

Research Article

OSPREY NESTS (PANDION HALIAETUS) AS A POTENTIAL KEY HABITAT FOR SMALL REPTILE SPECIES ON RED SEA ISLAND HABITATS

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ABSTRACT

As part of the conservation efforts in the northern Red Sea development areas, the nests of Osprey (*Pandion haliaetus*) have been moved, out of nesting season, to relocate them away from areas where they would be damaged or disturbed by development. During these operations, a significant association with these structures and lizard species has been identified. The implications are threefold. Primarily, the nests may provide an important refuge habitat for these species on the uninhabited islands in the Red Sea. Secondly, as Osprey nests are avoided during surveys to ensure the species is not disturbed, there is a potential under reporting of the populations of small reptile species on the islands. This in turn has implications for wider population assessments and their consideration in the environmental impact assessment process. Thirdly, the potentially high numbers of *Stenodactylus doriae* and *Acanthodactylus* sp (likely *A. opheodurus*) in close proximity or a potentially loose colony structure in the nests is at odds with the published and accepted behavioural norm of these usually territorial species. Records are from initial observations only and further more structured research is required. Further investigation into this association can only be recorded on an opportunistic approach, as Osprey nests (and particularly active nests) should only be disturbed where all other avoidance mitigation has been exhausted.

Keywords: lizard; habitat; osprey; nest; Red Sea; Gekkonidae; Pandionidae

INTRODUCTION

Osprey nests (*Pandion haliaetus*) are a feature of many of the offshore islands along Saudi Arabia coast, and in coastal areas. The osprey is a medium-large raptor which is a specialist fish-eater with a worldwide distribution. Ospreys are partially migratory, with semi resident individuals (often female) seen most of the year (less frequently in summer). (Jennings, 2010), Saudi Aramco, 2020) Breeding is preferred on undisturbed predator and pest free islands near coastal areas. Recorded active and disused nests are present throughout the three main giga projects along the Saudi Arabia Red Sea northern coast. Breeding is noted from November or December, and a single brood with a clutch of 2-4 eggs are recorded. Usually a single female with one or more males. Once fledged family groups remain in the area of the nest and island until April to May when they disperse (Jennings, 2010) Saudi Aramco, 2020). Although classed as a species of least concern (IUCN and HCP), disturbance especially through breeding season is not permitted and is avoided by all the development projects (Symes *et al.*, 2015). Osprey appear to show preference for returning to the same nest site each year. Nests are often recorded as being rebuilt and improved each year or abandoned for a preferred location on the same island, one nest on Tiran Island in the northern Red Sea is noted as active for over 80 years (Habib, 2019) Where a clutch of several juveniles fledge, an adolescent female is often present the following year, and first year (often unsuccessful) nests are often noted close to the occupied nest either on an adjacent island or sometimes at the opposing end of an island. Nests of other pairs are not found within approximately 2 – 2.5 km of an active nest.

LIZARD PRESENCE ON RED SEA ISLANDS

As part of the baselines surveys for the PIF gig projects in the Red Sea, and as part of the initial work for identifying suitable areas for development, a number of surveys have been conducted of the offshore islands for reptile presence using standard walkover and track recording as well as refuge investigation. part of these surveys, Osprey nests, especially any that maybe active were recorded but avoided to prevent any anthropogenic disturbance to the species. Baseline surveys were a mix of single event and seasonal visits of 150m – 250m walked transects with quadrats and investigation of potential refuge areas, but not osprey nests (Hill *et al.*, 2006, and Cox *et al.*, 2012). Surveys recorded low numbers of small lizards on the islands, mainly *Acanthodactylus* sp. and occasional *Mesalina* sp. Sandfish *Scincus scincus* were recorded on several of the smaller sand islands, but not at Al Nu'man Island. Agama spp were suspected but not confirmed on Al Nu'man and Sindalah where there were rocky habitats present (BDC, 2018 , BDC 2020). Rough tailed gecko (*Cyrtopodion scabrum*), dune sand gecko (*Stenodactylus doriae*), snake-tailed fringe-toed lizard (*Acanthodactylus opheodurus*), common fan-footed gecko (*Ptyodactylus hasselquisti*), sandfish (*Scincus scincus*) and rock semaphore gecko (*Pristurus rupestris*) were recorded in adjacent coastal areas through reptile surveys for environmental baseline purposes. Generally recorded in low densities across the northern Red Sea coastal area where surveys have been conducted for EIA purposes. Inland from the immediate coast, larger species of monitor lizards and spiny tailed lizard were recorded. Observations were noted, often as a single individual with estimates extrapolated from tracks and presence in refuge areas. In general, on all islands surveyed the numbers were believed to be low. This is a reasonable assumption due to the normal conclusions that these animals are relatively territorial and of low density with limited food sources on small offshore islands.

