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Nota editorial

Nova vaga

Nos passos largos que a revista tem dado, temos vindo a realçar a criatividade dos nossos autores em publicações inovadoras, mas também o papel da nova geração de investigadores para a divulgação do conhecimento relacionado com a Zoologia das ilhas de Cabo Verde. Nesse ecossistema tão dinâmico, o papel dos novos actores tem sido fulcral. Apesar da história não ter sido benevolente para o sexo feminino, contribuindo para a invisibilidade das mulheres na ciência e a perpetuação da ideia de que a ciência é um campo predominantemente masculino, temos hoje evidenciado uma nova vaga de mulheres investigadoras que tem produzido conhecimento de excelente qualidade. É neste contexto que apresentamos o presente número da *Zoologia Caboverdiana*, onde constam três notas breves, todas lideradas por uma nova geração de investigadoras do sexo feminino.

A primeira nota breve intitula-se "*Presença de* Evania sppendigaster, *um parasita de baratas, na ilha da Boavista, Cabo Verde*". Os autores destacam aqui a presença pela primeira vez da espécie *Evania appendigaster* em Cabo Verde. Esta espécie, que é nativa da Ásia, é uma vespa parasita cujas larvas se alimentam de ovos de baratas. É encontrada em diversas partes do mundo, provavelmente introduzida junto com as próprias baratas. Apesar de ser uma espécie exótica, a presença desta em Cabo Verde poderá não ser um ponto negativo, visto que o provável impacto irá incidir principalmente sobre as baratas não nativas.

Na segunda nota intitulado " *Apanhado na teia: dietas de aranhas como uma janela para a diversidade de artrópodes em áreas remotas*" os autores utilizam o metabarcoding de DNA para analisar a dieta de aranhas *Argiope sector*. Com uma amostra de apenas nove exemplares os resultados revelaram 11 famílias pertencentes a seis ordens de insectos constituintes da dieta desta espécie. Os autores demostram que o uso de metodologias inovadoras poderá providenciar mais informações sobre a dieta desses predadores, principalmente em locais remotos onde os recursos tróficos são limitados.

A terceira e última nota breve reporta, pela primeira vez, a presença da espécie *Phaethon lepturus* nas ilhas de Cabo Verde. Os autores da nota " *Primeiro registro de reprodução do rabo-de-junco-de-bico-amarelo* Phaethon lepturus *em Cabo Verde* " conseguiram identificar e fotografar indivíduos adultos dessa ave na Reserva Natural Integral dos Ilhéus do Rombo, na zona mais a sul de Cabo Verde. A presença da espécie no arquipélago era uma incógnita até ter sido descoberto o primeiro indivíduo no ilhéu de Cima em Julho de 2020. Esta descoberta realça a importância da Reserva Natural Integral como um local chave para as aves marinhas, bem como enfatiza a necessidade de monitorizar e proteger estas áreas.

É de realçar o número crescente de submissões de artigos vindos geograficamente do sudoeste do arquipélago, até pouco tempo inexistentes na revista, o que traz mais diversidade e maior abrangência nacional. Dito tudo isso, em nome do Comité Editorial desejo-vos boa leitura e que apreciem este número.

Evandro Lopes
Editor-chefe interino da
Zoologia Caboverdiana

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Editorial note

New wave

In the significant strides that the journal has taken, we have been highlighting the creativity of our authors in innovative publications, as well as the role of the new generation of researchers in disseminating knowledge related to the Zoology of the Cabo Verde Islands. In this dynamic ecosystem, the role of these new actors has been crucial. Despite history not being benevolent towards females, contributing to their invisibility in science and perpetuating the idea that science is predominantly a male field, today we are witnessing a new wave of female researchers producing high-quality knowledge. It is in this context that we present the current issue of *Zoologia Caboverdiana*, which includes three short notes, all led by a new generation of female researchers.

