ornamental vegetation, and fruit-producing plants may provide more continuous suitable habitat and facilitate movement between occupied areas. These results contrast with Australia, where Red-whiskered Bulbuls sometimes enter riparian vegetation, forest edges, and urban reserves, although they often remain

near gardens and settlements (Mo, 2015).As described earlier, Hawaii demonstrates how broad dietary similarity can coexist with climatic and topographic separation, with the Red-whiskered Bulbul associated with wetter upper valleys and the Red-vented Bulbul with lower, drier settings (Williams & Giddings, 1984).

MORPHOLOGICAL DIVERGENCE AND OTHER COLONIZATION INSIGHTS

One of the most notable findings concerns the Red-whiskered Bulbuls on Réunion. On Réunion, Red-whiskered Bulbuls spread to the wetter windward and drier leeward sides after introduction. Amiot et al. (2007) measured a total of eleven relatively non-seasonal and three seasonal morphological traits. After accounting for sex dimorphism, they found differences between the two sides in nine of the eleven non-seasonal traits, mostly in bill size. The authors interpreted this pattern as rapid morphological divergence occurring within fewer than ten generations. They suggested that various food resources could help explain the bill differences, but did not establish that mechanism.

Differences that appear soon after introduction do not, on their own, show genetic adaptation. Morphological differences can arise through natural selection, developmental plasticity, founder effects, genetic drift, non-random dispersal, or combinations of these processes. The field comparison cannot tell how much each process contributed on its own. Bacigalupe (2009) argued that evolutionary explanations need measurements of selection and the additive genetic variation and covariation among traits, summarized in the G matrix. For Réunion, those data would help separate inherited differences from effects of the developmental environment.

Interpreting those differences also requires knowing how birds colonized the island. Amiot et al. (2007) describe a single introduction to Réunion; variation among the founders and their descendants could still contribute to differences between later populations. Movement between the two sides could also limit divergence despite different local conditions. Genetic and demographic studies would help assess these possibilities. Photographs taken under comparable conditions could flag visible variation for field sampling, but they would not replace direct measurements of captured birds.

The Hawaii comparison also provides a second insight: Williams and Giddings (1984) detected no significant difference in the bulbuls' population growth rates, although Red-vented Bulbuls spread much farther. They proposed that habitat distribution and dispersal helped explain this contrast. A dense population clustered in a few wet valleys may produce many sightings without occupying a wide region, while one using connected lowland habitat may occupy a larger area at lower density. These examples illustrate why analyses need both spatial sampling and observation efforts.

Founder numbers offer another possible explanation for establishment. For biological invasions, a higher level of propagule pressure increases the likelihood that introductions generally become established, reducing vulnerability to demographic chance, mate limitation, and some genetic effects (Blackburn et al., 2015). Small founding groups can still succeed, as Florida's population appears to have done in a setting with reliable urban food resources. However, the original number of birds and release events is uncertain

for Hawaii and Texas. These records cannot be used to set a minimum founder number for successful establishment.

Finally, social and behavioral traits may affect persistence. Carleton and Owre (1975) suggested that Florida's roosts could help birds locate food, while attachment to established roosts might simultaneously restrict dispersal. Thus, the same behavior may influence establishment and spread differently. Monitoring needs to record changes in numbers and changes in occupied areas separately to capture both outcomes.

TABLE 1

COMPARISON OF INTRODUCED BULBUL POPULATIONS ACROSS REVIEWED REGIONS

Species	Location	Introduction history	Evidence of establishment/breeding	Range expansion	Habitat associations	Ecological effects	Evidence type	Major limitations
RWB (WG84)	Hawaii: O‘ahu	First observed in 1965; escapes reported	Established population; increasing count index	Limited change between 1977 and 1982	Wet upper residential valleys	Not assessed	Effort-adjusted CBC data, distribution surveys, transects; P, R, T	Historical observations; local CBC circle; observational design
RVB (WG84)	Hawaii: O‘ahu	First observed in 1966	Established, spreading population	Range approximately tripled between 1977 and 1982	Lower, drier residential and scrub habitats	Not assessed	Effort-adjusted CBC data, distribution surveys, transects; P, R, T	Historical observations; proposed dispersal mechanism not experimentally tested

