Failing to fledge: why are UK little tern (*Sternula Albifrons*) populations declining despite intensive conservation measures?

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Introduction

In the last three decades, UK little tern populations have declined by 37% (Wilson et al., 2020). As the UK's second rarest seabird, numerous conservation actions have been employed to increase their population sizes (Smart and Amar, 2018). Despite annual employment of electric fencing, signage, wardens, and predator control measures, UK little tern populations are projected to continue declining (Wilson et al., 2020).

Background

Globally, seabirds are one of the most threatened bird groups, having experienced a population decline of 70% in the last fifty years (Vulcano et al., 2024). Ground-nesting seabirds are particularly vulnerable since their nests are more susceptible to predation (Smart and Amar, 2018) or inundation by flooding and tidal fluctuations (Doyle and Newton, 2015). Climate change is frequently listed as a major threat to seabirds (Vulcano et al., 2024) due to its widespread and unpredictable effects that often act both directly and indirectly upon a species via environmental changes, food chain disruptions and habitat loss (Hakkinen et al., 2022). The frequency of extreme weather events within Europe have increased by 60% in the last three decades (Furtak and Wolińska, 2023). Consequently, coastal habitat is at a greater risk to storms and floods, and in turn coastal species populations are threatened and at risk of greater decline. Whilst storms and floods may be unavoidable, the potential negative impacts on coastal wildlife can be mitigated with sufficient preparation and employment of effective solutions (Hakkinen et al., 2022). However, conservation work is often financially and energetically costly, so efforts tend to prioritise a single rare and vulnerable species (Wilson et al., 2020). Careful consideration of conservation actions and an extensive understanding of the individual circumstances of a species or specific location are required to ensure longevity and success (Hakkinen et al., 2022).

Little terns (*Sternula albifrons*) are a long-distance migratory seabird (Schekler, Kiat and Dor, 2019) that predominantly breeds in the northern hemisphere of the world (Lopes, 2014) but has a widespread global presence across Europe, Africa, Asia, and Australasia (Birdlife International, 2019). Between the months of April and August little terns breed on UK beaches, nesting on sand or shingle in a shallow scrape (Rowell, 2020), often located close to the high tide line (Doyle and Newton, 2015). As a highly sociable species, little terns nest colonially, with social attraction potentially motivating younger and less experienced individuals to nest at sites more than environmental conditions (Medeiros et al., 2012). Conversely, Ratcliffe et al. (2008) suggested that colony site selection is driven by consistently stable habitat characteristics such as vegetation cover or human disturbance since East Anglian colonies continually returned to the same nest sites regardless of breeding success. Overall, little terns require specific environmental conditions for nesting and will abandon a previously established successful colony in response to adversity (Wilson et al., 2020). Internationally, little terns are assessed as ‘least concern’ by the IUCN Red List because of their large range and population size (Birdlife International, 2019). However, international populations are decreasing (Birdlife International, 2019), a trend reflected by UK little tern populations which have declined by 37% in the last three decades (Wilson et al., 2020). Within the UK, the species’ continual population decline and amber-listed status (Stanbury et al., 2021) has drawn attention from both conservation charities and the general public, leading to numerous local conservation projects for little terns (Wilson et al., 2020)

Main threats to little terns

The decline in UK little tern populations is commonly attributed to consistently poor productivity of UK breeding colonies (Smart and Amar, 2018; Wilson et al., 2020; Rowell, 2020). Conservation actions have accordingly focused on increasing breeding success by preventing or reducing threats to little tern nests, eggs, and chicks (Wilson et al., 2020). According to the IUCN Red List (Birdlife International, 2019), the main threats to UK little terns are predation, human disturbance, urban development, and climate change. Whilst the former two threats are more species specific, with associated conservation actions directly linked to issues, the latter two threats are complex and overarching across ecosystems. Current solutions to such broad, insurmountable issues are insufficient in their scope and efficacy (Vulcano et al., 2024).

Predation

Predation is widely accepted as a major cause of little tern breeding failure and subsequent population decline (Smart and Amar, 2018; Wilson et al., 2020; Rihane, 2025). In the UK, the most commonly observed predators of little tern eggs/chicks are raptors, foxes, and gulls, taxa which are all native to the UK (Figure 1) (Wilson et al. 2020). Corvids are also known to be a prolific predator of the eggs of other bird species (Catry and Granadeiro, 2006). Of the corvids, carrion crows (*Corvus corone*) are the most common predator of little tern eggs (Catry and Granadeiro, 2006).

