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The coastal ichthyofauna of the Cape Verde Islands: a summary and remarks on endemism

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Keywords: zoogeography, Cape Verde, seamounts, coastal reef fish, paleoendemism

ABSTRACT

The zoogeographic composition of the coastal ichthyofauna of the Cape Verde archipelago shows a predominance of Guinean species, followed by tropical-subtropical (amphi-Atlantic) fishes and several endemic species. Recent taxonomic revisions, new species descriptions, new fish records in the area and recent ecological surveys of intra-specific fish interaction as well as emergent research on seamounts in national waters warrant an up-to-date review of research on the ichthyofauna of Cape Verde. An updated percentage of endemic coastal reef fish of 10.2% attest significant speciation in Cape Verde waters. Almost half of the total cryptobenthic fish species richness in Cape Verde comprises endemic species, some of them newly discovered. Examples of endemism are discussed, notably white seabream *Diplodus sargus lineatus*, bulldog dentex *Dentex* (*Virididentex*) *acromegalus*, blackfish drummer *Girella stuebeli*, Lubbock's chromis *Chromis lubbocki*, Cape Verde damselfish *Similiparma hermani* and Guinean parrotfish *Scarus hoefleri*. Cape Verde diverges considerably from the other Macaronesian island groups in terms of its ichthyofauna and its uniqueness warrants special attention by governmental agencies and conservation organizations.

RESUMO

A composição zoogeográfica da ictiofauna litoral do arquipélago de Cabo Verde apresenta uma predominância de espécies Guineanas, seguidas de peixes tropicais-subtropicais (anfi-Atlânticas), e várias espécies costeiras endémicas. Recentes revisões taxonómicas, descrição de novas espécies, novas ocorrências de espécies na zona e novos estudos ecológicos focando interações intraespecíficas de peixes assim como a investigação emergente dos montes submarinos nas águas de Cabo Verde justificam uma revisão do estado da arte da investicação na ictiofauna cabo-verdiana. Uma percentagem actualizada de peixes costeiros endémicos de ambiente recifal em 10,2% atesta uma especiação significante em águas de Cabo Verde. Quase metade da riqueza total de espécies de peixes criptobêntónicos em Cabo Verde é composta por espécies endémicas, alguns dos quais recém-descobertos. Exemplos de endemismos são discutidos, focando: sargo-branco *Diplodus sargus lineatus*, benteia *Dentex* (*Virididentex*) *acromegalus*, morro *Girella stuebeli*, burrinho *Chromis lubbocki*, pá-mané-de-rabo-branco *Similiparma hermani* e bidião-carnaval *Scarus hoefleri*. Relativamente à ictiofauna, Cabo Verde diverge consideravelmente dos outros grupos de ilhas da Macaronesia e essa singularidade requer especial atenção por parte das autoridades nacionais e organizações de conservação.

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INTRODUCTION

The main factors driving coastal ichthyofaunal composition include regional latitudinal temperature gradients (Ferreira *et al*. 2004, Willig & Bloch 2006), evolutionary patterns (Harrison & Cornell 2008), coastline distance and depth (Floeter *et al*. 2007, Fox & Bellwood 2007) and biogeography (Lloris *et al*. 1991, Floeter *et al*. 2008, Almada *et al*. 2013).

Lloris *et al*. (1991) provided the first summary of the biogeography of the Macaronesian ichthyofauna using an inventory of 913 fish species, including fish data from 'African sites' (Morocco and Western Sahara), and for the first time proposed a hierarchy of biogeographic levels for the studied area. In comparing Cape Verde with other Macaronesian archipelagos, Brito *et al*. (2007) concluded that the zoogeographic composition of its coastal ichthyofauna is mainly tropical, with Afrotropical species clearly dominant, followed by amphi-Atlantic tropical and subtropical species (i.e. taxa distributed on both sides of the Atlantic), and then by Mediterranean and circum-tropical species. Later, Floeter *et al*. (2008) described reef fish biogeography and evolution for all Atlantic 'provinces' and clarified our understanding of how and when areas of endemism of the tropical Atlantic Ocean formed, how they relate to each other and what processes contributed to their faunal composition. However, Lloris *et al*. (1991) were of the opinion that – from an ichthyological point of view – the Macaronesian archipelagos do not constitute a coherent marine biogeographical region and cannot be considered to constitute a 'province'. Spalding *et al*. (2007), in their 62 provinces of marine ecoregions of the world, included the Cape Verde Islands and the Sahelian Upwelling marine ecoregions in the same province of 'West African Transition'. In contrast, the nearby Lusitanian province, an often recognized biogeographical unit, has been considered a warm eastern Atlantic region by Almada *et al*. (2013), who partly evaluated the tropicality index and included Macaronesia (without Cape Verde) in the group.

From the mid 1980s onwards, taxonomic revisions, descriptions of new species and new records of fish in Cape Verde waters have increased significantly (e.g. Edwards 1986, Hensley 1986, Matallanas & Brito 1999, Brito & Miller 2001, Menezes *et al*. 2004, González & Tariche 2009, Wirtz 2009, González *et al*. 2010, Fricke *et al*. 2010, Wirtz & Schliewen 2012, Rocha *et al*. 2012a, Vieira *et al*. 2013, Wirtz *et al*. 2013, Freitas *et al*. 2014). These new data warrant an up-to-date review of the ichthyofauna of the Cape Verde archipelago.

THE CAPE VERDE ISLANDS

The Cape Verde Islands are located in the central East Atlantic, 500-750 km west of Senegal, West Africa. There are 10 islands and eight islets, with a total area of 4,033 km^2 (Duarte & Romeiras 2009). The archipelago was formed by rock accumulation arising from eruptions from a hotspot under submarine platforms (Laborel 1974). The coastline is about 965 km long and the marine shelf (depth < 200 m) covers an area of 5,934 km^2 (Bravo de Laguna 1985, DGMP 1998). The archipelago is situated at the eastern border of the North Atlantic sub-tropical gyre and the southern limit of the Canary Current. The climate in the region is tropical, with two alternating seasons: a moderate (December to June, with an average seawater temperature of 22-23ºC) and a warm (July to November, 26-27ºC) (Almada 1993).

Hermatypic corals are widespread in Cape Verde rocky coastal areas (van der Land 1993), and pavements of *Siderastrea radians* (hard coral) are very common in shallow waters (Moses *et al.* 2003). The seawater temperature gradient, which is affected by the cold Canary Current, does not allow the formation of true 'coral reefs' in the tropical Cape Verde archipelago (Laborel 1974). Thus, coral reefs in Cape Verde in fact consist of several reef organisms (i.e. sponges, corals and algae) that grow on hard substrata formed by the deposition of dead coral, coralline calcareous algae and other organisms, mainly above volcanic material (van der Land 1993). Consequently, the appropriately named 'coralline community' in Cape Verde (Almeida *et al.* 2007) is mostly based on a complex environmental framework of deposits (carbonates/corals plus biota). According to van der Land (1993), this community appears to be of minor importance in the coastal ecosystems of Cape Verde, which have a predominantly tropical character with some subtropical elements. Wirtz *et al*. (2013) categorised 'coastal fish' as fish found in the first 60 m of depth from the shoreline, implying a rather vague boundary. The term 'reef fish' is applied here to coastal fishes living and feeding in coralline communities.

RESEARCH ON THE COASTAL ICHTHYOFAUNA

In an all-inclusive catalogue of the fishes of the Cape Verde Islands, Reiner (1996) listed 520 species, an important publication with meritorious data on Cape Verde fishes, but also including many erroneous records. Some older studies (e.g. Franca & Vasconcelos 1962) as well as more recent ones (e.g. Thorteinsson *et al*. 1995, Oddsson & Monteiro 1998, Menezes *et al*. 2004, González & Tariche 2009) investigated and evaluated the composition of the ichthyofauna of the Cape Verde Islands. Some recent studies were published as illustrated books and checklists, employing different zoogeographical approaches (e.g. Reiner 2005, Brito *et al*. 2007).

In particular, recent researches on the African hind *Cephalopholis taeniops* (Serranidae), one of the most important commercial demersal species caught in Cape Verde, have increased. Tariche *et al*. (2002) investigated the biology of the species and presented a preliminary stock assessment for the northern Cape Verde Islands. Medina *et al*. (2008) studied habitat fragmentation and average body-shape variation by canonical multivariate models and demonstrated that fish in the northern islands of Santo Antão, São Vicente and Santa Luzia and the eastern island of Boa Vista showed a similar direction in shape ontogeny, contrasting with Fogo Island, the southernmost locality. Lino *et al*. (2011) performed a preliminary acoustic telemetric study on artificial reefs off Sal Island using implanted underwater acoustic transmitters in four *C. taeniops* specimens monitored during 63 days, demonstrating site fidelity with no migrations to the nearby natural reef. Costa (2014) recently analyzed the reproductive biology of *C. taeniops*, focusing on reproductive seasonality, gonadal development and sex change, and concluded that multiple spawning occurs from April to October, while the species was considered diandric protogynous hermaphrodite, with primary and secondary males.

Using SCUBA and stationary visual census methods, Monteiro *et al*. (2008) compiled a check-list of 53 fish species of 27 families (including data on biogeography, habitat, egg type, diet, conservation and fisheries status) at two seamounts in the Cape Verde archipelago, the Northwest Bank and João Valente Bank, and suggested that the upper part of these seamounts may act both as attraction points and as 'stepping-stones' for the dispersal of coastal species.

Fricke *et al*. (2010) described a new clingfish (Gobiesocidae) from Cape Verde, probably endemic to the archipelago, as *Apletodon barbatus*. More recently, Wirtz & Schliewen (2012) described a new species of serranid perch as *Liopropoma emanueli*, not endemic to Cape Verde (cf. Wirtz 2014), while Rocha *et al*. (2012a) recognized *Sparisoma choati* as a new Atlantic parrotfish from the West African-Guinean region. In the past, *S. choati* has been mistaken in Cape Verde and Senegal for Caribbean *S. rubripinne* (cf. Randall 1981, Reiner 1996, Brito *et al*. 1999, Santos *et al*. 2012). Feeding ecology and morphometric relationships of a 'relic' species (Summerer *et al*. 2001) of white seabream, *Diplodus sargus lineatus*, endemic to the Cape Verde archipelago, were studied by Soares *et al*. (2012), who considered it a generalist and moderately opportunistic omnivorous (but predominantly herbivorous) species with a preference for red algae. Freitas *et al*. (2014) reviewed dispersal in Brazilian reef fishes and reported the occurrence of western Atlantic Agassiz's parrotfish *Sparisoma frondosum* in Cape Verde, suggesting that the North Equatorial counter-current should receive more attention as a potential dispersal route for marine organisms crossing the Atlantic in a west to east direction.

A SCUBA survey of the reef fish and benthic community structure of Santa Luzia Marine Reserve in Cape Verde was carried out in 2009-2010 and some of the results were summarized by Freitas (2012). Parallel to this survey, an investigation of cleaning mutualism, the prevalence of multi-specific reef fish cleaning stations and three new records of facultative cleaner fish species in Santa Luzia Island were reported by Quimbayo *et al*. (2012).

Employing the same SCUBA routines as mentioned above, Carvalho (2014) used remote video and introduced a new approach in Cape Verde, quantifying and comparing feeding rates of a reef fish community in order to identify the main contributing species on the coralline benthos across depth and exposure.

Ramos *et al*. (2011) performed a stakeholder perceptions study of the decision making process for marine biodiversity conservation off Sal Island, suggesting that limiting activities was the preferred management option to be considered in the future. Linked with this study, Santos *et al*. (2012) carried out a comparative study on the fish assemblages of natural and artificial reefs off Sal in light of the increase in diving ecotourism in Cape Verde.

A long-line bottom fishery survey (using 20 long-line sets up to 1,200 m depth) caught 97 demersal species from 49 families, including 12 species new for Cape Verde (Menezes *et al*. 2004). Pereira *et al*. (2012) presented weight-length relationship data for 27 demersal fish species, based on the long-line fishery data of Menezes *et al*. (2004). Oliveira *et al.* (2014) provided weight-length and length-length relationship data of 29 species from Cape Verde. González *et al*. (2010) reviewed Moridae (Gadiformes) from the archipelago, using data from several deep-sea fisheries surveys (González & Tariche 2009) and reported the first record for Cape Verde of the benthonic species *Physiculus cyanostrophus,* collected off northern Santiago Island.