The first short note is entitled "*Presence of* Evania appendigaster, *a cockroach parasite, on the island of Boavista, Cabo Verde*". The authors highlight here the first documented presence of the species *Evania appendigaster* in Cabo Verde. This species, which is native to Asia, is a parasitic wasp whose larvae feed on cockroach eggs. It is found in various parts of the world, likely introduced along with the cockroach themselves. Despite being an exotic species, its presence in Cabo Verde may not necessarily be negative, as the likely impact will mainly affect non-native cockroaches.

In the second short note titled "*Caught in the web: spider diets as a window into arthropod diversity in remote areas*", the authors use DNA metabarcoding to analyse the diet of *Argiope sector* spiders. With a sample size of just nine specimens, the results revealed 11 families belonging to six insect orders that constitute the diet of this species. The authors demonstrate that the use of innovative methodologies can provide more information about the diet of these predators, especially in remote locations where trophic resources are limited. The third and final short note reports, for the first time, the presence of the species *Phaethon lepturus* in the islands of Cabo Verde. The authors of the note "*First breeding record of the white-tailed tropicbird* Phaethon lepturus *in Cabo Verde*" were able to identify and photograph adult individuals of this bird species in the Integral Natural Reserve of Ilhéus do Rombo, in the southernmost area of Cabo Verde. The presence of the species in the archipelago was unknown until the first individual was discovered on the Cima Islet in July 2020. This discovery highlights the importance of the Integral Natural Reserve as a key location for seabirds, as well as emphasizes the need to monitor and protect these areas.

It is noteworthy the increasing number of manuscript submissions coming geographically from the south-west of the archipelago, which until recently were absent in the journal, thus bringing more diversity and broader national coverage. Having said all this, on behalf of the Editorial Committee, I wish you a nice read and hope that you will appreciate this issue.

Evandro Lopes
Interim Editor-in-Chief of
Zoologia Caboverdiana

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Nota breve | Short note

Presence of *Evania appendigaster*, a cockroach parasite, on the island of Boavista, Cabo Verde

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Keywords: distribution record, Evaniidae, parasitoid wasp.

The family Evaniidae comprises a group of wasps known for their parasitic behaviour, targeting the egg capsules (ootheca) of cockroaches (Edmunds 1953). Evanids deposit their eggs within these oothecae, where their larvae develop by consuming the cockroach eggs, ultimately emerging as adults (Lebeck 1991). Morphologically, this group of Hymenoptera is easily recognisable by the distinctive shape of their body. Their compact and small abdomen, along with elongated posterior legs, often give the impression that the rear part of their body is missing (Rey del Castillo 1984).

During a visit to the island of Boavista, Cabo Verde, in January 2023, we made an *ad hoc* observation of an adult specimen of *Evania appendigaster* (L., 1758) (Fig. 1) in the vicinity of an hotel in Sal Rei, close to Praia do Estoril (16.17353, -22.91489). This is one of the most characteristic species of the family, recognisable by its large size (5.5 to 7.0 mm) compared to other species, black colouration and blue eyes (Fig. 1).

This species of apparent Asian origin, has a cosmopolitan distribution, except for the polar regions, and is believed to have been facilitated in its worldwide spread by human activities and the spread of its cockroach hosts (Morillo & Cazorla 2020). Despite its extensive distribution range, there are no published records of any Evaniidae species in Cabo Verde, although we have found three sightings of *E. appendigaster* on the iNaturalist platform (www.inaturalist.org) from two islands in the archipelago, i.e, Sal and São Vicente. Two

observations were made in Santa Maria, at the southern tip of Sal, while the third was recorded on São Vicente (16.90394, -24.90807) in a residential area near Baía das Gatas. The present observation constitutes the first published record of an evaniidid in Cabo Verde and the first record of *E. appendigaster* for Boavista.

Fig. 1. *Evania appendigaster* recorded on the island of Boavista in January 2023 (photo by M. García-París).