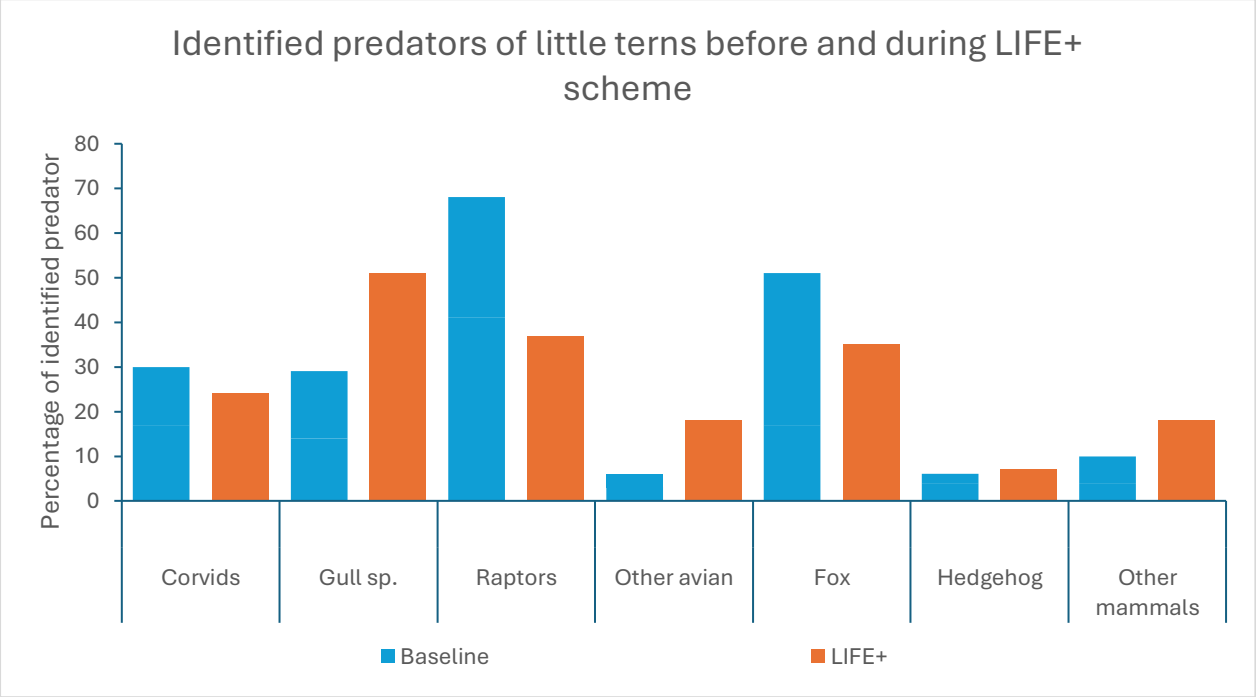

Figure 1. Prevalence of each predator type, measured as a percentage of all identified predators during baseline years (5 years prior to LIFE+ project, 2009-2014) and LIFE+ project years (2014-2018).

Of the raptors identified in Wilson et al. (2020), 77% were kestrels (*Falco tinnunculus*), an aerial predator known to limit the success of little tern breeding colonies (Smart and Amar, 2018). Like little terns, kestrels are an amber-listed species (Stanbury et al., 2021) whose populations have decreased by 36.85% in the last three decades (JNCC, 2025). Whilst kestrel predation does threaten little tern reproductive success in the UK, and in turn long-term species breeding success, both species are declining indicating that kestrels are not the main driving factor for little tern population declines. Furthermore, Smart and Amar (2018) suggest that it may be more energetically profitable for kestrels to consume little tern chicks *in situ*, thereby not feeding them to their own offspring, indicating little terns could be an inadequate or inefficient food source for kestrels.

Similarly, predation of little tern colonies by red foxes (*Vulpes vulpes*) could be opportunistic since little terns do not appear to select negatively against presence of red foxes on beaches and red foxes appear to have widespread coastal presence in the UK (Ratcliffe et al., 2008). Instead, red foxes may be drawn to beaches for the same reasons as gulls: to scavenge for litter and food waste produced by humans.