RATE OF ENDEMISM AND FUNCTIONAL CATEGORIES

The most recent validated check-list of coastal fish from the Cape Verde Islands (Wirtz *et al*. 2013) includes 24 new records and lists a total of 315 fish species, of which 88% are Teleostei (bony fish) and the remainder Elasmobranchii (sharks, rays and skates). At the species level, 20 of these (6.3%) appear to be endemic to the archipelago, mostly reef-associated species. Wirtz *et al*. (2013) also included *ca.* 110 species the identification of which is doubtful or in need of confirmation, as well as definitely invalid records from the older literature. An alternative interpretation of this list was performed in which 105 species (33%) were rejected for being oceanic-pelagic and/or bottom-deep-water species. A renewed analysis of the data employed by Wirtz *et al.* (2013) showed a more realistic rate of endemism of 10.2% for the Cape Verdean coastal ichthyofauna. In this new analysis, reef-associated elasmobranchs (25 species) are mostly represented by Carcharhinidae, Dasyatidae and Myliobatidae. Teleost fishes of six families (morays, gobiids, carangids, seabreams, damselfishes and wrasses) comprise 31% of reef fish diversity in Cape Verde, with the number of species per family ranging from 7 to 15. The new analysis of 185 coastal osteichthyes comprised 61 families and a total of 135 genera, dominated by morays (*Gymnothorax* and *Muraena*, with six and four species respectively), followed by damselfish *Abudefduf* and seabreams *Diplodus*, with four species each, five genera with three species (e.g. gobies *Didogobius* and parrotfish *Sparisoma*), 26 genera with two species and 100 genera with only a single representant. Ichthyogeographically, coastal bony fish species of Cape Verde are dominated by amphi-Atlantic (40%), tropical West African and eastern Atlantic (both 22%), and Macaronesian (5.4%) taxa.

Based on a new approach towards the analysis of functional diversity of Atlantic reef fish communities (Halpern & Floeter 2008), Cape Verde coastal fishes can be grouped as follows: median to small fish (with a length of 10-50 cm) comprise 50% of the total, small fish (< 10 cm) comprise 14% and large fish (> 50cm) comprise 36%. Of 13 dietary groupings, a little over 25% consisted of macro-carnivores and another 25% concerned benthic invertivores or cleaners, 13% of omnivores, 7% of piscivores, 7% of coral/colonial sessile invertivores and around 20% were combined in eight functional groupings (e.g. planktivores 6.5%, sand invertivores, scrapers, macroalgae browsers, territorial algae/detritus feeders and three others).

Floeter *et al*. (2008) calculated the endemism rate of reef fishes of oceanic islands of the Atlantic Ocean and rated Cape Verde with 8.3% of 207 species. The newly obtained value of 10.2% places Cape Verde between St Peter and St Paul Rocks (9.3%) and Ascension Island (11.0%), both isolated islands with less than 100 species recorded. However, a recent survey (Wirtz *et al*. 2014) considered Ascension to have 132 coastal fish species, of which 11 (8.3%) appear to be endemic, while 16 species (12.1%) appear to be shared endemics with St Helena Island.

REEF FISH ENDEMISM

Wirtz *et al*. (2013) found that species endemic to Cape Verde were on average smaller than non-endemics, presumably because large fish can better pass oceanic barriers. The presence of 20+ endemic taxa (Brito *et al.* 2007, Wirtz *et al*. 2013) suggests speciation in Cape Verde waters, which is further supported by the occurrence of the endemic 'monotypic subgenus' *Virididentex* (Sparidae) (Poll 1971; Fig. 1B). A high degree of coastal endemism is also found in small cryptobenthic fishes (Fig. 2) of the family Blenniidae, as well as in Labrisomidae and Gobiidae. Furthermore, two additional small cryptic species of *Malacoctenus* (Labrisomidae) and *Didogobius* (Gobiidae) are currently under description (cf. Wirtz *et al*. 2013). Almost half of the total small cryptobenthic species richness of Cape Verde is comprised of endemics recently discovered and described (e.g. three Blenniidae in the early 1990s, one by Wirtz & Bath 1989 and two by Bath 1990a, b and two Gobiidae by Brito & Miller 2001), some of which have arisen from recent colonization events (Rocha *et al*. 2005).

A phylogenetic analysis of *Diplodus* spp. based on 461 bp of the D-loop (Summerer *et al*. 2001), positioned the Cape Verde endemic *D. sargus lineatus* (Fig. 1E) as the sister taxon of the remainder of the *D. sargus* assemblage, showing *D. sargus sensu lato* to be paraphyletic, with *D. sargus lineatus* not being closely related to other *D. sargus* ssp. Summerer *et al.* (2001) suggested that the diversification and spread of the *D. sargus* assemblage to other Atlantic provinces originated in the tropical eastern Atlantic. Sparid fishes represent one of the major radiations of predominantly temperate to tropical benthic fishes (Santini *et al*. 2014). This is consistent with the presence of four diplodid sparids (seabreams) in Cape Verde waters, of which three are endemic species (Bauchot *et al*. 1981, Bauchot & Hureau 1990), probably the result of a relatively rapid diversification event (De la Paz *et al*. 1973). Summerer *et al*. (2001) suggested that all of these taxa should either be classified as subspecies of *D. sargus* or that *D. sargus lineatus* should be given specific rank as *D. lineatus.*

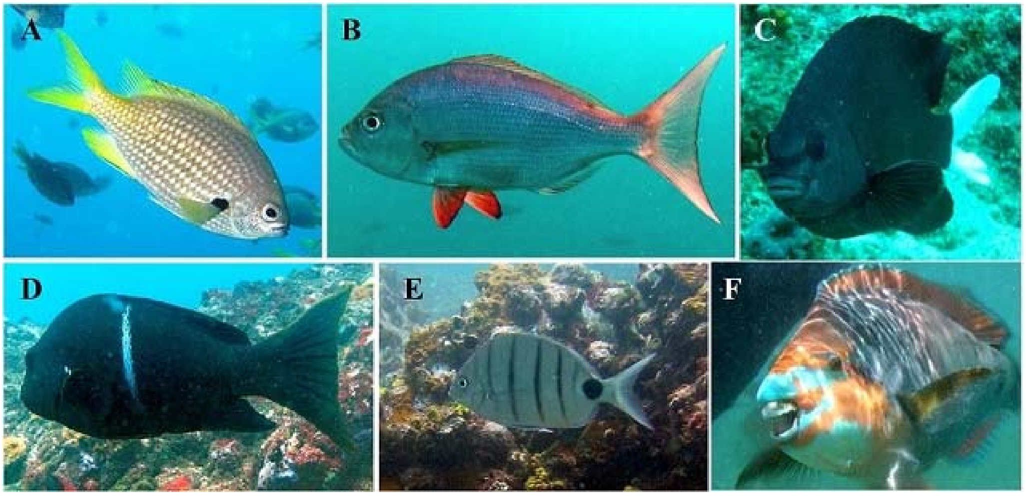

Fig. 1. Endemic Cape Verde reef fish. (**A**) Lubbock's chromis *Chromis lubbocki*; (**B**) Bulldog dentex *Dentex (Virididentex) acromegalus*; (**C**) Cape damsel *Similiparma hermani*; (**D**) Blackfish drummer *Girella stuebeli*; (**E**) White seabream *Diplodus sargus lineatus*; (**F**) Guinean parrotfish *Scarus hoefleri*. Photos by Sergio R. Floeter, Rui Freitas & Carlos Rangel.

The endemic sparid *Virididentex* (Fig. 1B), originally described as *Dentex acromegalus* by Osório (1911), was coined as a monotypic subgenus by Poll (1971). Apparently, both of these authors considered the bulldog dentex from Cape Verde to be closely related to the common dentex *Dentex dentex* (L.) from the eastern Atlantic. Subsequently, *Virididentex* was elevated (without further comment) to generic rank by Bauchot *et al*. (1981) and has since been commonly applied as such (e.g. Bauchot & Hureau 1990, Santini *et al.* 2014; also various FAO sheets and Clofeta checklists). Santini *et al*. (2014) listed *V. acromegalus* as a benthopelagic non-durophagous species, with a trophic index of 4.2, and placed it in a group consisting of various northeastern Atlantic and Mediterranean sparids.

The herbivorous species *Girella* (Kyphosidae, Girellinae) shows a disjunct distribution, which indicates either extinction in the western Atlantic or recent colonization of the eastern Atlantic from the Indian Ocean (Floeter *et al*. 2008). Therefore, this local kyphosid macroalgal browser (*Girella stuebeli*, Fig. 1D), which tends to bite or graze the algae, leaving the basal stem (Halpern & Floeter 2008, R. Freitas pers. obs.), has been hypothesized to be a paleoendemic in the Atlantic Ocean with origins in the Tethys Sea (Rocha *et al*. 2005, Brito *et al.* 2007) and, as the sole Atlantic *Girella*, is endemic to the Cape Verde archipelago (Desoutter 1990). Records of *G. zonata* in the Cape Verde region and adjacent areas are considered doubtful (cf. Brito *et al.* 2007, Wirtz *et al.* 2013).

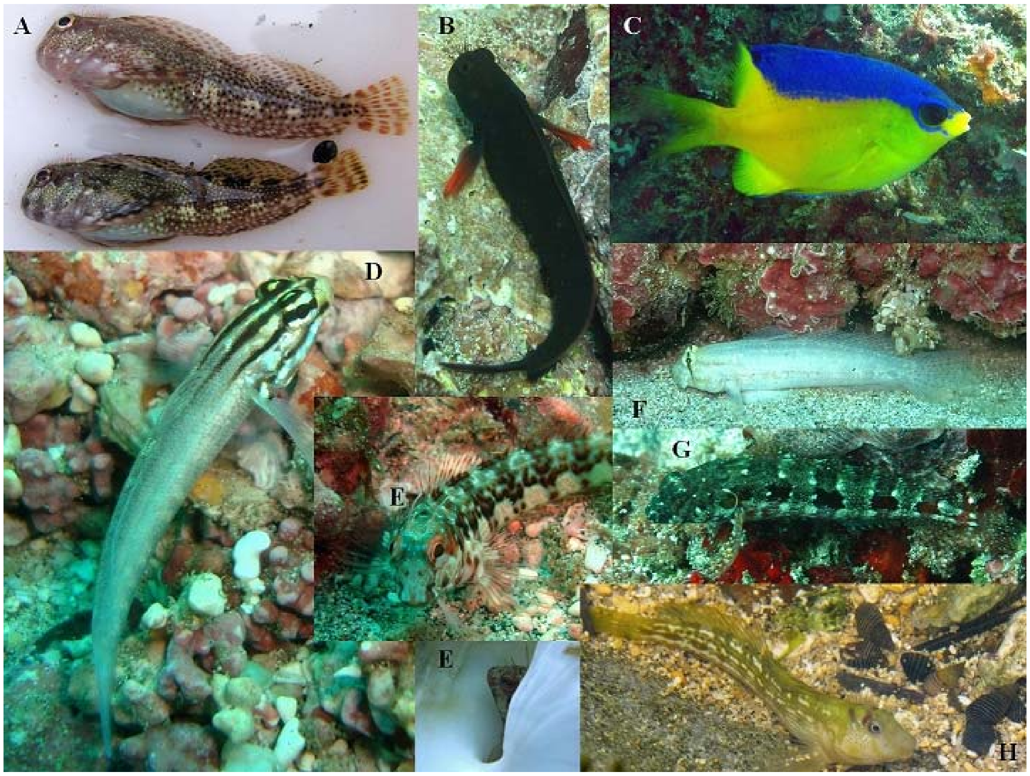

Fig. 2. Some (partially) endemic cryptobenthonic fish from the Cape Verde Islands: (**A**) *Scartella caboverdiana* (endemic blenniid); (**B**) *Ophioblennius atlanticus* (amphi-Atlantic blenniid); (**C**) juvenile *Similiparma hermani* (endemic, not a cryptic species); (**D**) *Gobius tetrophthalmus* (endemic gobiid); (**E**) *Parablennius salensis* (endemic blenniid); (**F**) *Gnatholepis thompsoni* (amphi-Atlantic gobiid); (**G**) *Labrisomus nuchipinnis* (amphi-Atlantic labrisomid); and (**H**) adult *Microlipophrys caboverdensis* (endemic blenniid). Photos by A. Boyra, Sergio R. Floeter, Rui Freitas & Carlos Rangel.