Evania appendigaster mainly parasitizes the eggs of *Periplaneta americana*, *Periplaneta australiasea*, and *Blatta orientalis*, ubiquitous cockroaches in urban areas (Stange 1978, Fox & Bressan-Nascimento 2006). Therefore, the arrival of *E. appendigaster* in Cabo Verde is likely linked to the introduction of these cockroaches. In the Canaries, *E. appendigaster* is relatively abundant (Rey del Castillo 1983), and it possibly arrived in Cabo Verde with ships carrying cockroaches from those islands.

The impact of *E. appendigaster* in Cabo Verde is presumably low as it mainly parasitizes invasive and non-native cockroaches. In fact, the species is often used as a biological control of cockroaches (Cameron 1957, Lebeck 1991). Given the expanding distribution of *E. appendigaster* and its role in controlling invasive cockroaches, further monitoring is needed in Cabo Verde to understand its ecological impact (e.g., interactions with the four native cockroach species of three different genera; Báez & Oromí 2005) and its potential benefits in urban pest management.

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REFERENCES

Báez, M. & Oromí, P. (2005) Arthropoda. *In:* Arechavaleta Hernández, M., Pérez, N.Z., Gómez, M.M. & Esquivel, J.M. (Eds), *Lista preliminar de especies silvestres de Cabo Verde. Hongos, Plantas y Animales Terrestres.* Gobierno de Canarias. Consejería de Medio Ambiente y Ordenación Territorial, Spain, pp. 60–100.

Cameron, E. (1957) On the parasites and predators of the cockroach II – *Evania appendigaster* (L.). *Bulletin of Entomological Research*, 48, 199–209.

Edmunds, L.R. (1953) Some notes on the Evaniidae as household pests and as a factor in the control of roaches. *The Ohio Journal of Science*, 53, 121–122.

Fox, E.G.P. & Bressan-Nascimento, S. (2006) Biological characteristics of *Evania appendigaster* (L.) (Hymenoptera: Evaniidae) in different densities of *Periplaneta americana* (L.) oothecae (Blattodea: Blattidae). *Biological control*, 36, 183–188.

Lebeck, L.M. (1991) A review of the hymenopterous natural enemies of cockroaches with emphasis on biological control. *Entomophaga*, 36, 335–352.

Morillo, C.Y.H. & Cazorla, D. (2020) First record of *Evania appendigaster* (L.) (Hymenoptera: Evaniidae) in Venezuela. *Revista Nicaragüense de Entomología*, 198, 1–18.

Rey del Castillo, C. (1984) Los Evaniidae de España (Hym., Evanioidea). *Eos Revista Española de Entomología*, 59, 243–253.

Stange, L.A. (1978) *Evania appendigaster* (L.), a cockroach egg parasitoid (Hymenoptera: Evaniidae). *Florida Department of Agriculture and Consumer Services*, 191, 1–2.

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Nota breve | Short note

Caught in the web: spider diets as a window into arthropod diversity in remote areas

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Keywords: Arachnids, Desertas Islands, diet assessment, DNA metabarcoding, primer effectiveness

Insects are the most diverse group of animals, hence many taxa remain poorly studied, especially in remote areas (Eggleton 2020). Spiders are among the most abundant insectivores, important for regulating insect populations (Michalko *et al.* 2019). Thus, understanding their diet is essential for indirectly assessing insect diversity within poorly studied habitats.

This study uses DNA metabarcoding to analyse the diet of *Argiope sector* (Forsskål, 1776) spiders collected in 2021 at three sites on the uninhabited island of Santa Luzia, Cabo Verde (Fig. 1), as detailed in Jowers & Caut (2021), to test whether it can indirectly assess insect diversity in this remote area. DNA from nine different opisthosomas were extracted using a standard high-salt protocol (Sambrook *et al.* 1989) and host DNA was removed using AMPureXP beads following Krehenwinkel *et al.* (2017). A two-marker approach was used to maximise prey identification and compare primer effectiveness targeting 16S rRNA (IN16STK-1F–mod/ IN16STK-1R-mod, Pinho *et al.* 2018), and cytochrome c oxidase subunit I (COI) (ZBJ-ArtF1c/ ZBJ-ArtR2c, Zeale *et al.* 2011). PCR conditions followed Pinho *et al.* (2018) for the 16S and Krehenwinkel *et al.* (2017) for the COI. Libraries were prepared according to Illumina MiSeq protocols (Illumina 2013) and sequenced using a 300-cycle MiSeq Reagent Kit V2. DNA sequences