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Acanthodactylus opheodurus, also known commonly as Arnold's fringe-fingered lizard or the snake-tailed fringe-toed lizard, is a species of lizard in the family Lacertidae. The species is endemic to the Middle East. They are believed to be territorial with skirmishes with others of the same genus noted (Cunningham, 2001). Schmidt's Fringed-toed Lizard (*Acanthodactylus scmidtii*) were also recorded in vegetated areas on the islands. *Melisera* spp. are relatively undescribed, and visually highly similar to *Acanthodactylus* spp (Sindaco *et al.*, 2018) exhibiting similar behavior. Where reptile specialist conducted surveys with specimens seen at close range, differentiation was possible. Spotted Toad-headed Agama (*Phrynocephalus maculatus*) (Sirhan *et al.*, 2010) and other Agama species are also noted (individual sightings) on some of the surveys. Favouring islands with rocky ground (Al Numan Island, Breem Island etc) (BDC, 2018, BDC 2020) these species are active at the hottest time of the day and wary of human presence often darting and burying or escaping into rock crevices before accurate identification can be made. On sites where building or ruined buildings are present, yellow-bellied Gecko (*Hemidactylus flaviviridis*) may also be present and have been recorded. In all cases, during often limited surveys for environmental impact assessment (EIA) for baseline conditions, very low numbers of these reptiles are noted and anticipated. Survey include seasonal surveys and methods to accepted international practices. The estimates provided are consistent with the established literature on the behaviour and occurrence of these species. Where initial surveys were made in winter seasons (such as Sindalah) no individuals were recorded. Even where multiple visits and seasonal surveys including summer active periods with crepuscular targeted surveys, counts in all cases were low.

OSPREY NEST RELOCATION

Nest move requirements.

As noted, in where possible, any disturbance of osprey nests (active, not active or abandoned) is avoided. However, due the necessity of ongoing geotechnical investigation and development in NEOM, AMAALA and The Red Sea Development Company (TRSDC) areas, to avoid destruction of the nests, BDC ecologists have relocation a small number of Osprey nests to prevent their removal. This has occurred post fledgling season and the nests have been carefully disassembled and then rebuilt at the closes point outside the construction area. Osprey, unlike some other raptors show a level of acclimation to human presence (Jennings, 2018). Exclusion zones of 250m have been established where nests are active. This is based on behavioural observations and the maximum distance where behaviour does not appear altered. At within 150m, osprey will vocalise and often leave the nest area, with close flying passes of any intruders. This extends to other species as the observation is that Osprey act aggressively to several other bird species and an area around the nests is also often devoid of other nesting birds such as terns and white eyed gulls. Gulls and other opportunistic seabirds may take small lizards as prey. BDC ecologists in conjunction with consultation with regional expert ornithologists, Mike Jennings (Jennings 2010, and pers comm) and Mike McGrady (McGrady *et al.*, 2020 and pers comm) have been developing mitigation for both these species for the development projects (Massey J, 2022). In relation to Osprey, the method of relocation has been developed and trialed at a number of locations to prevent nest loss. Early results indicate some success of the use of the nests by Osprey pairs in the subsequent seasons. Further assessment will be required before this is can be confirmed.

Osprey nests and lizard species.