The endemic damselfish *Similiparma hermani* (Fig. 1C) was described by Steindachner (1887) as *Glyphidodon hermani*. Hensley (1986) showed that *Glyphidodon* Agassiz, 1846 is an unjustified emendation of spelling and therefore a junior objective synonym of *Glyphisodon* Lacépède, 1802, which in turn is a synonym of *Abudefduf* Forsskål, 1775, and coined *Similiparma* as a replacement name for *Glyphidodon*. *S. hermani* is considered a paleoendemic, whose nearest relatives are mainly found in the southwestern Pacific (Rocha *et al*. 2005). Cooper *et al*. (2009) found *Abudefduf luridus* from the eastern Atlantic to fall outside *Abudefduf sensu stricto* and recovered it as the sister taxon of *S. hermani*. Subsequently, Cooper *et al.* (2014) reassigned it as *Similiparma lurida*. Both taxa are similar in ecology and are members of a subclade that also includes the genera *Microspathodon* and

Hypsypops. *A. luridus* is the only pomacentrid known to occur throughout Macaronesia (Lloris *et al*. 1991). As the juvenile stages are similar in shape and color pattern, *Similiparma hermani* (Fig. 2C) has sometimes been confused with the Beaugregory damselfish *Stegastes leucostictus* of the western Atlantic (e.g. Debelius 1997).

Parrotfish (Scarines *sensu* Westneat & Alfaro 2005) are considered the dominant consumers of benthic primary production on reefs. These corallivorous excavating fishes play a major role in reef dynamics and sedimentation while rasping algal communities (e.g. Bellwood & Choat 1990, Bernardi *et al*. 2000, Comeros-Raynal *et al*. 2012, Bonaldo *et al.* 2014). According to Choat *et al*. (2012), the Guinean parrotfish *Scarus hoefleri* (Fig. 1E) is 'basal' in the tropical Atlantic clade and the sole *Scarus* species that ranges from Mauritania to Congo (Wirtz *et al*. 2007). It is very common in the archipelagos of Cape Verde and São Tomé (Rocha *et al*. 2012b) and is considered endemic to the West African-Guinean region. A notable feature in the distribution of the allopatric sister species *S. hoefleri* (eastern Atlantic) and *S. perrico* (eastern Pacific), which have a mean divergence age of 3.4 Mya (Choat *et al.* 2012), is that the closure of the Isthmus of Panama resulted in distinct regional endemism of *Scarus* parrotfish. *S. hoefleri* inhabits shallow/ coastal rocky reefs areas from 3-30m, feeds mainly on algae and is found as solitary males or in small groups with female harems (Randall 1990, Rocha *et al*. 2012b). Because of its relatively large size and colour, but not because of its market value, adult males are intensively targeted by spearfishing in Cape Verde. Coral reef loss, fisheries and declining habitat conditions are threatening this iconic group (Comeros-Raynal *et al*. 2012). Bonaldo *et al*. (2014) presented suggestions for future directions in parrotfish research.

SENGHOR SEAMOUNT

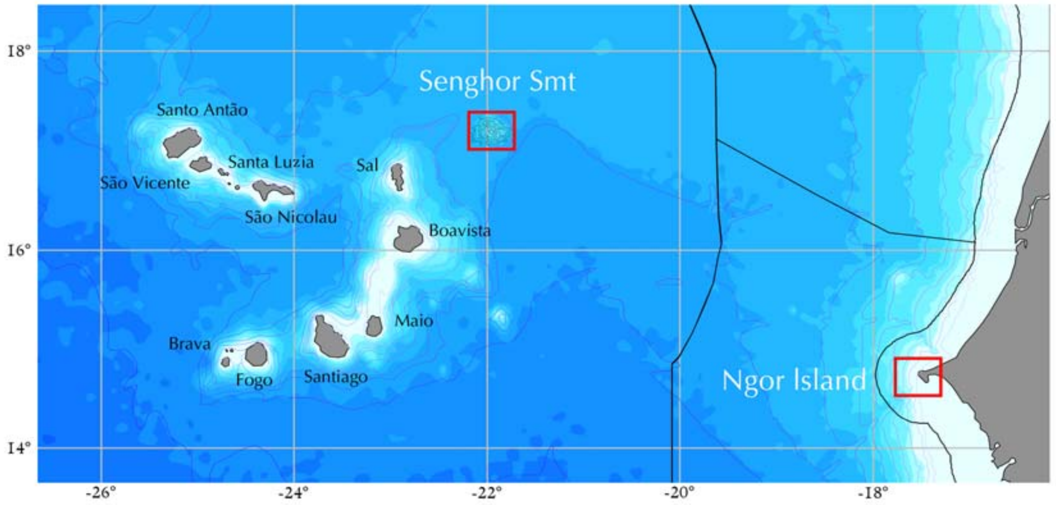

Fig. 3. Map of the Cape Verde Islands, showing the position of Senghor Seamount and Ngor Island, Senegal. Partial borders of the Exclusive Economic Zones (EEZ) of Cape Verde and adjacent countries are indicated (after Christiansen 2012).

Based on collections from trawl- and neuston net stations within the Cape Verde archipelago, John & Hanel (2008) studied the larval development of the Cape Verde damselfish *Chromis lubbocki* (Fig. 1A) and also suggested the occurrence of *Chromis cyanea* in Cape Verdean waters. Using complementary data of IKMT (Isaacs-Kidd Mid-water Trawl) and multi-net hauls from Cape Verde waters, five specimens of *C. lubbocki* and two *C.* cf. *cyanea* were identified (John & Hanel 2008). More recently, Hanel *et al*. (2010) expanded on these data and focused on larval fish abundance, composition and distribution at the Senghor Seamount, northeast of the Cape Verde archipelago. So far, the data suggest that the fish community at this location is diverse (IKMT captured 68 specimens of 37 species) and is mainly comprised of larvae of meso- and bathypelagic species.

Senghor Seamount, which lies within the Cape Verde Frontal Zone (CVFZ) and in the pathway of the south-westward North Equatorial Current, rises from a depth of 3,000 m, with its summit reaching to 93 m beneath sea level (Fig. 3). It is typical of several seamounts in the tropical northeastern Atlantic (Hanel *et al*. 2010). Senghor Seamount plays an important role in regional fisheries and information on larval abundance would help in determining the extent and health of these fishing grounds. Other shallow Cape Verdean seamounts, such as the Northwest Bank and João Valente Bank also deserve to be more intensively studied.

Oceanographic considerations (Wirtz *et al.* 2013) and the short distance (*ca.* 549 km) between Senghor Seamount and NGor Island, near Dakar, Senegal (Fig. 3), combined with the south-easterly direction of the Canary Current during the weak upwelling season, may possibly explain the occurrence of *Chromis* sp. outside the Cape Verde archipelago through rafting or larval dispersal. The recent observation of *Chromis lubbocki* at NGor Island may concern a hybrid pomacentrid, a stray individual or a genuine dispersal event (Wirtz 2012). *Chromis lubbocki* is a small planktivorous endemic species, occurring in large schools in Cape Verde seas, with high densities mainly in coastal areas with strong currents, e.g. off Santa Luzia (Freitas 2012). Although more evidence is needed, this could be the first example of dispersal by an endemic reef fish from the Cape Verde archipelago.

FINAL REMARKS

Other endemic coastal fishes of Cape Verde that have not yet been mentioned include skate *Raja herwigi* (Rajidae), mullet *Chelon bispinosus* (Mugilidae), needlefish *Platybelone argalus lovii* (Belonidae), possibly grunt *Parapristipoma humile* (Haemulidae), seabreams *Diplodus fasciatus* and *Diplodus prayensis* (Sparidae), sole *Pegusa cadenati* (Soleidae), *Gobius ateriformis* and *Mauligobius nigri* (Gobiidae; three small cryptic endemic species, such as the clingfish *Apletodon barbatus*, are not included in Fig. 2). Excluding the pelagic and deep water species from the reef fish, a percentage of endemic coastal reef fish of 10.2% is calculated, emphasizing the need for a differential approach.

Medina *et al*. (2007) proposed that reef fish communities of insular ecosystems are structured by island or island group according to their degree of physical isolation and environmental variability. Pérez-Ruzafa *et al*. (2005) suggested that, within the spatial scales between islands found in the Cape Verde archipelago, habitat characteristics are no longer relevant and other factors, such as biological productivity or seawater temperature, are important. However, Floeter *et al*. (2008) proposed that the high endemism of the Cape Verde Islands may be related to isolation (from West Africa and/or between islands), high heterogeneity of habitats and maintenance of warm tropical waters during glacial periods. Cape Verde has high sparid endemism, attributed to multiple radiations by populations with different trophic ecologies (Santini *et al*. 2014).

González & Tariche (2009) presented baseline data for the sustainable management of marine biodiversity in the Cape Verde archipelago, together with checklists of fish for potential new deep-sea fisheries. Recent oceanographic surveys that have been conducted in the region strongly suggest that validated check-list methodologies (such as those of Wirtz *et al*. 2007, 2013, 2014) should also be applied to the deep sea fishes of the Cape Verde Islands. Meanwhile, listing doubtful species or those in need of confirmation (e.g. Wirtz *et al*. 2013) may not be the best solution, since it can easily create misunderstandings. Indeed, it was one of the reasons why this approach has been criticized.

Only low levels of endemism exist in Macaronesia as a whole, which is probably related to the distance between these archipelagos and mainland Africa and Europe (Almada *et al*. 2013). The Cape Verde Islands have a much higher degree of coastal fish endemism than the other Macaronesian archipelagos (i.e. the Azores, Madeira, Salvage and Canary Islands) and, in terms of the number of endemic taxa, Cape Verde is more similar to the islands in the Gulf of Guinea than to the Northwest African coast (Wirtz *et al*. 2013). From the point of view of marine biota community structure and ichthyo-geography, Cape Verde diverges considerably from the other Macaronesian islands (Brito *et al*. 1999, 2007, Morri *et al*. 2000, Floeter *et al*. 2008) and inclusion of the Cape Verde Islands in a marine biogeographic 'Macaronesian' unit does not hold (Wirtz *et al*. 2013).

As reef fish in Cape Verde have only recently been more intensively studied, newly recorded species likely resulted from more research being carried out rather than being an indicator of recent biological events. New discoveries are still to be expected and, based on reef fish endemism and zoogeography, Cape Verde may perhaps be designated a distinct Atlantic biogeographic province in its own right in the future.

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First report of *Culex (Culex) tritaeniorhynchus* Giles, 1901 (Diptera: Culicidae) in the Cape Verde Islands

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Keywords: Culicidae, *Culex tritaeniorhynchus*, Cape Verde Islands, first occurrence.

ABSTRACT

During an entomological survey in Santiago Island, Cape Verde Islands, in November-December 2011 in order to study the bio-ecology and susceptibility to insecticides of *Anopheles arabiensis* Patton, 1905, *Culex tritaeniorhynchus* Giles, 1901 was found to be present in the Santa Cruz District. Both adult and immature specimens were collected and a description of both is given. Further confirmation of the taxonomic identity of the specimens was obtained from studying the male genitalia. This is the first known occurrence of *Culex tritaeniorhynchus* (a primary vector of Japanese encephalitis in eastern and southern Asia and a potential vector of West Nile Virus, Sindbis and Rift Valley Fever Virus) in the Cape Verde Islands.