Species	Location	Introduction history	Evidence of establishment/breeding	Range expansion	Habitat associations	Ecological effects	Evidence type	Major limitations
RWB (CO75)	Florida: Kendall, Dade County	Captive escapes in summer 1960	Nests and young documented; approximately 250 birds estimated in winter 1969 to 1970	Concentrated within approximately 3.2 square miles during the study	Suburban gardens, ornamental fruiting plants, communal roosts	Native-community effects not quantified	Field observations, roost counts, feeding trials; P, B	Founder size and annual growth reconstructed from tentative estimates
RWB (M15, K26)	California: greater Los Angeles Area (in comparison)	Aviary escapes around 1968 (M15)	Establishment reported historically (M15); nesting not assessed in woodland study (K26)	Regional expansion not quantified by these sources (M15, K26)	Near the botanical gardens (M15); walnut woodland at one surveyed site (K26)	Not assessed in woodland study (K26)	Historical review (M15); five feeding observations in 2023 (K26)	Feeding events are not a count of unique birds; only one surveyed site yielded bulbuls (K26)
RVB (B13)	Texas: Houston	Records from the mid-1990s; population origin unknown	Nests, fledglings, and parental feeding reported	Local spread suggested; expansion beyond Houston not documented	Urban gardens and residential vegetation	Limited aggression reported; no controlled impact test	Citizen questionnaires, photographs, and descriptions, P, B;	Opportunistic reports; fewer than 15% of sites checked

Species	Location	Introduction history	Evidence of establishment/breeding	Range expansion	Habitat associations	Ecological effects	Evidence type	Major limitations
RVB (T18)	New Caledonia: Grande Terre	Release near Nouméa around 1983	Established, expanding population; nesting not independently assessed	Historical spread nearly 100 km beyond release site	Roads, gardens, other modified habitats	Negative abundance association with 9 native species	Approximately 2,470 point counts at 97 stations from 2010 to 2015; P, R, A	No pre-invasion baseline and uneven sampling effort; observational association
RWB (BP24)	Eastern Spain: Valencia	First recorded at La Cañada in 2003	Persistent wild population reported; nests not surveyed in this study	Expansion rate not measured	Suburban habitat selected; no detections in sampled natural Mediterranean vegetation or cropland	Not assessed	200 winter point counts across 784 km² study area; 74 counts for abundance associations; O, habitat associations	One nonbreeding season; proposed barriers not tested through direct dispersal tracking

Species	Location	Introduction history	Evidence of establishment/breeding	Range expansion	Habitat associations	Ecological effects	Evidence type	Major limitations
RWB (A07)	Réunion	Accidental introduction from Mauritius in 1972	Established population; adult birds sampled	Historical colonization of contrasting coasts between 1972 and 1999	Windward and leeward agricultural sites, especially orchards	Not tested in the morphological study	Morphological measurements of 272 adults from 13 sites; historical P, R	Morphological differences do not establish a genetic basis; ecological effects not been tested
RWB (M15)	Sydney, Australia	Sydney records from 1865; Melbourne releases from 1915	Established regional populations reported	Historical spread and introduction outcomes varied among locations	Settled areas, orchards, forest edges, riparian vegetation	Aggression and weed dispersal reported	Review of historical records and observations; reported P, B, R	Mixed historical sources; represents a 2015 synthesis

Note. RWB = Red-whiskered Bulbul; RVB = Red-vented Bulbul. Source keys are defined below. Entries describe the cited studies and their observation periods. “Not assessed” means that the cited study did not evaluate an effect; it does not mean that no effect occurred.

Evidence codes: O = recorded occurrence; P = continued presence; B = confirmed local breeding; R = change in recorded range; T = population trend based on comparable counts; A = an observed association relevant to ecological effects.

Source keys: W83 = Williams (1983); WG84 = Williams and Giddings (1984); CO75 = Carleton and Owre (1975); B13 = Brooks (2013); M15 = Mo (2015); K26 = Khanna-Dang and Wood (2026); BP24 = Bernat-Ponce et al. (2024); A07 = Amiot et al. (2007); T18 = Thibault et al. (2018);

Table 1 shows that association with human-modified habitats does not produce a uniform pattern of spread. On O‘ahu, Red-vented Bulbuls expanded across a relatively continuous belt of suitable lowland habitat, whereas Red-whiskered Bulbuls remained concentrated in wetter residential valleys. The study detected no significant dif erence in estimated population growth rates. Habitat distribution and dispersal opportunities were proposed to explain the contrasting expansion patterns (Williams & Giddings, 1984).