were processed bioinformatically using the OBITtools package (Boyer *et al.* 2016), following Pinho *et al.* (2023). Contigs were discarded if read counts were <10 and sequence lengths differed from expected base pair (bp) sizes (16S: 110 bp; COI: 210 bp). Potential PCR/ sequencing errors, singletons and contaminations were removed, and molecular operational taxonomic units (MOTUs) were obtained and compared against sequences in NCBI Nucleotide Database and our reference collection (Pinho *et al.* 2018), using the BLAST+ software (Camacho *et al.* 2009).

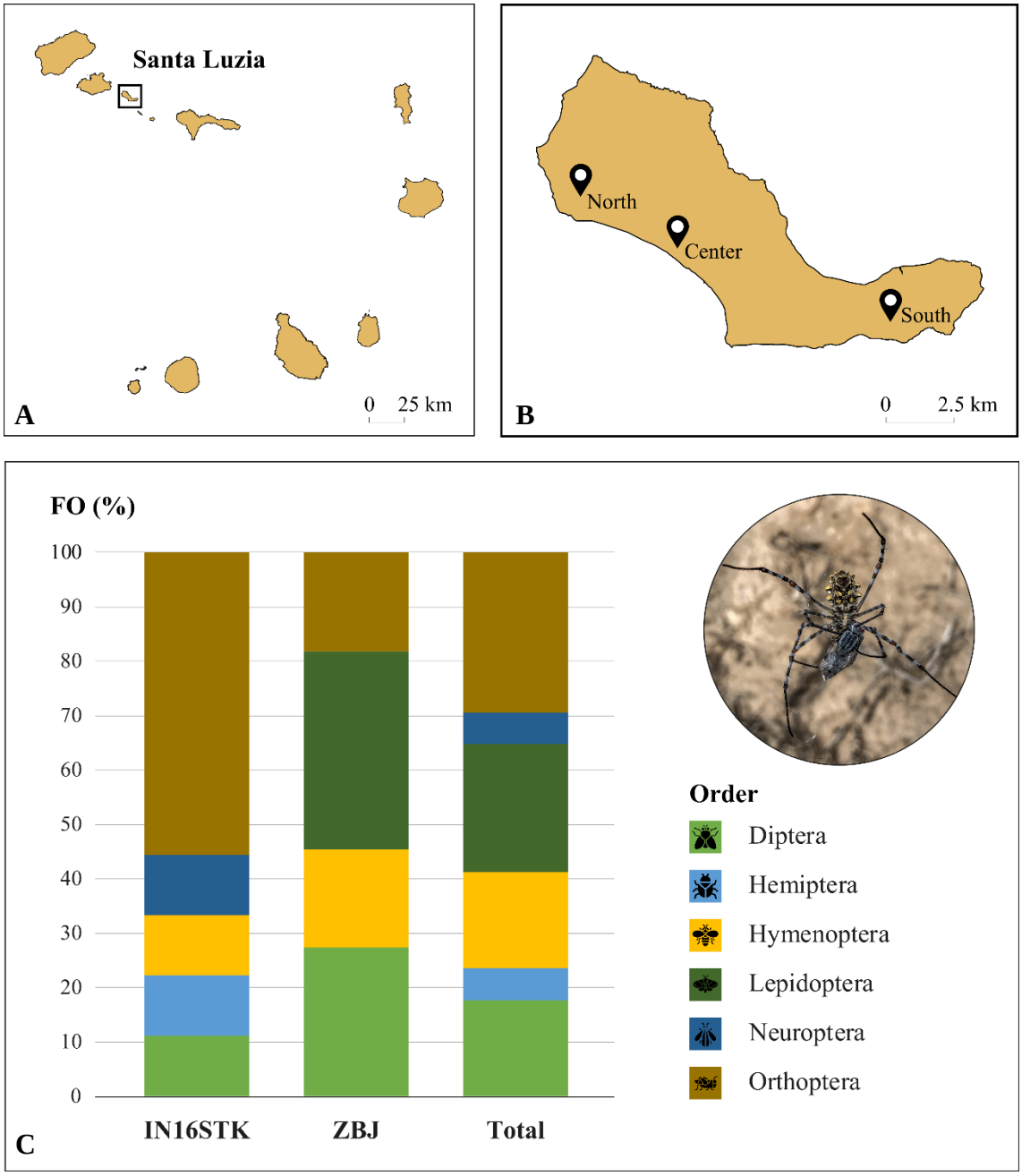

Fig. 1. Study area and results of the diet of *Argiope sector*. **A**) Map of Cabo Verde showing the geographic location of Santa Luzia Island. **B**) Map of Santa Luzia depicting the three sampling points. **C**) Stacked column chart showing the relative percentages (FO) of each insect order retrieved from DNA metabarcoding analyses using each mitochondrial marker (IN16STK and ZBJ) and considering the total of the two. In the top right corner, an orb spider is depicted predating a fly (photo by S. Caut).

Six orders (Fig. 1C), 11 families (Anthomyiidae, Psychodidae, Nabidae, Braconidae, Diapriidae, Eulophidae, Crambidae, Gelechiidae, Tortricidae, Myrmeleontidae, and Acrididae), and 16 MOTUs were identified, eight of which were identified at the genus or species level (*Apantales*, *Ochrodia*, *Scrobipalpa*, *Creoleon*, *Acrotylus*, *Sphingonotus*, *Nomophila noctuella*, and *Nabis capsiformis*).