RESUMO

Durante um levantamento entomológico realizado na ilha de Santiago, arquipélago de Cabo Verde, em Novembro-Dezembro de 2011, com o objectivo de estudar a bioecologia e susceptibilidade de *Anopheles arabiensis* Paton, 1905, foi encontrado *Culex triteaniorhynchus* Giles, 1901, no Concelho de Santa Cruz. Foram recolhidos, identificados e descritos espécimes quer no estado adulto quer na forma do quarto estadio larvar. A identificação taxonómica foi posteriormente confirmada através do estudo da genitália de machos. Relata-se pela primeira vez, nas ilhas de Cabo Verde, a ocorrência de *Culex triteaniorhynchus,* vector primário do vírus da Encefalite Japonesa na Ásia Oriental e do Sul e vector potencial dos seguintes vírus: o da febre do Nilo Ocidental, Sindbis e febre do Vale do Rift.

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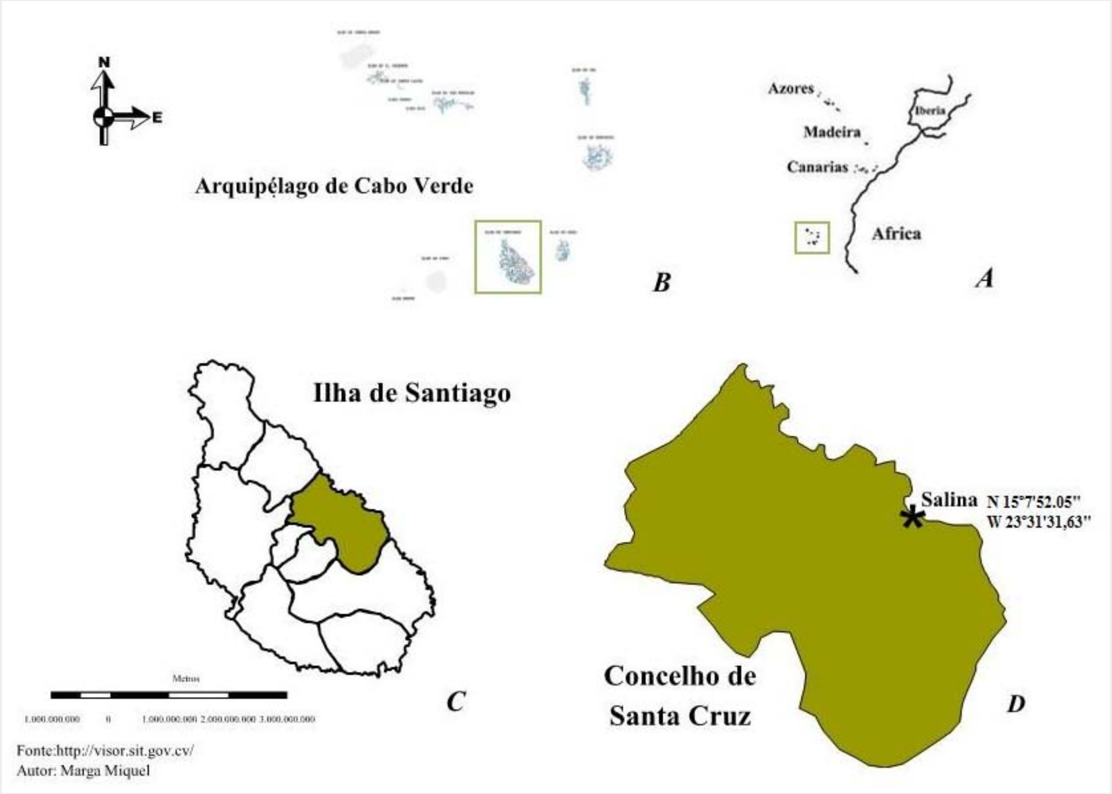
INTRODUCTION

Updating knowledge of the culicidean fauna of the Cape Verde Islands has been a priority for many years (e.g. Ribeiro *et al.* 1980, Cambournac *et al*. 1982, Alves *et al*. 2010). During an entomological survey, conducted between November and December 2011, in order to study the bio-ecology and susceptibility to insecticides of *Anopheles arabiensis* Patton, 1905 in Santiago Island, *Culex (Culex) tritaeniorhynchus* Giles, 1901 was found to be present in the Santa Cruz district (Fig. 1). We describe the site and provide descriptions of both adult and larval stages.



Fonte:http://visor.sit.gov.cv/
Autor: Marga Miquel

Fig. 1. Maps of Santiago Island and the Santa Cruz district, indicating (*) the locality where specimens of *Culex tritaeniorhynchus* were found.

The habitat consisted of a natural basin of rain water drainage in a confluent zone between a lagoon and a beach in a coastal region (Fig. 2). The breeding site was exposed to sunlight, characterized by the presence of emergent and fluctuant aquatic vegetation and the water was slightly brackish, but within the limits of being considered freshwater. So far, only *Culex ethiopicus* Edwards, 1912 had been found breeding at this and similar sites in the area. *Culex tritaeniorhynchus* is considered a primary vector of Japanese encephalitis in eastern and southern Asia (van den Hurk *et al.* 2009). It is also a potential vector of West Nile Virus (WNV), Sindbis and Rift Valley Fever Virus (RVFV) (Wills *et al.* 1985, Kheir *et al*. 2010). The presence of *C. tritaeniorhynchus* in this area underlines the need for further investigations into its significance for public health and epidemiological issues.

MATERIAL AND METHODS

We visited localities in five districts of Santiago Island to collect immature stages of mosquitoes at several breeding sites, including ponds, pools, pits and tanks. Upon collection, all immature mosquitoes were placed in containers and transported to the laboratory, where they were reared until they emerged as adults. In addition, adult mosquitoes were collected with CDC light traps (placed in local people's bedrooms and in sheds for cattle, goats and sheep) and by using pyrethrum spray in human dwellings. After collection, mosquito specimens were sorted, counted and identified morphologically using a stereomicroscope and according to the identification keys provided by Ribeiro & Ramos (1995).

Fig. 2. Partial view of the breeding site of *Culex tritaeniorhynchus*, Santa Cruz district, Santiago Island, Cape Verde Islands, where specimens were collected (photo by Ibrahima Dia; © Joana Alves).

RESULTS

A total of 2,192 mosquito specimens were identified. The distribution by district and capture method is given in Table 1. A large majority of specimens were immatures (94.1%), followed by resting females from human dwellings. Specimens from CDC light traps in bedrooms and sheds were the least abundant (0.4% and 0.1% respectively). From the total of emerged specimens, *Culex* spp. averaged 7%, while in the district of Santa Cruz the average of emerged *Culex* spp. was 27%. In most samples, *Culex* spp. were found in association with *Anopheles gambiae s.l.* Giles, 1902 and *A. pretoriensis* (Theobald, 1903).

While identifying the collected mosquitoes, we found specimens with a median pale ring in the proboscis. Using the key of Ribeiro & Ramos (1995), 136 specimens were identified as *C. tritaeniorhynchus*. The identification of 4th instar larvae confirmed this. Identification was also confirmed by the morphology of the male genitalia (Fig. 3) (cf. Ribeiro 1966, Harbach 1988).

ADULTS Pale ring of female proboscis extending just to the base, absence of low mesepimeral setae, absence of pale scales on femora; scutum dark brown with pale scales almost completely confined to near scutellum; abdominal tergites with basal pale bands; wings without pale disseminated scales.

LARVAE Mentum with well developed teeth; comb of the abdominal segment VIII composed entirely by typical scales without spine or spiniform scales in number between 30-45; syphon light brown to nearly colorless; pecten of the syphon simple at tip; subventral tufts of the syphon smaller than the diameter, usually with 3-4 branches, rarely 2; head setae 5, 3-branched; pre-clipeal spines brawn and strong; anal brush without median tufts.

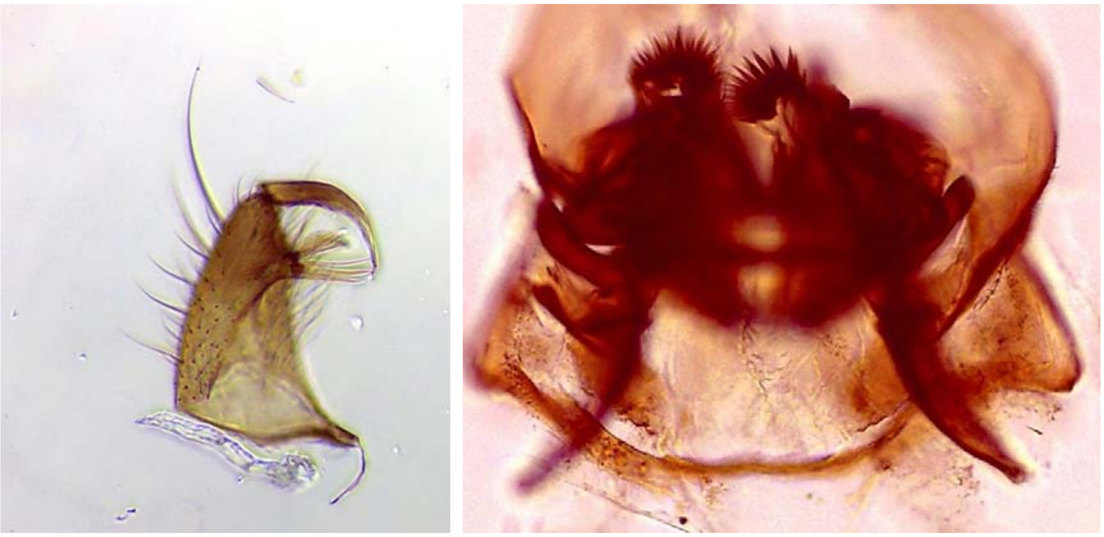


Fig. 3. Left: coxite of male terminalia of *Culex triteaniorhynchus* from Santa Cruz, Santiago, Cape Verde Islands (magnification x1000). Right: Basal parts (frontal view) of the male terminalia of *Culex triteaniorhynchus* from Santa Cruz, Santiago, Cape Verde Islands (magnification x1000).

Species	Collecting method	Praia	Santa Cruz	Santa Catarina	São Miguel	Tarrafal
Anopheles pretoriensis	immature stages	894	241	60	250	30
Anopheles gambiae		12	36	5	45	21
Culex pipiens		21	86	8	15	41
Aedes aegypti		89	0	0	0	43
Culex tigripes		0	4	0	7	5
Culex tritaeniorhynchus		0	136	0	0	0
Culex ethiopicus		0	0	0	3	0
Aedes caspius		0	0	0	10	1
Subtotal		**1016**	**503**	**73**	**330**	**141**
Culex pipiens	spray catches	11	53	0	54	0
Subtotal		**11**	**53**	**0**	**54**	**0**
Culex pipiens	CDC in bedroom	7	1	0	0	0
Subtotal		**7**	**1**	**0**	**0**	**0**
Anopheles pretoriensis	CDC in cowshed	0	0	0	0	2
Culex pipiens		0	0	0	0	1
Subtotal		0	0	0	0	3
TOTAL		**1034**	**557**	**72**	**584**	**144**

Table 1. Distribution of mosquito specimens by collecting method in the five districts of Santiago Island prospected.

DISCUSSION

Culex tritaeniorhyncus, a mosquito with a cosmopolitan distribution, is considered a primary vector of JEV (Flavivirus: Flaviviridae) (Self *et al*. 1973, Takahashi 1977, van den Hurk *et al*. 2009), a disease that mainly affects children in the Asian region, with a lethality rate of around 30% (Nett *et al.* 2009). It is also a vector of WNV (Flavivirus: Flaviviridae), considered an emerging vector-borne disease in some parts of the world due to the increased circulation of people and trade goods as a consequence of globalization, while migratory birds may also play a role (Kanojia & Geevarghese 2004, Medlock *et al*. 2005), as well as SINV (Alfavirus: Togaviridae) and the Rift Valley fever virus (Plebovirus: Bunyaviridae) (Kheir *et al*. 2010). The occurrence of *Culex tritaenyorhynchus* in the Cape Verde Islands prompts the need for focused follow-up investigations in order to evaluate its possible implication in the transmission of vector-borne pathogens in the archipelago. The presence of this species, with its large trophic range (cattle, pigs, birds, humans) (Bram 1967) and as a potential transmitter of Japanese encephalitis, may introduce yet another vector-born emerging disease and calls for close monitoring. Therefore, practical measures for its surveillance and control, including pathogen isolation, must be taken. At the same time, investigations on other arboviruses, such as WNV, Sindbis and Valley Rift fever virus, transmitted by *Culex pipiens pipiens* L., 1758 and *Culex perexiguus* Theobald, 1903 (Jupp *et al*. 1986, Turell *et al.*1996, 2002, Jupp 2001, Orshan *et al*. 2008), species both known to occur in Cape Verde, should not be neglected.