Use of osprey nests by lizards is not reported in the literature. However, other species of raptors and The construction of an Osprey nest is similar to the refuge habitats that are surveyed and preferred by these species. Whilst a number of sources note the importance of cover and use of branches and nests for essential habitat e.g. (Goldberg SR 1979) there is no specific association and the potential importance on island habitat which offer very little alternative cover. The potential for opportunistic taking of lizards may have contributed to the assumption that this was not a suitable habitat for these species, (Fischer *et al.*, 2001) or the avoidance of disturbing of active nests by surveying ecologists. In 2019, ecologists were asked to monitor and then remove an active and two inactive nests from an island designated for development in the Al Wadj Lagoon area (now The Red Sea Development Company managed area) approximately 600km north of Jeddah between the towns of Umluj and Al Wadj off the Red Sea coast. The island is a 2km by 3km island called Al Osh al Sharqi. The island is sand covered, with fringing coastal scrub. To the north east of the island the area is favoured by crab plover with deeper sands and tunneled nests. The Osprey nests were located at the south east corner (active nest), overlooking the marine area and providing a raised platform. In the northern central coast there was a second nest, partially inundated with scrub which was not active but had been observed used as a perch. In the south west there was a further abandoned nest. (Massey J, 2022). On the adjacent island to the north of Al Osh al Sharqi was a larger island (Al Osh) with similar orientation. As the headland point of the island relocation island had the same orientation and conditions as the active nest, this was chosen as the relocation site. After the pair of osprey and their 2 fledged checks had moves off the nest and away from the immediate area, the nest was carefully disassembled and moved to a point of similar outlook and elevation on the adjacent island. Two abandoned nests in the island (used for roost and perch only during the preceding two seasons) were also removed. The active nest was approximately 1.2m high and 3m in circumference, the centre was a mound of sand and topped with dried algae and other material to create the nest. The nest construction for the outer structure was predominantly wood (a mix of driftwood and sticks) with other material including bone, fishbone, some plastic waste and metal. Fish bones included a number of species including the carcasses of a number of guitarfish (Rhinobatidae) too desiccated for clear species identification. Osprey are piscivores nearly exclusively (Fischer *et al.*, 2001) Osprey nest collections from Saudi coral-dominated fringing reefs tended to contain more predatory fish species (e.g. Carangids), associated with an overall high species richness, whereas Ospreys in other sites tended to feed on fish lower down the food chain (e.g. grazing Pomacanthids). However several non-fish prey have been reported worldwide (see Wiley & Lohrer 1973), in the Canaries only lizards (two Caesar's lizard *Gallotia caesaris* individuals captured on El Hierro; Díaz *et al.*, 1986) and crabs (without any more information; Martín & Lorenzo 2001) have been recorded.

Al Osh al Sharqi - Initial Observations .

As the first nest was disturbed a number of small lizards ran from the nest. The numbers of small lizards were notable and estimated at between 20 and 30 individuals. Predominately *Stenodactylus doriae* species with a few *Acanthodactylus* sp (most likely *A.opheodurus*) were noted. The lizards escaped the site often burying in the sand and then further running from the disturbance. Unfortunately it was not possible to safety capture and record the species with the equipment present on the site. The initial findings were surprising and therefore an accurate count and assessment were not full possible, however, the numbers and main species were identified. Following

this initial move, two further nests were removed from the island and relocated. The second nest was used as a perch but was relatively long abandoned with significant vegetation (*Haloxylon salicornicum*) over the edges of the nest (Massey J, 2022). A small amount of fresh faeces on the nest suggested some use but the main structure had not been preserved. There were lower numbers of lizards recorded on the disassembly of the nest. Insect populations were higher than surrounding areas when disturbed. As it was abandoned the central portion of the nest was harder without the nesting algal and other softer material. Around 10-15 individuals were recorded at this second nest. There were greater numbers of *Acanthodactylus opheodurus* in comparison to *Stenodactylus doriae*, potentially due to the presence of vegetation around the nest, or as a result of the abandoned state. The same was true of the third nest where a further ~10 individuals were recorded. This third nest was partially collapsed and had been abandoned for some time.

Sindalah

In NEOM, nests were moved by contractors with ecologist supervision. Sindalah is in the north of the Red Sea in the NEOM area and is a larger island, with alternative lizard habitats including inland cliffs and rock and ledge cover and less marine sands present. The island is predominantly gravel plain covering with fossilized coral and shell sandstone outcroppings and a firmer substrate. Baseline survey reports (BDC, 2018 and BDC, 2019) recorded no notable lizard species from walkovers, due to the lack of vegetative cover on the island. Osprey nests are predominantly on rock outcroppings on the north and south east of the island. Some utilizing natural rock platforms for elevation. The island has at least 2 breeding pairs and a number of smaller nests built mainly of wood and litter material. In moving these nests the ecologists were observing and directing contractors. The ecologists did note lizard presence at two of the nest moves but in lower numbers and without identification of species. The nests were old, used as perches but not active.

Ummahat Al Sheikh

In 2019, an active nest was moved on the island of Ummahat Al Sheikh (UAS) in the TRSDC area. The nest was active with an active pair on the island for the previous two years, however, the pair had not laid at the site or elsewhere on UAS.

Following the identification of a potential correlation between lizard species and the osprey nests, an attempt was made to retain the species for better enumeration and identification. Using plastic wrapping (which was excess from the material used to move the nest and removed after use) a low 10cm barrier was erected on one side of the nest. Supported by sticks driven into the same to create a semi-circular barrier approximately 10cm high and at a slight angle, the base was buried a few centimeters into the sand. It was designed on a similar basis to amphibian fencing to try and curtail the escaping lizards once the nest was disturbed. Unfortunately, this method was not successful as the small lizards were able to quickly scale the barrier or buried through the sand. The nest move did record around 20 individuals, predominately *Stenodactylus doriae* species with a few *Acanthodactylus* sp (likely *A. opheodurus*) and at least 2 other species, unidentified due to the speed of their evasion.