The most frequently identified gull species predating little tern eggs/chicks were common gulls (*Larus canus*), black-headed gulls (*Chroicocephalus ridibundus*), and herring gulls (*L. argentatus*) (Wilson et al., 2020). Alongside carrion crows, these species are considered facultative scavengers: species which feed on anthropogenic food sources in addition to wild prey (Cereghetti et al. 2019). Similarly to foxes, avian scavengers may prey on little terns opportunistically, being drawn to beaches by the litter and food waste available.

Human disturbance

Increases in levels of human disturbance are known to decrease the nesting success of little terns (Medeiros et al., 2007). The presence of humans in nesting colonies will result in adults being flushed from the site, increasing the vulnerability of nests and chicks to predators (Wilson et al., 2020). Furthermore, the highly camouflaged nature of little tern eggs and chicks makes them easily trampled by holidaymakers (Ratcliffe et al. 2008). Dogs brought by humans to beaches also pose a risk to nesting birds since they may eat eggs or chicks (Medeiros et al., 2012).

As little terns are one of the rarer breeding birds in the UK, egg collecting is a persistent threat, with multiple occurrences reported at Crimdon Dene, a now-abandoned breeding colony located in County Durham (Birdlife International, 2019). Finally, photographers and birdwatchers can create high levels of disturbance to breeding little terns by venturing too close to nests (Birdlife International, 2019).

Urban development

Arguably one of the most significant threats to all wildlife, urban development is one of the biggest drivers of habitat loss, fragmentation, and degradation (Birdlife International, 2019). Since 1968, 400km of land that previously supported breeding

little terns has lost the presence of breeding little terns, indicating a contraction in their range (Rowell, 2020). Wilson et al. (2020) note that little terns are increasingly found in larger, more concentrated colonies, and suggest the species may be attracted to protected breeding sites. In practice, little terns may be drawn to protected sites since levels of human disturbance may only be low enough for them to breed in protected areas. Whilst loss of appropriate nesting habitat and consequential increases in little tern colony sizes allows for easier protection of the species, the vulnerability of little tern populations increases, as stochastic events such as floods, or predation by one persistent predator, can disproportionately effect nationwide populations (Rowell, 2020). Additionally, human disturbance of the coastline could result in the selection of sub-par nest sites, which further decreases chances of breeding success (Medeiros et al. 2007).

Additionally, urban development of coastlines results in greater concentrations of people, which in turn results in increased production of food waste and litter. This could attract scavenging species such as foxes, gulls, and corvids – species that are frequently listed as major predators of little terns (Catry and Granadeiro, 2006; Wilson et al., 2020; Medeiros et al., 2007; Birdlife International, 2019).

Climate change

An unavoidable, irreversible threat with unpredictable impacts across ecosystems. One of the most frequently mentioned impacts of climate change affecting little terns is coastal flooding (Medeiros et al., 2007; Wilson et al., 2020; Rihane, 2025; Lopes, Ramos, and Paiva, 2015).

Current conservation actions employed within the UK

Under the LIFE+ little tern Recovery Project (2014-2018) resources were allocated to four types of conservation management: enhanced warden schemes; predator management; enhancement and management of preexisting habitat; creation or restoration of new habitat for future colonies (Wilson et al., 2020).

Enhanced warden scheme

Both signage and wardens are known to be effective at reducing the level of human disturbance near nesting little terns (Medeiros et al., 2007). Furthermore, the presence of wardens can deter ground predators, in particular red foxes, a measure which is highly effective in ground predator control when used in conjunction with electric fences (Smart and Amar, 2018). Of the conservation actions listed by Wilson et al. (2020), signage and daylight wardens were the most employed by sites. Both are widely accepted as effective measures, albeit Ratcliffe et al. (2008) note that warden schemes must be ran in perpetuity to maintain little tern populations. Smart and Amar (2018) also mention the species' dependence upon wardens. Within the UK, the breeding success and survival of little terns may only be sustained by intensive conservation action.

Regarding tidal flooding mitigation, Wilson et al. (2020) notes this is typically a reactive measure involving the relocation of chicks and eggs. Whilst this action could increase the chances of survival for a colony, it also creates a high level of human disturbance. With increasing frequencies of extreme weather events in Europe, coastal storms and flooding will only become more common, ergo approaches to mitigate flooding with lower levels of human disturbance should be developed and employed. Furthermore, movement of eggs and chicks by wardens further increases species' dependence on the presence of wardens.