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An abundance estimate for humpback whales *Megaptera novaeangliae* breeding around Boa Vista, Cape Verde Islands

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Keywords: humpback whale, mark-recapture, photo identification, breeding grounds, Cape Verde Islands

ABSTRACT

The abundance of humpback whales occurring around Boa Vista, Cape Verde Islands, was estimated by mark-recapture modelling. Photographs of markings on tail flukes of individual whales were collected during the breeding season. Sighting histories were constructed for each individual and an abundance of 171 animals was estimated using a Jolly-Seber mark-recapture model. Correcting for known biases arising due to sex-specific behaviour and temporary emigration insofar as possible, an estimate of 260 whales was obtained. This is significantly higher than the previous estimate of 99 humpback whales from this region. Due to limited survey effort it is not known how representative the study area is of the entire Cape Verde archipelago and this estimate may be considered to be biased low and serves as a minimum estimate. The high recapture probability (0.37) coupled with the low abundance is consistent with a small local population. The low survival rate (0.86) suggests possible emigration and further studies are needed to assess connectivity between humpback whales breeding in Cape Verde and other breeding locations. The amount of exchange between groups of whales breeding in Cape Verde and adjacent areas remains unknown. It is unclear whether the abundance estimate herein applies to part of an isolated population or part of a larger and continuous one.

RESUMO

Apresenta-se uma estimativa da abundância de baleias-de-bossa na ilha da Boa Vista, Cabo Verde, realizada através de modelação por marcação e recaptura. Durante o período de reprodução, foram fotografadas marcas nas barbatanas caudais de indivíduos, tendo sido também construídos historiais de avistamentos. Aplicando o modelo de marcação e recaptura de Jolly-Seber chegou-se a uma estimativa de 171 baleias-de-bossa. Após correcção, tanto quanto possível, de desvios relacionados com comportamentos sexuais específicos e migração temporária, a estimativa foi alterada para 260 indivíduos. Este valor é consideravelmente maior do que a anterior estimativa para a mesma área, que identifica 99 indivíduos. Sendo os estudos ainda escassos, desconhece-se a representatividade da área de estudo face ao arquipélago de Cabo Verde no seu conjunto, pelo que esta estimativa deve estar enviesada negativamente e deve ser tomada como valor mínimo. A alta probabilidade de recaptura (0.37) e reduzida abundância são consistentes com uma população local e pequena. A baixa taxa de sobrevivência (0.86) sugere uma possível migração, pelo que devem ser realizados mais estudos no sentido de analisar a relação entre a reprodução das baleias-de-bossa em Cabo Verde e noutros locais. A frequência de mistura entre grupos de baleias que se reproduzem em Cabo Verde e em áreas adjacentes permanece desconhecida. Não é claro se a abundância aqui estimada se aplica a parte de uma população isolada ou a parte de uma população mais vasta e contínua.

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INTRODUCTION

Humpback whales *Megaptera novaeangliae* migrate from northern feeding areas to the Cape Verde Islands during winter to breed and give birth. This species is typically found from February to late May in sheltered waters in the lee of islands. Although likely biased by search effort, humpback whales are chiefly found off Boa Vista, Sal and Maio, but occasionally around the other islands of the Cape Verde archipelago (Hazevoet & Wenzel 2000, Wenzel *et al.* 2009, Ryan *et al.* 2013a). Based on whaling records, it has been suggested that these humpbacks are a separate population to that in the West Indies (Townsend 1935, Smith & Reeves 2003). Molecular genetic analysis and photo-identification matching studies are currently underway to investigate if Cape Verde humpbacks are reproductively isolated from those breeding elsewhere in the North Atlantic. Preliminary genetic results suggest that this may indeed be the case (Bérubé *et al.* 2012).

Analysis of whaling ship logbook records indicate that *ca.* 5000 individuals occurred in the waters around Cape Verde prior to over-exploitation during the 18th Century (Smith & Reeves 2003, Punt *et al.* 2006). The only available modern-day abundance estimate for the archipelago is 99 (CV = 0.23), however the authors cautioned that it may be unreliable due to limited data available at that time (Punt *et al.* 2006). Furthermore, whether the abundance estimates presented both herein and by Punt *et al.* (2006) apply to a discreet population of whales is uncertain. Nonetheless, a local abundance estimate is important to monitor trends in the number of humpback whales breeding around Boa Vista in light of rapid development of the coastal environment (Ryan *et al.* 2013a). In the western North Atlantic Ocean, there has been an increase in humpback whale abundance at a rate of 0.031 yr^{-1} (Stevick *et al.* 2003). In contrast, on the eastern side of the Atlantic, a general lack of data available on humpback whales means that the species status is not known.

In this brief study, an updated abundance estimate is presented for humpback whales around Boa Vista, one of the three eastern Cape Verde Islands, using mark-recapture analysis of natural markings from tail fluke images (i.e. photo-identification). These techniques can be used to derive estimates of abundance for cetaceans (Hammond 1986), however the underlying assumptions can be difficult to satisfy (Hammond 1990, Hammond *et al.* 1990). The greatest challenge in this regard is accounting for heterogeneous 'catchability' (i.e. heterogeneity in the probability of recapture) and differentiating between temporary emigrations (Hammond 1990, Kendall *et al.* 1997). Using open-population models, permanent emigration or death can be accounted for, but temporary emigration presents challenges that are difficult to address using small datasets (Hammond 1990, Fujiwara & Caswell 2002). For a scenario such as that in Cape Verde, where population structure is unclear and movements between breeding areas cannot be discounted, open-population models such as the Jolly-Seber and Cormack Jolly-Seber (Cormack 1964, Jolly 1965, Seber 1965) models are therefore appropriate. However, heterogeneity still remains an issue, which usually results in downward biased abundance estimates (Hammond 1990).

MATERIALS AND METHODS

Between March and May each year from 2010 to 2013, boat-based searches were carried out for humpback whales in inshore waters to the northwest of Boa Vista, Cape Verde Islands (Fig. 1). A total of 385 surveys were carried out from Sal-Rei, the main town in Boa Vista, both opportunistically from whale-watching vessels and on a dedicated basis from a 5 m rigid-hulled inflatable (see Ryan *et al.* 2013a for details). Although different platforms were used, the survey methodology was similar in that vessels left the port of Sal-Rei and carried out searches of the study area *ad hoc* (Fig. 1). The route taken was dictated by the weather and sea conditions and once whales were sighted, efforts were made to photograph the underside of the tail fluke of each whale present by approaching slowly from behind. Photographs taken using digital SLR cameras with telephoto lenses were submitted to the North Atlantic Humpback Whale Catalogue (NAHWC) which was searched for matches based on markings, namely natural variation in pigments and scars. The NAHWC is curated by Allied Whale, College of the Atlantic, 105 Eden

Street, Bar Harbor, Maine 04609, USA (www.coa.edu/ html/alliedwhale.htm). New and recognizable individuals were then included in the catalogue. Images were graded according to photograph quality following criteria outlined by Friday *et al.* (2000) and the lowest quality images on a three level scale were excluded from this study. Due to changes known to occur over time in the pigmentation patterns observed on calf flukes (Carlson *et al.* 1990), all calf fluke photos are retained, but not included in the catalogue or used in this mark-recapture estimate. Following these matching and grading processes, an annual recapture history was constructed for each recognizable individual whale photographed in the study area.

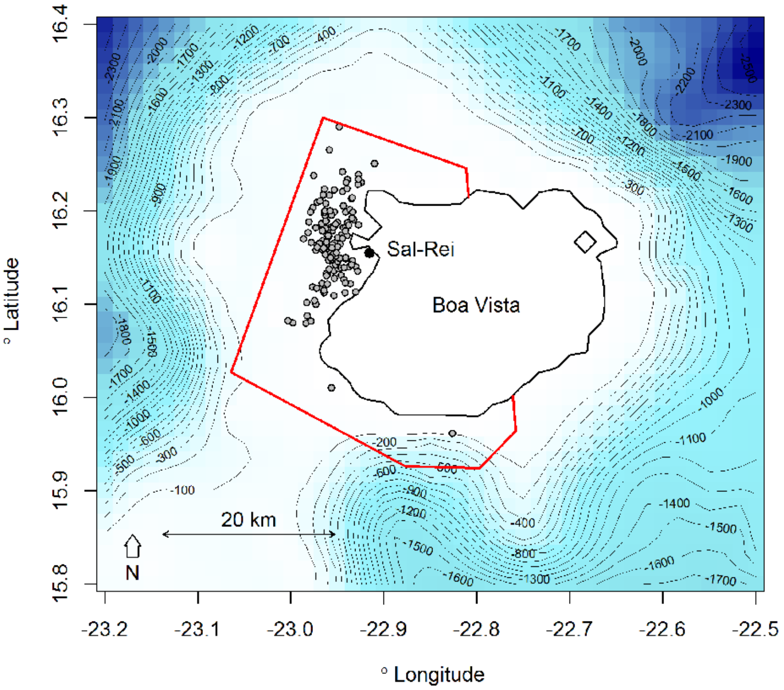

Fig. 1. Map of Boa Vista showing the study area where search effort was conducted and the locations in which photo-identification images were collected during February to May each year between 2010 and 2013.

Abundance was estimated using an open-population mark-recapture approach in R (R Development Core Team 2008). The *Rcapture* package was used to fit both log-linear Jolly-Seber (JS) and Cormack-Jolly-Seber (CJS) models to derive estimates of abundance N, apparent survival ρ and probability of recapture φ. For each annual capture period t ranging from 1 to t, the population size N_1 to N_t were estimated. Given that this study was conducted over a short timescale in comparison to the life-expectancy of a humpback whale, the total number of visitors to the study site N_{total} is the value of interest. However, the N_t values for each year were also considered to examine variability in the number of whales visiting this location between years. The JS model assumes:

1. that 'marked' individuals (i.e. individually recognizable whales) are representative of the population;
2. that individuals do not lose their marks (or remain 'identifiable' between years);
3. that identified (i.e. 'marked' and 'released') whales have the same probability of capture following 'release';
4. that survival probability is equal for all whales during a given sampling period.

As calf pigmentation patterns change during the first couple of years after birth and calves have lower probability of survival, they were removed to ensure that assumption 2 and 4 were not violated (Carlson *et al.* 1990, Blackmer *et al.* 2000). The only available evidence of differential sex-specific survival probabilities in humpback whales is from the Gulf of St. Lawrence, where females have a higher survival rate (0.992) than males (0.971) (Ramp *et al.* 2010). No sex-biased survival rate is available for the population in the present study, although if it is similar to that of Ramp *et al.* (2010), the effect on the population estimate is likely to be minor.

In its simplest form, the JS model which estimates the total abundance $\widehat{N}_t$ is defined as:

$$\widehat{N}_t = \frac{\widehat{M}_t}{\hat{\alpha}_t}$$

Where $\hat{\alpha}_t$, the proportion of marked whales is defined by:

$$\hat{\alpha}_t = \frac{m_t + 1}{n_t + 1}$$

(where m_t is the number of uniquely identifiable whales photographed for time period t and n_t is the total number of identifiable and unidentifiable (unmarked) whales captured in t). $\widehat{M}_t$, the abundance of the identifiable whales at t, is defined as:

$$\widehat{M}_t = \frac{(s_t + 1)Z_t}{R_t + 1} + m_{t-1}$$

(where s_t is the total number of whales 'released' (i.e. photographed and survived); Z_t is the total number of whales photographed previously (i.e. < t -1); R_t is the number of $s_t$whales surviving after t; and m_{t-1} is the total number of uniquely identifiable whales caught in both t and prior to t).