Nevertheless, habitat associations should remain region specific. *The absence of Red-whiskered Bulbuls from sampled natural Mediterranean vegetation in eastern Spain contrasts with their documented feeding in California walnut woodland, although the California observations are too limited to establish a habitat preference (Bernat-Ponce et al., 2024; Khanna-Dang & Wood, 2026).* A useful comparison therefore asks how much suitable habitat is available and how it is connected. It cannot be assumed that these bulbuls always avoid natural vegetation or spread quickly once established.

Table 1 contains much more evidence that birds persist and breed than evidence of their ecological effects. In Houston, the studies document reproduction and a wider later distribution, but do not provide a controlled estimate of effects on native birds (Brooks, 2013; Leahy & Brooks, 2025). Thibault et al. (2018) examined native bird abundance directly in New Caledonia, making that study more informative about possible competition. Its negative associations still do not establish causation or a general decline in native birds through time. Impact findings should therefore remain tied to the population and study in which they were obtained. Citizen-science records can locate breeding birds, range changes, and interactions for follow-up. Estimating population change and ecological effects requires comparable counts that account for effort and field comparisons with adequate replication (Johnston et al., 2021; Underwood, 1994).

COMPETITION WITH NATIVE SPECIES AND OTHER ECOLOGICAL CONSEQUENCES

Competition is frequently proposed as a consequence of non-native bulbul population, but the strength of supporting evidence differs among regions. Overlap in food resources and hostile interactions with local species can individually suggest competition, but none of these observations alone demonstrate the effect at the population level. Stronger inference requires repeated abundance data, information on habitat and observation effort, and evidence that a resource in short supply is used by both species, and before-and-after tests or comparisons where possible (Underwood, 1994). This standard is important because introduced bulbuls often occupy highly modified habitats where urbanization itself can alter the native bird communities.

In New Caledonia, Thibault et al. (2018) used 2,478 point counts from 97 monitoring stations over six years; their comparisons in inhabited habitats focused on 579 counts. Nine of the fourteen other species had lower mean abundance where Red-vented Bulbuls were present, and all nine were native or endemic. The introduced species highlighted in the comparison, including Rock Doves, House Sparrow, Common Myna, European Starlings, and Common Mynas, did not show the same negative association. The authors suggested that aggressive foraging by bulbuls could displace native birds from feeding locations.

The study could not compare native bird numbers before and after bulbul arrival because no pre-invasion counts were available. Survey effort also varied among years, so the authors compared invaded and uninvaded inhabited areas as an alternative. They did not find a general decline in native birds over the monitoring period. Instead, they suggested that birds might be using a narrower set of habitats or moving toward less urbanized areas, rather than dying as a direct result of bulbul presence. They explicitly recommended continued monitoring and experimental tests. Thus, the study is consistent with a

competitive effect in this context, but should not be generalized automatically to every introduced population.

Evidence for Red-whiskered Bulbul competition is more limited. Historical reports suggest that Red-whiskered Bulbuls may have contributed to declines of White-eyes in Mauritius and may have displaced Nicobar Bulbuls on some islands of the Nicobars (Mo, 2015). Because these claims derive from earlier observational reports, they suggest possible competition rather than providing definitive evidence of population-level effects. In Australia, observers have described aggressive encounters with Silvereyes and Rosellas at fruiting trees, but formal evidence of ecologically significant competition is lacking. Claims involving predation on nestlings or reductions in arthropods are also based on limited observations and are not prominent in quantitative diet studies. These reports identify plausible mechanisms and questions for further investigation; they do not by themselves establish population decline.

Studies from Texas and California provide the limits of the available impact evidence as well. Brooks (2013) found no evidence from 2008–2012 that Red-vented Bulbuls in Houston were causing serious harm to native birds, dispersing unwanted plant species, or damaging agriculture. However, the study described distribution, diet, behavior, and breeding; it was not a controlled test of ecological effects. Lack of detected damage therefore cannot establish that the population had no impact. In California, the few Red-whiskered Bulbul feeding observations likewise document habitat use without providing a test of competition (Khanna-Dang & Wood, 2026).

Competition should also be evaluated alongside other effects. Eating fruit can damage crops or disperse invasive plants to new spots, while the consuming insects provide a potential helpful service. The magnitude and direction of these effects depend on the location, season, population density, and the species involved. A defensible synthesis should therefore avoid labeling either bulbul as uniformly harmful or harmless. Overall, the available evidence varies substantially among different regions: Red-vented Bulbuls show quantitative evidence of negative associations with native birds in New Caledonia, but many other claims of rivalry remain observational. Comparable monitoring across introduced populations is needed to assess how far those findings apply.