Predator management

As aforementioned, fencing and wardens are effective at deterring ground predators. However, aerial predators require more complex solutions. Whilst the presence of wardens could deter aerial predators, more persistent individuals may ignore wardens. Furthermore, most aerial predators can easily evade wardens who usually have no ability to dissuade them other than attempting to scare/chase them off. As both a protected and declining species, kestrels are usually dissuaded from predating little terns by diversionary feeding (Wilson et al., 2020). However, employment of diversionary feeding is often site-specific since the logistics of regularly provisioning food and ensuring it is only taken by kestrels can be challenging depending on the resources available to a site. Furthermore, diversionary feeding is financially and energetically costly, so should only be done when justified (Smart and Amar, 2008).

Habitat management

Wilson et al. (2020) specifies habitat management measures as the strimming of marram, vegetation removal, and addition of sand to nest patches on shingle beaches. Vegetational growth covering nesting areas will increase the chance of little terns abandoning a site (Medeiros et al., 2007). Cutting back marram grass and removing vegetation slows vegetational succession on coasts, preserving a beach as suitable nesting habitat for little terns. Creation of sand patches in nesting colonies helps to prevent egg chill, which can occur if nests are on shingle substrate (Wilson et al., 2020).

Habitat creation/restoration

Restoration or creation of habitat can involve the re-shingling of beaches or the raising of beaches by adding sand to protect ground-nesting birds from inundation by high tides (Wilson et al., 2020; RSPB, 2025). This is a labour-intensive solution: in 2023, the RSPB moved 50,000 cubic metres of sand and shingle to Horsey Island, Essex (RSPB, 2025). As a result, rising tides should not be able to inundate ground-nesting coastal birds, however, the resource-intense nature of this action makes it unsuitable for small, single-species colonies since the benefit may not outweigh the cost.

Floating rafts and platforms for use as alternative nesting locations offer a promising solution to rising tides, however research into coastal applications is insufficient to conclude if they are an effective alternative for little terns (Rowell, 2020).

Evaluating the success of little tern conservation in the UK

Wilson et al. (2020) found conservation actions employed under the LIFE+ scheme trebled breeding success to 0.37 chicks per pair. Unfortunately, to achieve population stability, current breeding success must double to reach the minimum breeding for population stability of 0.7 chicks per pair (Rowell, 2020). Clearly, current conservation practices successfully slow population declines, but are insufficient in restoring little tern populations to stable levels.

The inconsistency between time and energy spent on little tern conservation and benefit to little tern populations could be attributed to over-emphasis of warden schemes and predator management. Over 90% of sites included by Wilson et al. (2020) employed at minimum one conservation action related to wardening or predator management (Figure 2). In contrast, 52% of sites employed at least one habitat creation/restoration measure (Figure 2).