For model validation, Pearson's residuals from the fitted models were plotted against the frequency of capture. This method is appropriate for log-linear models such as the JS model (Krebs 1999), permitting assessment of a key assumption of the JS model, that recapture probabilities are homogenous among individuals. Model choice was based on the goodness of fit using Akaike Information Criterion (AIC). The 95 % confidence intervals were estimated using the equation provided by Krebs (1999) for JS models, which uses the variance of the estimate.

Explicitly accounting for the effects of temporary emigration can be challenging, however Kendall *et al.* (1997) provided a means to estimate the rate of temporary migration. This is determined by dividing the capture probability from the JS open population model by that from a closed population model (Kendall *et al.* 1997). For the purpose of estimating the rate of temporary emigration, a closed-population model was applied to our data using *closedp* command in the *Rcapture* package. This routine attempts to fit 12 different log-linear models (see Baillargeon & Rivest 2007 for details). The model with the lowest AIC value was chosen, from which the estimated capture probability was used to estimate the rate of temporary emigration as described above. Kendall *et al.* (1997) also presented a modified model to account for scenarios where temporary emigration occurs in a predictable manner, e.g. Markovian emigration, where the probability that an animal is not available for recapture in period *i* is dependent on whether or not it was available for capture in period *i* – 1. Accounting for Markovian temporary emigration might appear to be appropriate in the case of female humpback whales which have a two year breeding cycle due to their 11 month gestation period. However, our data indicate that some males (as determined by 'singing' and genetic biopsy sampling) returned to the study area each year. As the sex of each whale was not known, we could not implement routine Markovian temporary emigration type models.

RESULTS

Between 2010 and 2013, a total of 119 individually recognizable adult humpback whales were photographed in coastal waters to the west of Boa Vista with image quality sufficient for inclusion in this study. A summary of the number of recaptures per year is presented in Table 1. The simple JS model was selected as it had a lower AIC (83.5) compared to the CJS model (221.5). A Pearson's residual plot exhibited good dispersion of indicating low heterogeneity in the data (Fig. 2). The abundance estimate for the total study period (2010–2013) was 171 and the model parameters are presented in Table 2. It was also possible to derive inter-annual abundance estimates for some periods: 100 ± 8 from 2011 to 2012 and 131 ± 12 from 2012 to 2013. Estimations for the first period (2010–2011) are not possible as there are no appropriate prior data from which to estimate recaptures. The rate at which new individuals are being recorded in the study area is declining, showing that the humpback whales occurring around Boa Vista are well represented in the sample (Fig. 3).

The rate of temporary emigration was found to range from 0.45 to 0.52 for the duration of the study. Therefore temporary emigration appears to be an important source of bias in the probability of recapture in the present study. At this rate of temporary emigration, the resulting negative bias on the abundance estimate is 31% (Kendall *et al.* 1997). The net known bias arising due to both sex-specific behavior and temporary emigration is therefore 52%, giving a final abundance estimate of 260 humpback whales.

Year	2010	2011	2012	2013
Whales identified m_t	31	40	22	26
Whales recaptured R_t	-	23	21	23

Table 1. Number of whales identified and subsequently recaptured during the study.

Parameter	Estimate	CV	95 % CI
$\widehat{N}$	171	0.02	163-179
φ	0.37	0.75	0.23-0.53
ρ	0.86	0.37	0.52-0.97

Table 2. Mark-recapture Jolly-Seber model estimates including the absolute abundance ($\widehat{N}$), capture probability (φ) and survival rate (ρ). NB, the estimate presented here is not corrected for known biases. See results section for further details.

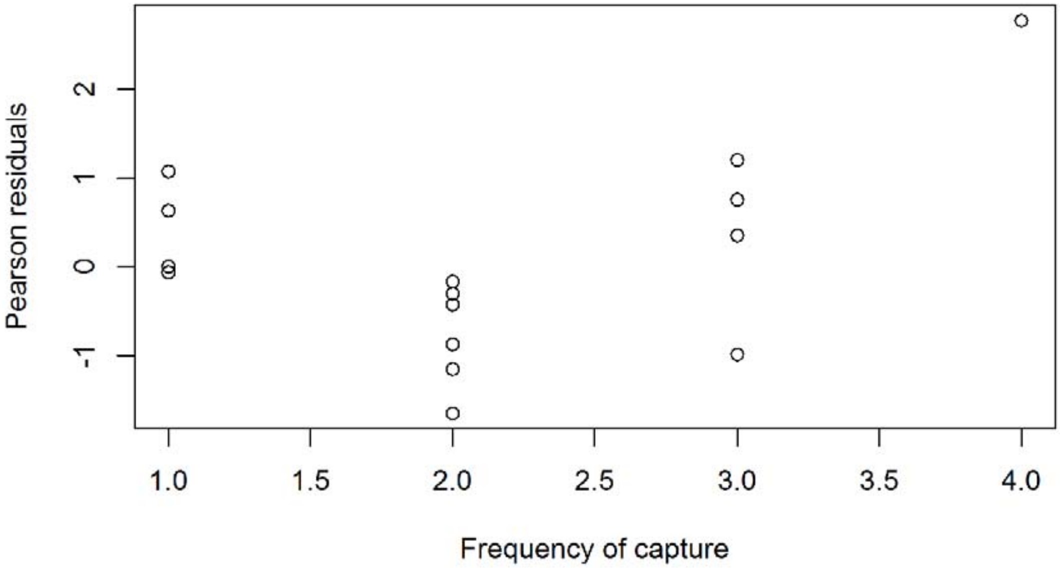

Fig. 2. Scatter-plot of Pearson residuals versus frequency of capture for the fitted data from the chosen (Jolly-Seber) mark-recapture model, showing dispersion which indicates low heterogeneity in the data.

DISCUSSION

Humpback whale research in the Cape Verde Archipelago began in the early 1990s (see Reiner *et al.* 1996, Hazevoet & Wenzel 2000, Jann *et al.* 2003, Wenzel *et al.* 2009). Unfortunately, these research efforts were not spatially or temporally comparable for the purpose of this mark-recapture population estimate. These initial dedicated surveys aimed to determine the distribution and relative abundance of humpbacks around the archipelago, which led researchers to focus their future efforts on Boa Vista. Although still an emerging industry in

Cape Verde, whale-watching activities in Boa Vista have been consistent since 2010. Whale-watch vessels have proved to be a useful platform from which to carry out photo-identification research to facilitate this mark-recapture analysis.

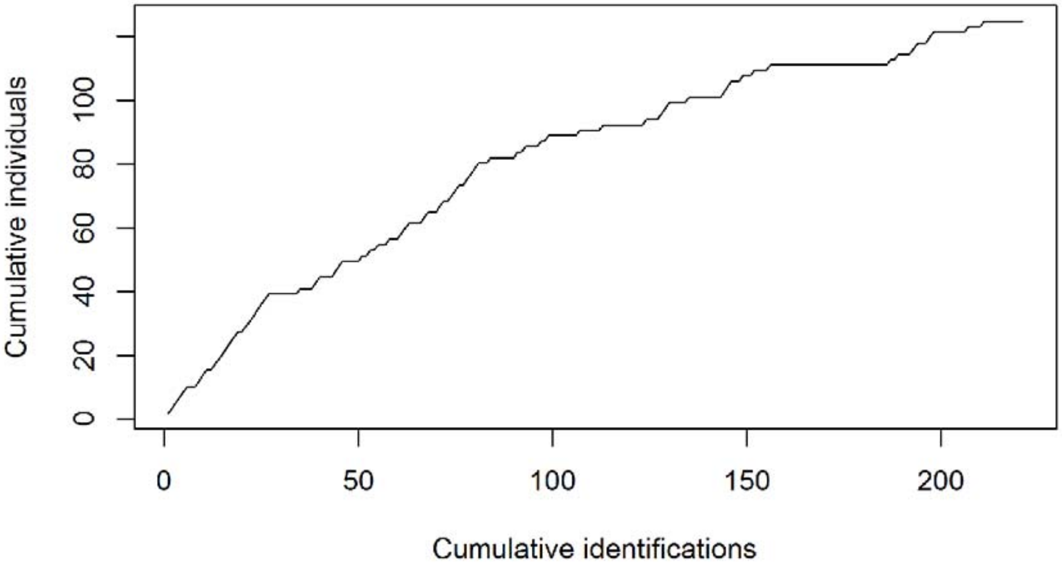

Figure 3. Rate of discovery of individually recognizable whales.

The geographic range of humpback whales found breeding around Cape Verde today is not yet known and this prevents a clear interpretation of our findings. Furthermore, whether this group is isolated or forms part of a continuous population remains to be determined. Nevertheless, one advantage of the JS model is that it does not assume a closed population, i.e. it allows for the possibility of inward or outward migration. The abovementioned assumptions of the JS mark-recapture approach have been satisfied as far as possible, albeit without accounting for the possible sex-biases arising from differential survival rates and capture probabilities. Regarding assumption 1, it has been demonstrated that the distinctiveness of humpback whale fluke patterns has no measurable effect on abundance estimation using comparable mark-recapture methods (Friday *et al.* 2008). Removal of calves from the analysis ensured that assumption 2 was not violated, as fluke pigment undergoes significant changes in young animals, but not so much in older animals over short timescales (Carlson *et al.* 1990, Blackmer *et al.* 2000). Furthermore, calves were not considered because potentially they have a higher rate of natural mortality, violating assumption 4.

Finally, one unavoidable caveat exists in relation to assumption 3 – females with calves in attendance appear to prefer shallow waters (Ryan *et al.* 2013a) where they are less likely to fluke-up (and therefore be 'captured' for photo-identification purposes). This results in females with calves being under-represented, resulting in a low biased abundance estimate (Smith *et al.* 1999). Furthermore, differential timing of migrations according to sex and overwintering of females at higher latitudes may exacerbate this bias (Smith *et al.*1999). Such bias can be largely overcome by sampling whales on both their feeding and breeding grounds, but this was not feasible in the present study. A parallel study found that females were significantly under-represented in a sample of biopsied whales from Boa Vista (Ryan *et al.* 2013b). However, it is not known whether sampling effects arising during both biopsy sampling and photo-identification result in comparable sex bias. The net effect of sex bias in humpback whale photo-identification mark-recapture analysis is that abundance estimates are negatively biased by up to 21% (Smith *et al.* 1999). Further bias in the estimate presented herein arises from temporary emigration, estimated to be 31%. Therefore, accounting for a net negative bias of 52%, the best estimate for humpback whales in the study area is 260 individuals. Finally, as the means of 'capture' were non-invasive and were unlikely to result in long-term disturbance, sampling methods did not result in a violation of assumption 3.

The abundance estimate of 171 to 260 individuals is low, but higher than that previously reported by Punt *et al.* (2006) from this region (99 individuals). Given the challenges arising from unavoidable heterogenity in capture probabilities (Hammond 1990, Smith *et al.* 1999), there may be further negative bias in our estimate (in addition to that arising from sex-bias and temporary emigration dealt with above). The coefficient of variation on the estimate presented here is an order of magnitude lower given that more data are now available (0.02 compared to 0.23). It is not known how representative the study area (northwest Boa Vista) is of the total Cape Verde archipelago. This area is the most important known nursing location for this species in the eastern North Atlantic (Wenzel *et al.* 2009, Ryan *et al.* 2013a). However, this may reflect sampling bias given a lack of comparable research effort in adjacent areas. As such, a systematic archipelago-wide survey for humpback whales in Cape Verde is required to determine if the abundance estimate presented here is conservative. The high probability of recapture reported here is consistent with a small and potentially isolated population, with strong fidelity to the area studied off Boa Vista. The low survival rate (0.86), albeit with wide 95% CIs, may indicate some outward migration and would benefit from further investigation.