DISCUSSION

Small lizards are noted and recorded on many of the islands of the Red Sea and the adjacent coastal areas, though in low numbers. The survey on the islands has noted, but avoided Osprey nests so as not to disturb the species, especially on active nests or breeding pairs

where 150-250m exclusion zones have been followed to avoid startle behaviour. The association between the Osprey nest structures is not recorded in the literature, however, it does make sense as the nest provide shaded habitat and refuge similar to the refuge habitats that are highlighted in the survey methodologies for reptiles. The surveys correctly estimated the number of these species on the islands using the assumption that they are territorial and have a low spatial density as a result. The presence of numbers concentrated in a previously undescribed habitat and density, is of interest as it not only suggests higher numbers may occur in coastal and island habitats than previously estimated, but also a loose colony or tolerant aggregation of usually aggressively territorial species may be present forced into a single structure due to the lack of cover and suitable habitat. From a conservation point of view, the expected presence of a few individuals means that due care and consideration has been given to date to small lizards in the EIAs and management plans. In addition, this habitat (Osprey nests) are avoided from disturbance as far as possible, meaning that by default the reptile habitat is preserved as far as practicable. Where Osprey nests had been identified for relocation, consideration to date has only been given to the bird species, and future consideration should also be made for the potential associated fauna. More data on this potential association can only be collected where other mitigation has been exhausted and Osprey nests are identified for relocation.

CONCLUSIONS

From the current evidence, there appears to be a correlation between the osprey nest habitat and the lizard species on sandy low lying Red Sea islands where there is little other cover. The number per nest are over double the total estimates per island for the numbers of lizards present. This means that the number of these species on the island is likely to be higher than previously estimated, where such nest habitat is present. This means that current estimate of low numbers on the islands for EIA purposes maybe underestimating the total numbers. As the habitat is already protected as far as possible, then from the conservation stand point, the underestimation of species, and the lack of knowledge on the potential association does not affect the conservation and EIA conclusions with respect to the lacerids, geckos or Osprey. Where Osprey nests are identified in future for relocation, a more structured approach of investigation and a designated Herpetologist present will be considered to collect data on the species and numbers present and compare to estimates for the islands.

Further work

Osprey nests cannot be disturbed for the purposes of this research or to confirm the association on islands as this would cause disruption to potential breeding pairs of the species. It is likely that additional nests will need to be relocation in the Saudi Vision 2030 tourism projects as the developments progress. Where BDC are tasked with this operation, a dedicated herpetologist will be present onsite to record the move and provide methods for increased small reptile retention and identification onsite. Where nests are planned to be moved, initial investigation by a dedicated herpetologist will be undertaken first to try to gain better understanding of the habitat usage and confirm if there are behavioural changes of these species forced due to the lack of other available habitat on the islands.

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Supplementary Material

Figure 1: Map of Island locations

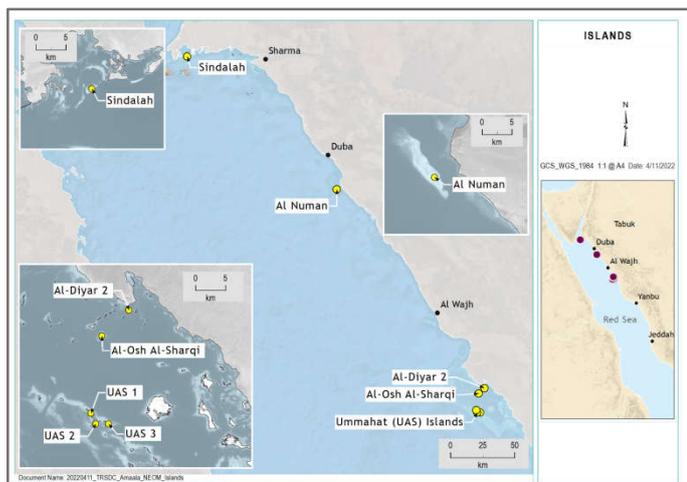


Table 1 Osprey Nest relocations and associated numbers of small reptiles by site

Island	Project	Nest #	Nest status	# of Lizards per nest
Al Osh al Sharqi	TRSDC	3	1 Active , 2 Abandoned	~30 ~15
Al Numan	AMAALA	1	Abandoned Inactive	/ ~10
Ummahat Sheikh	AI TRSDC	1	1 Active	~30
Sindalah	NEOM	2	Inactive Abandoned	/ ~ 5

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