Given the limited sample size, the diet of these individuals revealed a noteworthy diversity of insects, some particularly challenging to sample and unrecorded on the island (e.g., *N. noctuella*). It was not possible to amplify Hemiptera or Neuroptera with ZBJ primers or Lepidoptera with IN16STK (Fig. 1C). Similar results were observed by da Silva *et al*. (2019), with ZBJ showing clear biases, especially by overestimating Lepidoptera.

This study highlights the importance of using a multiple marker approach in dietary studies (Cuff *et al*. 2022), and of studying the diet of top predators with DNA metabarcoding for biodiversity assessments in remote areas (Santos *et al*. 2022). Furthermore, it emphasises the need for comprehensive surveys of arthropod biodiversity on Santa Luzia (e.g., Fortes 2021) to preserve unique species that may be declining before they even have been described.

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REFERENCES

Boyer, F., Mercier, C., Bonin, A., Le Bras, Y., Taberlet, P. & Coissac, E. (2016) obitools: a unix-inspired software package for DNA metabarcoding. *Molecular Ecology Resources*, 16, 176–182.

Camacho, C., Coulouris, G., Avagyan, V., Ma, N., Papadopoulos, J., Bealer, K. & Madden, T.L. (2009) BLAST+: architecture and applications. *BMC Bioinformatics*, 10, 421.

Cuff, J.P., Windsor, F.M., Tercel, M.P.T.G., Kitson, J.J.N. & Evans, D.M. (2022) Overcoming the pitfalls of merging dietary metabarcoding into ecological networks. *Methods in Ecology and Evolution*, 13, 545–559.

da Silva, L.P., Mata, V.A., Lopes, P.B., Pereira, P., Jarman, S.N., Lopes, R.J. & Beja, P. (2019) Advancing the integration of multi-marker metabarcoding data in dietary analysis of trophic generalists. *Molecular Ecology Resources*, 19, 1420–1432.