IMPLICATIONS FOR CITIZEN-SCIENCE MONITORING AND COMPARATIVE ANALYSIS

Birdwatchers contributing to citizen science are well suited to help monitor bulbuls given that both species are conspicuous, vocal, and common in some settled areas. Broad participation can reveal new locations, breeding evidence, seasonal changes, and range boundaries much faster than a small professional research team could survey the four states. Brooks (2013) used community reports to map 117 Houston locations and describe feeding, flocking, and breeding in Houston; Williams and Giddings (1984) used Christmas Bird Count data to compare growth in Hawaii. Photographs and written descriptions in Houston showed how accompanying documentation can strengthen volunteer reports.

eBird attaches useful survey information to sightings, including location, date and time, method, duration, distance, number of observers, and checklist completeness. Filters flag records that are unusual for the

place or season, and regional reviewers may request photographs or audio (Sullivan et al., 2014). Even after validation, records can retain biases in where, when, and how birds are observed. Observers are often clustered around roads, parks, and population centers; rare or introduced birds may attract additional attention; experience varies among participants; and some birds may go undetected. Raw record totals therefore need to be interpreted alongside survey effort. Analyses should distinguish gardens, parks, orchards, industrial areas, riparian corridors, and natural vegetation, then evaluate temperature, rainfall, humidity, elevation, irrigation, canopy cover, and fruit resources as separate predictors. These variables describe different aspects of weather, habitat, and resource availability; combining them under "climate" would obscure those differences. Records suspected to involve captive birds or recent escapes should be flagged and reviewed, with any decision to exclude them documented.

A comparative study of Hawaii, Texas, Florida, and California should use an operational evidence hierarchy based on recognized stages of invasion (Blackburn et al., 2011). A verified sighting supports occurrence, while records across seasons give stronger evidence of persistence. Nests, fledglings, and confirmed-breeding records support local reproduction. Sightings in new grid cells over several years can indicate range expansion if changes in observer effort are taken into account. Estimating population trends requires comparable counts or models that address effort and detectability. To assess ecological effects, a study must also measure a response in another species or ecological process. Comparisons between invaded and uninvaded sites, observations before and after colonization, and experiments can help test proposed mechanisms. Stronger causal claims about ecological effects require comparative, time-series, or experimental designs, preferably including replicated reference sites and before-after observations where feasible(Underwood, 1994).

Data cleaning is especially important when multiple platforms and projects overlap. The same birding event with multiple participants may be entered into more than one database, leading to duplicate records. Because the Great Backyard Bird Count submits through eBird, treating the two sources as independent would overestimate the amount of separate observation effort (Great Backyard Bird Count, n.d.). Date, location, observer group, list ID, and media should be used to match records. Spatial coordinates of sensitive sites may also be obscured, which should be mentioned explicitly Any downstream analyses should use complete checklists when possible, include effort covariates, and assess whether findings change when observation hot spots or uncertain records are excluded.

The themes used in this review can also guide a later analysis of citizen-science data. Sources can be compared by species, region, introduction pathway, study design, habitat, climate scale, diet, breeding, population trends, ecological effects, and stated limitations. Keeping the study design alongside each finding helps explain why results deserve different weight. For example, the New Caledonia abundance comparison addresses a different question from Houston's descriptive records or a single aggressive encounter. Citizen science can then reveal patterns across places and years, while targeted field studies examine the processes that might produce them.

CONCLUSION

The reviewed populations followed different paths after introduction. Red-whiskered Bulbuls persisted in a small part of Florida and were recorded in California, Red-vented Bulbuls bred in urban Houston, and both became established on Oʻahu (Carleton & Owre, 1975; Mo, 2015; Brooks, 2013; Williams & Giddings, 1984; Leahy & Brooks, 2025). Across the reviewed studies, arrival did not necessarily result in establishment or subsequent spread. Oʻahu provides the clearest direct comparison: Red-vented Bulbuls expanded their range faster than Red-whiskered Bulbuls even though the study found no significant difference in their population growth rates (Williams & Giddings, 1984). Selected international cases extend these comparisons without constituting a comprehensive global review. While the Red-vented Bulbuls were negatively associated with native bird species in New Caledonia, such a finding should not be assumed to apply to every introduced population (Thibault et al., 2018). Across regions, evidence of occurrence or reproduction is more readily available than comparable evidence of population trends and ecological effects.