Photo-identification and molecular genetic studies are underway in order to assess connectivity between humpback whales breeding in Cape Verde and other breeding locations such as the West Indies (Per Palsbøll pers. comm.). It is hoped that these studies may serve to address some of the aforementioned caveats in the present study. The most recent abundance estimate (calculated from data collected only on the high latitude feeding grounds) for the entire North Atlantic Ocean is 11,570, although this estimate is believed to be downwardly biased (Stevick *et al.* 2003). Therefore, assuming the estimate of 260 presented here is representative, the breeding group of humpback whales around Boa Vista might constitute only *ca.* 1.8% of the total North Atlantic population. The aforementioned sampling bias makes it difficult to determine whether our estimate for Boa Vista is representative for the archipelago. During the 1800s, some shore-based whaling was carried out from Boa Vista although the details are lacking (Cabral & Hazevoet 2011). According to available evidence however, shore-based whaling centred around the island of São Nicolão, where an estimated 105 whales were landed between 1874 and 1918 (Cabral & Hazevoet 2011). In addition, *ca.* 200 whales were killed per annum in Cape Verdean waters during peak activity by foreign whalers in the late 1800s (Smith & Reeves 2003). To apply the precautionary principle (i.e. a worst case scenario whereby the abundances estimate presented herein is representative of the entire archipelago), this population may be precariously small and therefore threatened by stochastic effects and anthropogenic impacts. Furthermore, unlike the humpback whale population of the western North Atlantic (Stevick *et al.* 2003), this population may be failing to recover from over-exploitation despite commercial whaling ending in Cape Verde in the 1920s (Cabral & Hazevoet 2011) and in the entire North Atlantic by 1955 (Smith & Reeves 2003). However local site fidelity, a spatially structured population, or even a distribution change cannot be discounted. Therefore, an archipelago-wide abundance estimate, coupled with a clearer understanding of population structure of humpback whales in the North Atlantic is needed. Future research may serve to shed further light on the unknowns regarding site fidelity and movements between adjacent areas. However, until this time, and in the absence of such information, the precautionary principle invokes that strict protection and clear conservation goals should to be established for the estimated 171-260 (minimum estimate) humpback whales remaining in Cape Verde, currently the only known breeding ground for eastern North Atlantic humpback whales.

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Eighth report on birds from the Cape Verde Islands, including records of nine taxa new to the archipelago

Cornelis J. Hazevoet [1]

Keywords: Aves, Cape Verde Islands, distribution, migration, vagrancy, endemics, breeding.

ABSTRACT

Recent data on status and distribution of resident and migrant birds in the Cape Verde Islands are presented, including records of nine taxa new to the archipelago, viz. *Ciconia nigra, Ciconia ciconia, Circus macrourus, Falco naumanni, Chlidonias hybrida, Chlidonias leucopterus, Apus affinis, Ptyonoprogne fuligula* and *Phylloscopus inornatus.* Also presented are data on a number of breeding taxa, including the first record of the endemic Cape Verde purple heron *Ardea bournei* outside Santiago island. The alarming situation of the magnificent frigatebird *Fregata magnificens,* of which only three individuals remain in Cape Verde, constituting the entire population in the East Atlantic, remains of great concern. Several species of birds of prey are also highly threatened and have already become extinct in some islands. Following its expansion through Northwest Africa and the Canary Islands, Eurasian collared dove *Streptopelia decaocto* has now also become established in at least three of the Cape Verde Islands.

RESUMO

São apresentados dados sobre o estado e distribuição de aves residentes e migratórias nas ilhas de Cabo Verde, incluindo registos de nove novos taxa no arquipélago, viz. *Ciconia nigra*, *Ciconia ciconia*, *Circus macrourus, Falco naumanni, Chlidonias hybrida, Chlidonias leucopterus, Apus affinis, Ptyonoprogne fuligula* e *Phylloscopus inornatus*. São igualmente disponibilizados dados sobre taxa nidificantes, incluindo o primeiro registo da espécie endémica garça-vermelha-de-Cabo-Verde *Ardea bournei* fora de ilha de Santiago. É destacada também a situação alarmante da fragata *Fregata magnificens* da qual apenas restam três indivíduos em Cabo Verde, constituindo a totalidade da população em todo o Atlântico Leste. Algumas aves de rapina estão altamente ameaçadas e já se encontram extintas em algumas ilhas. Na sequência da sua expansão através do Noroeste Africano e ilhas Canárias, a rola-turca *Streptopelia decaocto* estabeleceu-se em pelo menos três das ilhas de Cabo Verde.

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INTRODUCTION

This is the eighth supplement to The Birds of the Cape Verde Islands (Hazevoet 1995). For previous installments, see Hazevoet (1997, 1998, 1999a, 2003, 2010, 2012) and Hazevoet *et al.* (1996). Most data in the current report concern the years 2012-2014, but records from earlier years that came to light after the publication of previous supplements are also included.

During the past few years, the Poilão watershed has again produced an amazing number of rare waterbirds and, with more watersheds having been and currently being constructed, this trend is likely to continue unabated in the years to come. Some of these species, considered rare vagrants in the past, are now known to be regular visitors, including several from North America. The eastern islands of Sal and Boa Vista, the islands most often visited by foreign bird watchers on holiday, also continue to produce avian surprises, while the sewage works in São Vicente have again confirmed their fame as 'hotspot' for rare migrant waterbirds, including several from the other side of the Atlantic.

Less bright than the increase in migrant visitors known to occur in the Cape Verde Islands, is the plight of some local breeding birds. The situation of the magnificent frigatebird *Fregata magnificens* continues to be precarious, while a number of birds of prey are on the edge of extinction or have passed that mark already. This almost certainly applies to the Cape Verde kite *Milvus fasciicauda*, of which there have not been any reliable records for more than 40 years, while the Egyptian vulture *Neophron percnopterus* has become increasingly rare over the past 25 years and may not breed in Cape Verde any longer. The lone Egyptian vulture still seen every now and then could perhaps be a Palearctic migrant rather than a local bird, although this has as yet not been established. A programme to study *Neophron* and resolve its current status in Cape Verde is being prepared at present. Perhaps somewhat surprsingly, the number of sightings of black kite *M. migrans* has increased somewhat over the past few years, after a decade of almost no sightings at all, but – as with *Neophron* – it remains to be seen if these concern local birds rather than Palearctic migrants. Among other birds of prey, the Cape Verde buzzard *Buteo bannermani* is another taxon worthy of more attention than it has received over the past decades. Very little is known about the buzzard's habits, apart from the fact that it survives in small numbers in the islands of Santiago and Santo Antão, having apparently disappeared from São Nicolau.

In Boa Vista, ngo BIOS.CV continues their long-term studies of frigatebird, red-billed tropicbird *Phaethon aethereus* and osprey *Pandion haliaetus*. The situation of the tropicbird in Boa Vista does show little, if any, sign of improvement, with many birds still falling victim to feral cats and human vandalism. Recently, a number of breeding platforms for ospreys have been erected in the hope of enhancing their breeding success, which has been close to zero in Boa Vista for many years. Equally, a number of artificial nests to accommodate the frigatebird were constructed on Curral Velho islet, hoping to improve their chances at successful breeding as well.

In the island of Maio, *Fundação Maio Biodiversidade* continues their studies of Kentish plover *Charadrius alexandrinus*, as well as other bird species, while in the island of Sal, *SOS Tartarugas* is now carrying out regular counts of waders, both local breeding species and migrant visitors. Over the past year, in depth studies of the Cape Verde cane warbler *Acrocephalus brevipennis* were carried out by an international team in Santiago, Fogo and São Nicolau, while the islands of Brava and Santo Antão were prospected in search of the cane warbler, be it without result so far.

The grand total of species level taxa of birds recorded in the Cape Verde archipelago now stands at 228, an increase of 84 since the publication of Hazevoet (1995), not counting a number of introduced taxa that may or may not have established a permanent population or have disappeared since they were introduced. Unless stated otherwise, general data on distribution, status, number of records, etc. in the following are taken from Hazevoet (1995, 1997, 1998, 1999a, 2003, 2010, 2012) and Hazevoet *et al.* (1996). In the taxon accounts, islands are listed in clockwise order, starting with the main island of Santiago. Records of rare taxa were scrutinized by the author, with the assistence of Nils van Duivendijk, Jan van der Laan and C.S. Roselaar.

ABBREVIATIONS OF OBSERVERS' NAMES: AA – Agueda Alcalde; AC – Andy Clifton; AM – Adolfo Marco; AN – Angelo Nava *et al.*; AP – Andrew Power *et al.*; BD – Ellen de Bruin & Ricardo van Dijk; CG – Colin Gittins; CGr - Tim Collins & Mags Grindle; CH – C. Heuck *et al.*; CJH – Cornelis J. Hazevoet; CL – Cécile Lazaro; CR – Christian Roder; FM – François Moutou; FS – Fredrik Ström; GBC – Gerard Bota Cabau; GM – Guy Mirgain; HB – Helena Batalha *et al.*; HD – Hugues Dufourny *et al.*; JB – John Badley *et al.*; JC – Jacquie Cozens; JLE – John Lee; JLI – John Lines; JR – Janne Riihimäki; KD – Klaus Drissner; KH – Kari Haataja; KW – Keijo Wahlroos; LB – Lucas Baliteau; MC – Marco Crivellari; MF – Michael Fricke; MG – Mike Greenfelder; MK – Mike King; MMJ – Michael Mosebo Jensen; MN – Marc Newsome; MR – Magnus Robb; MSR - Manuel Simões Rodrigues; NA – Nick Addey; ND – Nils van Duivendijk; PC – Paul Chapman; PD – Paul Donald; PLS – Pedro López Suárez; RF – Ronan Le Fur; RP – René Pop; RS – Rainer Sottorf; SB – Simon Baliteau; SC – Sampsa Cairenius; SM – Samir Martins; TK – Tommy Karlström; TM – Tommy Melo; UF – Ulrich Filbrandt.

BREEDING BIRDS

In this section, additional data on Cape Verde breeding birds are presented, including range expansions within the archipelago, new breeding sites of rare species, new or rare records for a particular island and other noteworthy observations.

Magnificent frigatebird *Fregata magnificens* Mathews, 1914

BOA VISTA: two females were seen at ilhéu de Curral Velho, 15 February 2014 (PLS). During a visit to Curral Velho islet on 10 January 2014, a frigatebird nest with a single egg was found, but during a subsequent visit on 13 March, only egg shells were found and the egg apparently did not hatch and was presumably predated (PLS). Away from Boa Vista, single male frigatebirds were reported from Sal, *ca.* 5 July 2014 (JC), and Raso, *ca.* 10 October 2014 (TM).

In November 2012, the total frigatebird population in Cape Verde was thought to consist of one male and one female (López Suárez *et al.* 2012). The sighting of two females at Curral Velho in February 2014 perhaps allows for some subdued optimism, be it of the most cautious sort. At present, Curral Velho islet is the only breeding locality of *Fregata* in the Cape Verde archipelago and, indeed, in the whole of the eastern Atlantic. There has been no nesting activity at the former breeding site of Baluarte islet, off eastern Boa Vista, during the past 10 years and breeding success at Curral Velho islet has been zero during the same period. It is as yet unclear if individual frigatebirds from the Cape Verde population wander into the Atlantic, only to return to the islands at a later date, or if trans-Atlantic dispersal occurs, with birds from Caribbean populations possibly reaching Cape Verde at times.

Cattle egret *Bubulcus ibis* Linnaeus, 1758

SANTIAGO: during the second half of 2012, a breeding colony was established in trees on the premises of Escola António Nunes in the Calabaceira neighboorhood of Praia, where 526 nests were counted in September (Rendall Monteiro & Semedo 2012). By 2014, the Calabaceira site had been abandoned and birds had apparently moved to trees at Mercado de Sucupira in Praia, where in October-November 2014 a large roost and breeding colony existed (Oceanpress, 5 November 2014), although the number of birds and nests involved still needs to be established. A roost at Barragem de Poilão held at least 1,650 birds, 5 March 2013 (HD). BOA VISTA: a count at a roost near Rabil, 28 January 2013, yielded the stunning number of at least 6,100 birds (SC).

In Cape Verde, cattle egret is a common and widespread migrant visitor and a scarce breeding bird, although the number of reported breeding instances has increased during the past decade. The geographical origin of the large numbers of migrant birds occurring in Cape Verde has as yet to be established, but may involve both Palearctic and Afrotropical birds. In West Africa, it is common and widespread (Borrow & Demey 2014), involving both Palearctic migrants and local breeding birds, the latter showing erratic movements determined by available food resources (Isenmann *et al*. 2010).