Eggleton, P. (2020) The state of the world's insects. *Annual Review of Environment and Resources*, 45, 61–82.

Fortes, L. (2021) *Levantamento da Araneofauna das ilhas desertas (Santa Luzia e Raso) de Cabo Verde*. Bachelor Thesis in Biological Sciences. Technical University of the Atlantic, Mindelo, Cabo Verde, 50 pp.

Illumina (2013) *16S Metagenomic Sequencing Library Preparation*. Available from: https://support.illumina.com/documents/documentation/chemistry_documentation/16s/16s-metagenomic-library-prep-guide-15044223-b.pdf

Jowers, M.J. & Caut, S. (2021) A new record of the orb spider *Argiope sector* (Araneidae) for the island of Santa Luzia, Cabo Verde. *Zoologia Caboverdiana*, 9, 37–39.

Krehenwinkel, H., Kennedy, S., Pekár, S. & Gillespie, R.G. (2017) A cost-efficient and simple protocol to enrich prey DNA from extractions of predatory arthropods for large-scale gut content analysis by Illumina sequencing. *Methods in Ecology and Evolution*, 8, 126–134.

Michalko, R., Pekár, S. & Entling, M.H. (2019) An updated perspective on spiders as generalist predators in biological control. *Oecologia*, 189, 21–36.

Pinho, C.J., Darwish, M., Šmíd, J., Carranza, S. & Vasconcelos, R. (2023) Green matters: Dietary assessment of a reptile community using DNA metabarcoding. *Global Ecology and Conservation*, 47, e02667.

Pinho, C.J., Santos, B., Mata, V.A., Seguro, M., Romeiras, M.M., Lopes, R.J. & Vasconcelos, R. (2018) What is the giant wall gecko having for dinner? Conservation genetics for guiding reserve management in Cabo Verde. *Genes*, 9, 599.

Sambrook, J., Fritsch, E.F. & Maniatis, T. (1989) *Molecular cloning: a laboratory manual*, Cold spring harbor laboratory press.

Santos, B., Pinho, C.J., Štáhlavský, F., Mata, V.A., Lopes, R.J. & Vasconcelos, R. (2022) Diet study of geckos reveals the first records of pseudoscorpions on Desertas Islands (Cabo Verde). *The Journal of Arachnology*, 50, 39–42, 34.

Zeale, M.R.K., Butlin, R.K., Barker, G.L.A., Lees, D.C. & Jones, G. (2011) Taxon-specific PCR for DNA barcoding arthropod prey in bat faeces. *Molecular Ecology Resources*, 11, 236–244.

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Nota breve | Short note

First breeding record of white-tailed tropicbird *Phaethon lepturus* in Cabo Verde

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Cima is a small islet located approximately five nautical miles northeast of the island of Brava in Cabo Verde and is part of the Rombo's Natural Integral Reserve (Anonymous 2003). The Rombo islets are an Important Bird Area with currently five regular breeding seabird species, including red-billed tropicbird *Phaethon aethereus* L., 1758 (Hazevoet 2001, Semedo *et al.* 2020, Lopes *et al.* 2021). So far, there were only two records of (non-breeding) white-tailed tropicbirds *P. lepturus* (Daudin, 1802) in Cabo Verde, i.e. on the islands of Boavista in 1999 and Santiago in 2011 (Hazevoet 1999; Hazevoet 2012). Earlier, because of a number of pelagic records not far from Cabo Verde, Hazevoet (1995) had pointed out the potential vagrancy of white-tailed tropicbird to the islands.

Adult white-tailed tropicbird has an overall white plumage with long white tail-streamers, a black diagonal stripe on the inner wings, black outer primaries, white head and underparts with a black outer eye-line from lore to ear-coverts, a bright orange-yellow pointed bill, dark brown eyes, and dark grey feet and legs (Del Hoyo 1992; Lee & Walsh-McGee 2020). Six subspecies are currently recognized, of which two breed across the Atlantic: *P. lepturus ascensionis* on Fernando de Noronha, Ascension, and the Gulf of Guinea islands, and *P. lepturus catesbyi*, in Bermuda, the West Indies, Gulf of Mexico and U.S.A. (Lee & Walsh-McGee 2020). In both subspecies, the predominant morph is white, but white birds with golden streamers and birds with golden morphs also occur (Le Corre & Jouventin 1999).