Citizen science links observations across regions and years, but its value depends on how those observations were collected (Johnston et al., 2021; Sullivan et al., 2014). Monitoring should record short-term weather and time of day because they can affect bird activity and detection. Whether these factors need statistical adjustment depends on the survey design and the relationship being tested (Bas et al., 2008). Longer-term moisture conditions serve a different purpose: by shaping vegetation, they can influence habitat and population persistence (Bernat-Ponce et al., 2024). Separating observation conditions from habitat conditions helps explain whether a pattern reflects the birds, the survey, or both.

Future comparisons could test whether variables such as elevation, vegetation cover, irrigation, humidity, and fruit availability help explain differences among introduced populations. For the focal U.S. populations, repeated counts, documented breeding, and targeted studies of ecological effects would make cross-region comparisons more informative. Together, these considerations provide a framework for studying the introduction, establishment, spread, and ecological effects of other species beyond their native ranges.

REFERENCES

Amiot, C., Lorvelec, O., Mandon-Dalger, I., Sardella, A., Lequilliec, P., & Clergeau, P. (2007). Rapid morphological divergence of introduced Red-whiskered Bulbuls Pycnonotus jocosus in contrasting environments. Ibis, 149(3), 482–489. https://doi.org/10.1111/j.1474-919X.2007.00671.x

Bacigalupe, L. D. (2009). Biological invasions and phenotypic evolution: A quantitative genetic perspective. Biological Invasions, 11(10), 2243–2250. https://doi.org/10.1007/s10530-008-9411-2

Bas, Y., Devictor, V., Moussus, J.-P., & Jiguet, F. (2008). Accounting for weather and time-of-day parameters when analysing count data from monitoring programs. Biodiversity and Conservation, 17(14), 3403–3416. https://doi.org/10.1007/s10531-008-9420-6

Bernat-Ponce, E., Domínguez-Pérez, L., & Gil-Delgado, J. A. (2024). Habitat selection by invaders: Avoiding natural habitats by the red-whiskered bulbul Pycnonotus jocosus. Ecological Research, 39(2), 182–191. https://doi.org/10.1111/1440-1703.12427

BirdLife International. (2024). Pycnonotus jocosus. The IUCN Red List of Threatened Species 2024, e.T22712634A263762446. https://doi.org/10.2305/IUCN.UK.2024-2.RLTS.T22712634A263762446.en

Blackburn, T. M., Lockwood, J. L., & Cassey, P. (2015). The influence of numbers on invasion success. Molecular Ecology, 24(9), 1942–1953. https://doi.org/10.1111/mec.13075

Blackburn, T. M., Pyšek, P., Bacher, S., Carlton, J. T., Duncan, R. P., Jarošík, V., Wilson, J. R. U., & Richardson, D. M. (2011). A proposed unified framework for biological invasions. Trends in Ecology & Evolution, 26(7), 333–339. https://doi.org/10.1016/j.tree.2011.03.023

Brooks, D. M. (2013). Ecology, behavior, and reproduction of an introduced population of Red-vented Bulbuls (Pycnonotus cafer) in Houston, Texas. The Wilson Journal of Ornithology, 125(4), 800–808. https://doi.org/10.1676/13-037.1

Carleton, A. R., & Owre, O. T. (1975). The Red-Whiskered Bulbul in Florida: 1960–71. The Auk, 92(1), 40–57. https://doi.org/10.2307/4084416

eBird. (n.d.-a). Red-vented Bulbul. Cornell Lab of Ornithology. Retrieved September 27, 2026, from https://ebird.org/species/revbul

eBird. (n.d.-b). Red-whiskered Bulbul. Cornell Lab of Ornithology. Retrieved September 27, 2026, from https://ebird.org/species/rewbul

Great Backyard Bird Count. (n.d.). About. Retrieved September 27, 2026, from https://www.birdcount.org/about/

iNaturalist. (2026, September 26). About iNaturalist. https://www.inaturalist.org/pages/about.html

Johnston, A., Hochachka, W. M., Strimas‐Mackey, M. E., Ruiz Gutierrez, V., Robinson, O. J., Miller, E. T., Auer, T., Kelling, S. T., & Fink, D. (2021). Analytical guidelines to increase the value of community science data: An example using eBird data to estimate species distributions. Diversity and Distributions, 27(7), 1265–1277. https://doi.org/10.1111/ddi.13271