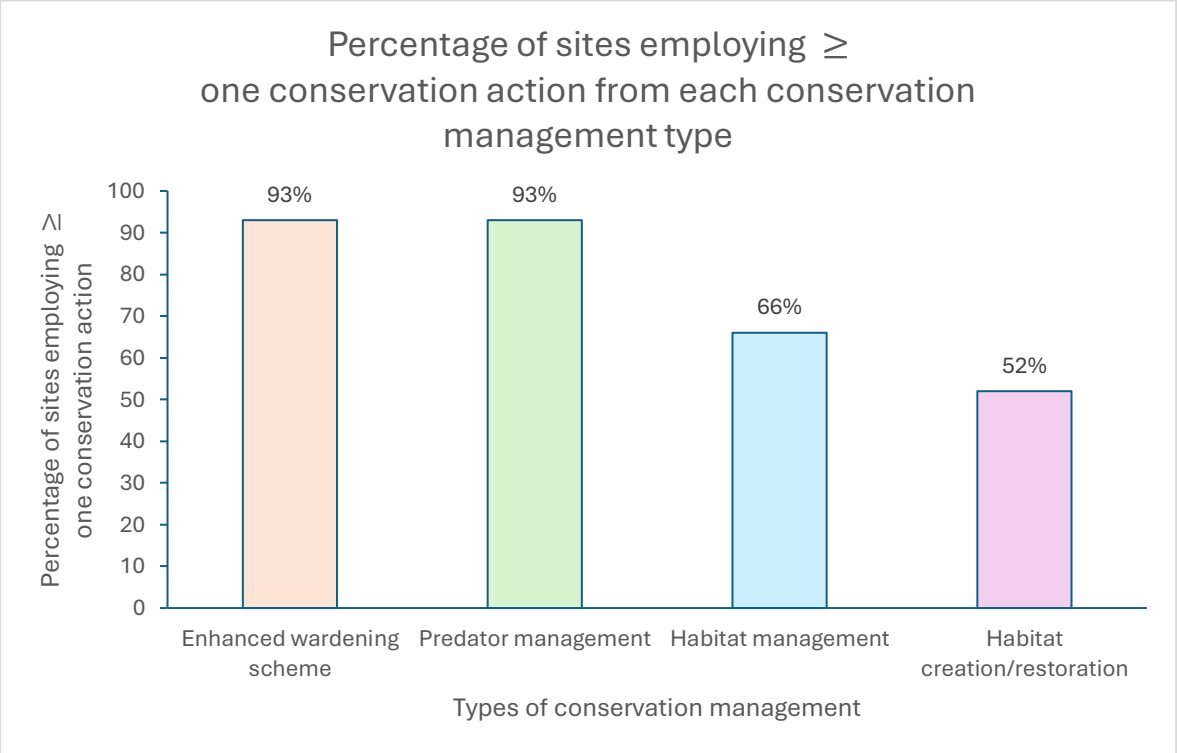

Figure 2. Comparison of the percentage of sites employing at minimum one conservation action from each type of conservation management mentioned by Wilson et al. (2020).

Warden schemes and predator management have been shown to be beneficial to the survival of little terns, and pre-existing programmes are easy to implement since they already have established frameworks. Despite this, little terns' continual population decline indicates a need to establish new practices. As the intensity and frequency of extreme weather events and coastal flooding increase, so do pressures on coastal conservation schemes to react. To develop effective and efficient solutions to issues exacerbated by climate change, clear communication and collaboration between research is essential. Hakkinen et al. (2022) highlighted the

disconnect between species threat level, ecological research and practical conservation action, which in turn results in implementation of ineffective conservation actions, or off-the-cuff solutions. Little tern conservation within the UK exemplifies the issues highlighted by Hakkinen et al. (2022): their international conservation status does not align with the intensity of work employed in the UK; research solutions often are inapplicable due to financial strain; the main threats typically highlighted (human disturbance and predation) overshadow the looming threat of climate change and habitat loss, which exacerbates the issues of predation. The conservation actions listed by Wilson et al. (2020) are predominantly focused on disturbance and predation (Figure 3), with fewer actions linked to the threats of urban development and habitat loss.