A team of 2-3 technicians of Projecto Vitó first observed a white-tailed tropicbird with a golden coloration on Cima Islet in July 2020 (Fig. 1A) during the regular monitoring of the red-billed tropicbird. The white-tailed tropicbirds were flying over the same area. On August 4, 2020, we found two adults with an egg in a burrow, but it was abandoned before hatching. Before the hatching failure, we ringed one adult (7502929) and measured both (Fig. 1B). In January 2021, November 2022, and May 2023, we regularly observed the species at the same place (Fig. 1C), flying over the nest-site and attempting to land on the ground. On February 13, 2024, we found a nest with an adult (Fig. 1D) and a chick which, in addition to down, had covering feathers, both on the head and body, and growing primary and secondary feathers. To minimize disturbance, only videos and photos were taken for species identification and study of plumage variability. On March 2, 2024, we ringed the two adults (6500001, 6500002) and on March 4, we ringed the chick (6500003), which fledged two days later.

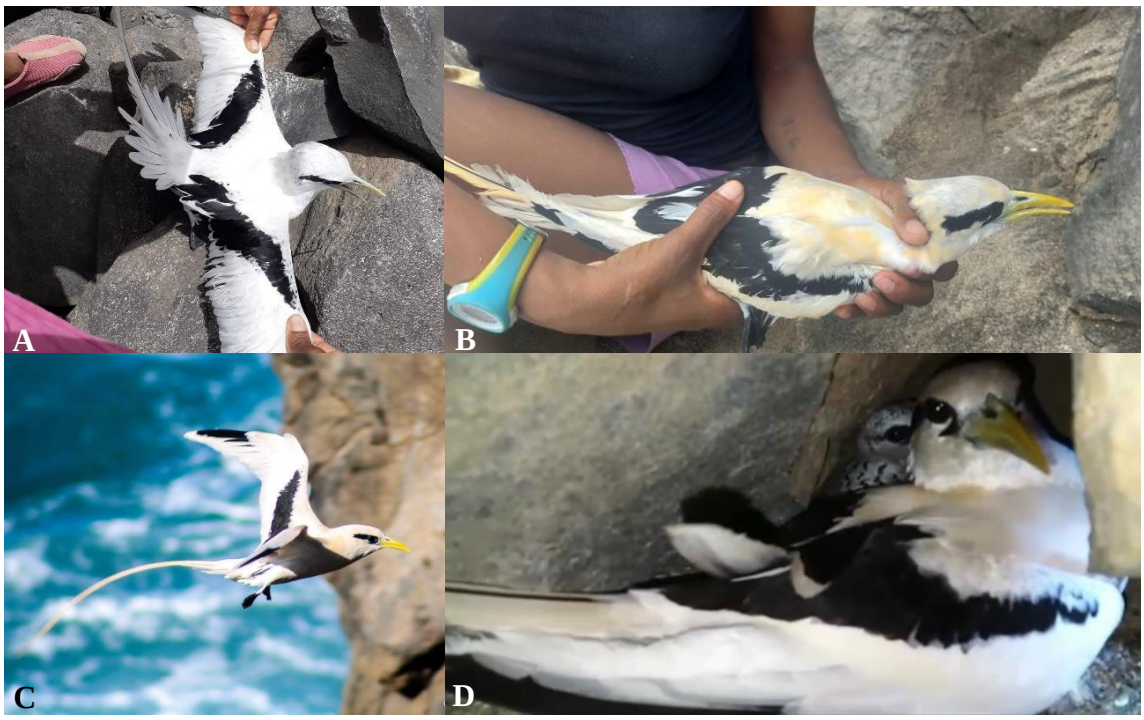

Fig. 1. Sighting and capture of white-tailed tropicbirds *Phaethon lepturus* on Cima Islet. **A)** Capture of a white morph on July 6, 2020 (photo by João Pinto). **B)** Capture of a golden morph on August 4, 2020 (photo by Gilson Montrond). **C)** Sighting of a light golden morph on January 25, 2021 (photo by Jorge Lopes). **D)** Capture of a light golden morph on February 13, 2024 (photo by Cleiton Alves).