Khanna-Dang, N., & Wood, E. M. (2026). Native tree richness and urbanization shape foraging bird use of California walnut woodlands. Bulletin, Southern California Academy of Sciences, 125(1), 4–23. https://doi.org/10.3160/0038-3872-125.1.4

Leahy, J., & Brooks, D. M. (2025). Range expansion, density, and population estimates of an introduced population of Red-vented Bulbuls (Pycnonotus cafer) in Houston, Texas (USA). The Wilson Journal of Ornithology, 137(4), 620–629. https://doi.org/10.1080/15594491.2025.2533701

Mo, M. (2015). The Red-whiskered Bulbul Pycnonotus jocosus in Australia: A global perspective, history of introduction, current status and potential impacts. Australian Zoologist, 37(4), 461–471. https://doi.org/10.7882/AZ.2015.014

National Audubon Society. (n.d.). About the Christmas Bird Count. Retrieved September 27, 2026, from https://www.audubon.org/community-science/christmas-bird-count/about-christmas-bird-count

Seychelles Islands Foundation. (n.d.). Major projects. Retrieved September 27, 2026, from https://www.sif.sc/node/169

Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. Journal of Business Research, 104, 333–339. https://doi.org/10.1016/j.jbusres.2019.07.039

Sullivan, B. L., Aycrigg, J. L., Barry, J. H., Bonney, R. E., Bruns, N., Cooper, C. B., Damoulas, T., Dhondt, A. A., Dietterich, T., Farnsworth, A., Fink, D., Fitzpatrick, J. W., Fredericks, T.,

Gerbracht, J., Gomes, C., Hochachka, W. M., Iliff, M. J., Lagoze, C., La Sorte, F. A., ... Kelling, S. (2014). The eBird enterprise: An integrated approach to development and application of citizen science. Biological Conservation, 169, 31–40. https://doi.org/10.1016/j.biocon.2013.11.003

Sullivan, B. L., Wood, C. L., Iliff, M. J., Bonney, R. E., Fink, D., & Kelling, S. (2009). eBird: A citizen-based bird observation network in the biological sciences. Biological Conservation, 142(10), 2282–2292. https://doi.org/10.1016/j.biocon.2009.05.006

Thibault, M., Vidal, E., Potter, M. A., Sanchez, T., & Brescia, F. (2018). The invasive Red-vented bulbul (Pycnonotus cafer) outcompetes native birds in a tropical biodiversity hotspot. PLOS ONE, 13(2), e0192249. https://doi.org/10.1371/journal.pone.0192249

U.S. Department of Agriculture. (2026). Operational activities: Invasive species. Animal and Plant Health Inspection Service. Retrieved September 27, 2026, from https://direct.aphis.usda.gov/operational-wildlife-activities/invasive

Underwood, A. J. (1994). On Beyond BACI: Sampling designs that might reliably detect environmental disturbances. Ecological Applications, 4(1), 3–15. https://doi.org/10.2307/1942110

Williams, R. N. (1983). Bulbul introductions on Oahu. 'Elepaio, 43(11), 89–90. https://hiaudubon.org/wp-content/uploads/2021/12/Elepaio43.11.pdf

Williams, R. N., & Giddings, L. V. (1984). Differential range expansion and population growth of bulbs in Hawaii. The Wilson Bulletin, 96(4), 647–655. https://www.jstor.org/stable/4161998

APPENDIX

Use in this review	Sources (n)	Scope
Regional empirical studies	8	Amiot et al. (2007); Bernat-Ponce et al. (2024); Brooks (2013); Carleton & Owre (1975); Khanna-Dang & Wood (2026); Leahy & Brooks (2025); Thibault et al. (2018); Williams & Giddings (1984).
Regional secondary review	1	Mo, 2015
Historical introduction account	1	Williams, 1983
General methods and conceptual background	9	Bacigalupe; Bas; Blackburn 2011 and 2015; Johnston; Snyder; Sullivan 2009 and 2014; Underwood
Official sources and platform pages	8	IUCN assessment entry; USDA; two eBird pages; iNaturalist; GBBC; CBC; Seychelles Islands Foundation
Total cited sources	27	10 regional sources plus 17 sources with other roles

Figure 1: Audit counts and evidence roles