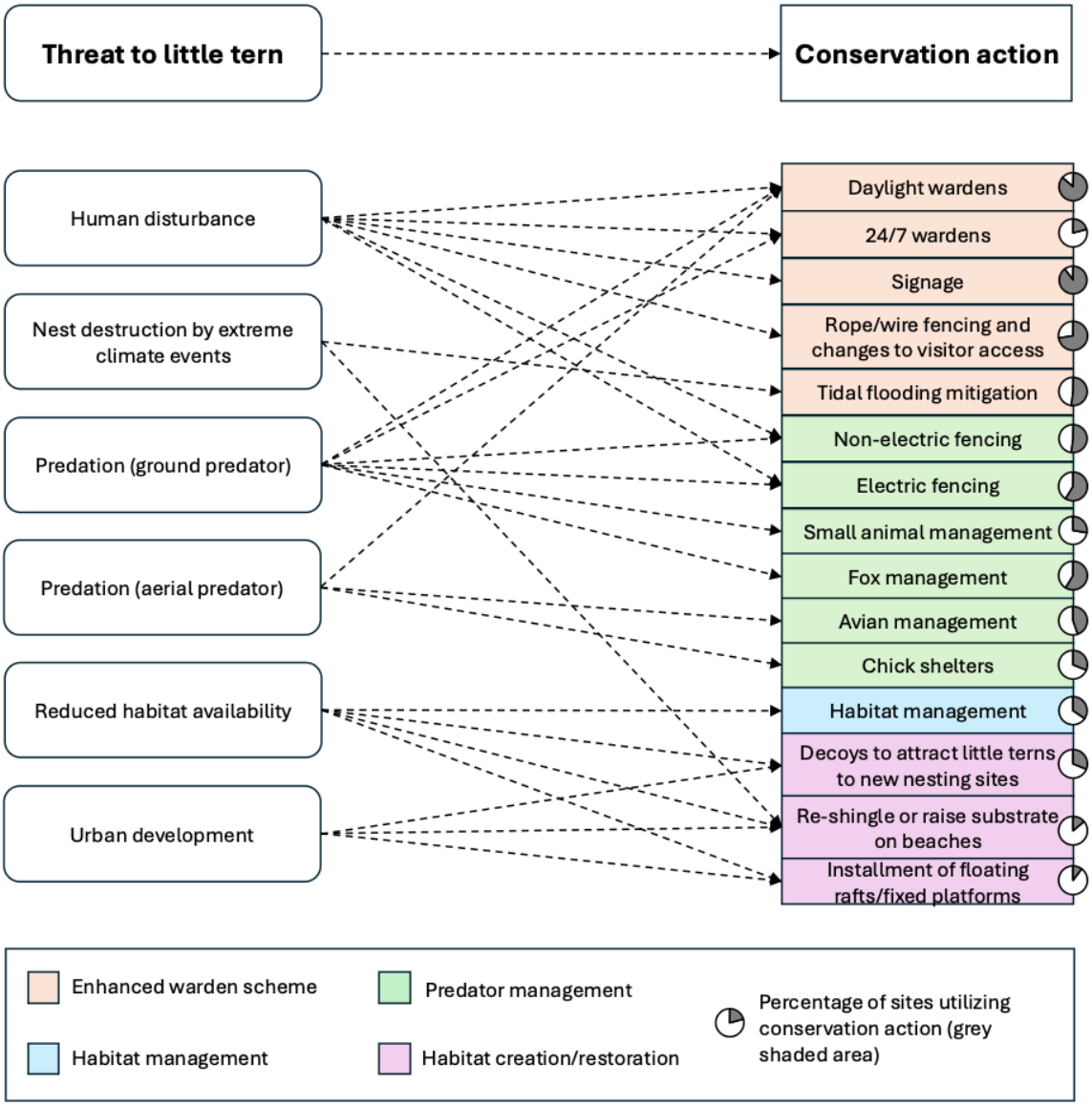

Figure 3. Summary of major threats to little terns and subsequent conservation actions employed under the LIFE+ little tern Recovery Project. Conservation actions and percentage of sites utilizing each action were taken from Wilson et al., 2020. Threats were compiled using the IUCN Red List page on little terns (Birdlife, 2019) and Wilson et al. (2020). Figure format taken from Hakkinen et al. (2022).

Whilst urban development and reduction in viable habitat for nesting are more complex issues than reducing human disturbance and predation, internationally little terns have been shown to adapt to more urban environments. In Portugal, nesting colonies have been found in the Salinas of Ria Formosa (Medeiros et al., 2007), and in Japan, little terns nest on rooftops (Fujita et al., 2009). The potential for UK little terns to integrate into more urban environments is currently unknown, but if achieved could alleviate some of the pressures caused by habitat loss since colonies could be more dispersed.

Conclusion

Outwardly, the efforts to protect and increase little tern populations may seem unproductive or futile, as their populations keep declining despite continual investment of time, money, and energy. The threats faced by little terns are not unique: the loss of a species may be gradual and unassuming, with conservation work too little and too late. Conservation has value, and public interest only adds to it. Whilst little terns may not currently see success in the UK, increases in extreme weather events, habitat loss, and urban development create a challenging environment where success should not be measured purely by achieving a minimum productivity level. Ultimately, the cause of little tern population declines cannot be pinpointed to one threat. Underlying threats such as climate change and urban development exacerbate more obvious threats such as predation, human disturbance, and coastal flooding. However, it is impossible to tackle overarching, seemingly impenetrable issues, especially with limited funding, ergo conservation approaches must try to work with them. Exploring the possibilities of integrating little tern colonies into urban environments, creating alternative nesting using rafts, and ensuring existing habitats are properly managed are a few ways little terns could remain in the UK in the future.

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