Based on the rings and differences in plumage colouration, we concluded that four adults were involved (Fig. 1). The white tips of the primaries (Fig. 1A and 1D) and general plumage colour indicated the subspecies *P. l. ascensionis* (Lee & Walsh-McGee 2020). This finding highlights the importance of the Rombo's Natural Integral Reserve as a key site for seabirds, as well as emphasizing the need to monitor and protect the area.

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REFERENCES

Anonymous (2003) Decreto-Lei Nº 3/2003 de 24 de Fevereiro. *In:* Ministério da Justiça (Ed.), Boletim Oficial da República de Cabo Verde n°5, I série. Ministro do Ambiente, Habitação e Ordenamento do Território, Praia, Cabo Verde, 52–59 pp.

Del Hoyo, J., Elliott, A., Sargatal, J. & Christie, D.A. (1992) *Handbook of the birds of the world* (Vol. 1, No. 8). Lynx Edicions, Barcelona, Spain, pp. 233-234.

Hazevoet, C.J. (1995) *The birds of the Cape Verde Islands*. B.O.U. Check-list No. 13. British Ornithologists' Union, Tring.

Hazevoet, C.J. (1999) Fourth report on birds from the Cape Verde Islands, including notes on conservation and records of 11 taxa new to the archipelago. *Bulletin Zoologisch Museum, University of Amsterdam*, 17, 19–32.

Hazevoet, C.J. (2001) Cape Verde. *In*: Fishpool, L.D.C. & Evans, M.I. (Eds) *Important bird areas in Africa and associated islands: Priority sites for conservation*. Pisces Publications and Birdlife International, U.K., pp. 161–168.

Hazevoet, C.J. (2012) Seventh report on birds from the Cape Verde Islands, including records of nine taxa new to the archipelago. *Zoologia Caboverdiana*, 3, 1–28.

Le Corre, M.L., & Jouventin, P. (1999) Geographical variation in the white-tailed tropicbird *Phaethon lepturus*, with the description of a new subspecies endemic to Europa Island, southern Mozambique Channel. *Ibis*, 141, 233–239.

Lee, D.S. & Walsh-McGee, M. (2020) White-tailed Tropicbird (*Phaethon lepturus*), version 1.0. *In*: Billerman, S.M. (Ed), *Birds of the World*. Cornell Lab of Ornithology, Ithaca, U.S.A. Available from: https://doi.org/10.2173/bow.whttro.01.

Lopes, J.E., González-Solís, J., Gonçalves, A. & Dinis, H.A. (2021) Distribution and habitat use of the birds of Cima Islet (Rombo Islets, Cabo Verde) in winter. *Zoologia Caboverdiana*, 9, 27–36.

Semedo, G., Paiva, V.H., Militão, T., Rodrigues, I., Dinis, H.A., Pereira, J., Matos, D., Ceia, F.R., Almeida, N.M., Geraldes, P., Saldanha, S., Barbosa, N., Hernandez-Montero, M., Fernandes, C., González-Solís, J. & Ramos, J.A. (2020) Distribution, abundance, and on land threats to Cabo Verde seabirds. *Bird Conservation International*, 31, 53–76.

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Vespa parasita de baratas *Evania appendigaster* encontrado na ilha da Boavista, Cabo Verde, Janeiro de 2023 | A cockroach parasite *Evania appendigaster* found on Boavista Island, Cabo Verde, January 2023 (fotografia de | photo by M. García-París)

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