Cape Verde purple heron *Ardea bournei* de Naurois, 1966

SANTIAGO: a pair building a nest in a tree at São Domingos, 6 September 2014, and possibly more pairs present (SM). BOA VISTA: one along Lagoa de Rabil (Ribeira d'Agua), 9-19 March 2012 (CG).

There had not been any sign of breeding at São Domingos (the type locality) since the mid-1960s, when the population there was estimated at *ca.* 30 pairs in 1963 (Naurois 1966) and 50-60 pairs in 1966 (Bannerman & Bannerman 1968). Nowadays, the only substantial breeding colony is at Banana, Ribeira Montanha, where during the breeding seasons of 2006 and 2007, the maximum number of occupied nests was *ca.* 60 (A. Rendall unpublished data). In 2006-2007, a few pairs bred in Serra Malagueta (Cesarini *et al.* 2008). The local purple heron population appears to have benefited from the recent construction of watersheds in Santiago island. This slightly optimistic note notwithstanding, the few existing breeding sites remain highly vulnerable and more targeted measures, aimed at their long-term protection and survival, remain urgently needed. The record from Boa Vista is the first ever outside Santiago island and may perhaps reflect the slightly less gloomy situation of the Cape Verde purple heron today, with some birds dispersing to other islands.

Fig.1-2. Cape Verde purple heron *Ardea bournei*, Lagoa de Rabil (Ribeira d'Agua), Boavista, 19 March 2012 (Colin Gittins).

Black kite *Milvus migrans* (Boddaert, 1783)

SANTIAGO: one in very bleached plumage near Praia harbour, 3-5 May 2013 (ND). SÃO VICENTE: one at the sewage works, 15 March 2013 (KH, KW), and two there, 31 December 2013 (CGR). SAL: one near Santa Maria, 24 October, and south of Murdeira, 27 October 2013 (BD). For many years, no sigthings from Santiago had been reported. Those from São Vicente follow a sighting of six in March 2011, which was the first there in three decades. During the past decades, most sightings of black kite are from the eastern islands, particularly Boa Vista and Maio, but the last report from Sal was of one in March 2007. It is as yet unclear whether black kites seen Cape Verde are Palearctic migrant visitors or local breeding birds. There are very few breeding data of black kite in Cape Verde. In West Africa, it is an uncommon to locally fairly common Palearctic visitor, but precise status is uncertain due to confusion with locally breeding yellow-billed kite *M. parasitus* (Borrow & Demey 2014). In this connection it may also be noted that the Cape Verde kite *M. fasciicauda*, which still existed in Santiago, Santo Antão and São Nicolau during the 1950s and 1960s, is almost certainly extinct, there having been no reliable records for more than 40 years.

Fig 3-4. Black kite *Milvus migrans*, sewage works, São Vicente, 15 March 2013 (Keijo Wahlroos).

Unidentified large falcon *Falco* sp.

BOA VISTA: one along the road between Sal Rei and the airport, 18 February 2014 (PLS); one west of Riu Touareg Hotel (Lacacão), 6 November 2014 (HD). These sightings of large falcons are included here in view of the scarcity of peregrine records in Cape Verde. However, in both cases the birds were seen only briefly or at great distance, hence it was not possible to ascertain whether it concerned local *Falco madens* or migrant peregrine falcon *F. peregrinus* or perhaps even barbary falcon *F. pelegrinoides* or lanner *F. biarmicus.*

Rose-ringed parakeet *Psittacula krameri* (Scopoli, 1769)

SANTIAGO: 2-5 at Cidade Velha, 19 November -4 December 2013 (AP). During the years 1993-1995, a few pairs of this introduced species resided at Parque 5 de Julho in Praia, Santiago, but thereafter no records were obtained there. In January-March 1992, small parties were regularly seen at Mindelo, São Vicente, but none have been reported there since. There is also an old record of one collected at Praia in April 1909. It appears that new introductions take place every now and then, but so far without a resident population becoming established. Rose-ringed parakeet occurs naturally in a wide belt across Africa from southern Mauritania and Senegal in the west to southern Sudan and Ethiopia in the east, as well as in southern Asia from Pakistan and the Indian subcontinent to Burma. Feral populations exist in many cities in Europe, North Africa, South Africa, Turkey, the Middle East, Japan and North America.

Common waxbill *Estrilda astrild* (Linnaeus, 1758)

SANTO ANTÃO: ‘considerable’ flocks present at Ribeira de Paúl and Ribeira Grande, 11-15 Septmber 2014 (HB). The only record of common waxbill for Santo Antão was of three collected at Janela, 15 January 1924. Apparently this introduced estrilid was recently released anew in the island, but it remains to be seen if this will lead to a more permanent settlement. Common waxbill is common in Santiago. In São Vicente, where it also had not been recorded since 1924, a number were apparently released prior to 2005, in which year there were a couple of sightings. However, it has not been seen subsequently and has seemingly disappeared there once again. Populations in Cape Verde are descended from birds imported from Angola.

Fig. 5. Common waxbill *Estrilda astrild*, Ribeira Grande, Santo Antão, 13 September 2014 (Torbjörn Blixt).

MIGRANT VISITORS AND VAGRANTS

In the following, the numbers in brackets at the beginning of each entry indicate 1) the number of records up to 1 January 1980 and 2) the number of records since that date. When the number of records before 1 January 1980 is uncertain this is indicated as (--). Taxa new to the archipelago are marked with an asterisk. Records of taxa included in previous reports, of which there are now more than 20 records since 1 January 1980 (viz. *Egretta gularis, Platalea leucorodia, Circus aeruginosus, Charadrius dubius, Calidris alpina, Philomachus pugnax, Gallinago gallinago, Limosa lapponica, Tringa totanus, T. glareola, T. ochropus, Chroicocephalus ridibundus, Larus michahellis, Thalasseus sandvicensis, Oenanthe oenanthe*) are included only when an observation represents a new island record or when there are otherwise remarkable circumstances (e.g. unusual numbers or date).

[**Mallard** *Anas platyrhynchos* Linnaeus, 1758

A female mallard (a taxon not recorded before in Cape Verde) was claimed at Barragem de Poilão, Santiago, 29 December 2011 (Birding World 25: 16, 2012). However, documentation was deemed insufficient for acceptance and inclusion in the present report. Unfortunately, this unsubstantiated claim was included and mapped for Cape Verde by Borrow & Demey (2014).]

Common teal *Anas crecca* Linnaeus, 1758

(2, 20) SANTIAGO: four females at Barragem de Poilão, 28 October 2012, and 2-4 males and one female there, 6-13 January 2013 (UF). SAL: a male at the sewage works near Santa Maria, 20 December 2013 (FM). BOA VISTA: two at Lagoa de Rabil (Ribeira dÁgua), 7 November 2014 (HD). Common teal has been reported from Santiago (5), São Vicente (7), Sal (4) and Boa Vista (6). All records are from October to March. This is by far the anatid most often recorded in Cape Verde. Observers should remain alert for the possibility of green-winged teal *A. carolinensis*, of which there is a single record. In West Africa, common teal is a locally fairly common to uncommon Palearctic visitor (Borrow & Demey 2014).

Northern pintail *Anas acuta* Linnaeus, 1758

(0, 8) SANTIAGO: seven at the Pedra Badejo lagoons, 9 December 2012 (CGR). SANTO ANTÃO: a male at Ribeira Grande, 28 December 2012 (CGR). SÃO VICENTE: two at the sewage works, 20-21 December 2012 (CGR). Northern pintail has been recorded (November, December, February) from Santiago (1), Santo Antão (1), São Vicente (2), Sal (3) and Maio (1). In West Africa, it is a locally common Palearctic winter visitor south to Senegal, uncommon to scarce further south (Borrow & Demey 2014).

Garganey *Anas querquedula* Linnaeus, 1758

(0, 3) BOA VISTA: one at Lagoa de Rabil (Ribeira d'Agua), 7 November 2014 (HD). Prevous records of garganey were from São Vicente (April) and Sal (December). In West Africa, it is a locally common to uncommon Palearctic visitor (Borrow & Demey 2014).

Northern shoveler *Anas clypeata* Linnaeus, 1758

(0, 7) SANTIAGO: 1-2 at Barragem de Poilão, 28 October-8 December 2012 (UF, CGR), and a female there, 24 November-8 December 2013 (AP). SAL: a female at the sewage works near Santa Maria, 31 January-5 February 2014 (JLI). Northern shoveler has been reported from Santiago (3), São Vicente (2) and Sal (2), with records from October to February. In West Africa, it is a locally common to uncommon Paleractic visitor (Borrow & Demey 2014).

Blue-winged teal *Anas discors* Linnaeus, 1766

(0, 6) SANTIAGO: four at Barragem de Poilão, 8 December 2012 (CGR), and one male and four females there, 6 January-14 March 2013 (HD, KH, UF). BOA VISTA: a female at Lacacão, 2-7 November 2014 (HD). This Nearctic duck has been reported (January-March) from Santiago (3), São Vicente (2) and Boa Vista (1). In West Africa, there are records from Senegal only (Borrow & Demey 2014).

Fig. 6. Blue-winged teal *Anas discors*, Barragem de Poilão, Santiago, 14 March 2013 (Kari Haataja).
Fig. 7. Blue-winged teal *Anas discors*, Lacação, Boa Vista, 6 November 2014 (Georges Olioso).

Ring-necked duck *Aythya collaris* (Donovan, 1809)

(0, 5) SANTIAGO: five at Barragem de Poilão, 8 December 2012 (CGR), and still a male there, 6 January-10 March 2013 (HD, UF). This Nearctic migrant has now been reported (November-March) from Santiago (2), São Vicente (2) and Sal (1). There appear to be as yet no records from the West African mainland (cf. Borrow & Demey 2014).

Tufted duck *Aythya fuligula* (Linnaeus, 1758)

(1, 3) SANTIAGO: four females at Barragem de Poilão, 6-13 January 2013 (UF), and 1-2 females there, 24 November-8 December 2013 (AP). While sightings of other anatids have increased markedly during the past decade, those of tufted duck have remained exceedingly scarce. Previously, there were only two records, i.e. one each from Santiago (February 1966) and Sal (November 1999), which is in agreement with its status as a rare to locally uncommon Palearctic visitor in the West African mainland (Borrow & Demey 2014).

Fig. 8. Tufted duck *Aythya fuligula*, female, Barragem de Poilão, Santiago, 24 November 2013 (Andrew Power).

Red-footed booby *Sula sula* (Linnaeus, 1766)

(0, 8) RASO: an adult white morph in the brown booby *S. leucogaster* colony, 9 October 2012 (GBC), and again one there (possibly the same bird), 14 March 2013 (MF). One at sea at 19º48'59"N, 23º10'48"W, 2 October 2014 (MG), was just outside the geographical area considered here. There are records from Cape Verde seas (3), ilhéu de Cima (1), off Santo Antão (1) and Raso (3), in July (1), August (1), October (2), November (1), March (1) and April (2). The nearest breeding colonies are in Ascension Is. and Fernando de Noronha. There appear to be as yet no records off the West African mainland (cf. Borrow & Demey 2014).

Fig. 9. Red-footed booby *Sula sula*, Raso, 9 October 2012 (Gerard Bota Cabau).

Masked booby *Sula dactylatra* Lesson, 1831

(0, 3) BOA VISTA: one at ilhéu de Curral Velho, 13 December 2012 (GM). MAIO: a bird in poor condition was found on the beach at Barreiro, 25 July 2014, and taken to Porto Inglês (Vila do Maio) for recovery (Fundação Maio Biodiversidade, PLS). The only previous record was of a long staying bird at ilhéu de Curral Velho, off southern Boa Vista, in 2003-2005. As in red-footed booby, the nearest breeding colonies are in Ascension Is. and Fernando de Noronha. There appear to be as yet no records off the West African mainland (cf. Borrow & Demey 2014).

Fig. 10. Masked booby *Sula dactylatra*, Porto Inglês, Maio, 27 July 2014 (Pedro López Suárez).

White-breasted cormorant *Phalacrocorax lucidus* (Lichtenstein, 1823)

(--, 4) BOA VISTA: one at Ribeira d'Agua, 30 January 2014 (PLS), an immature at Lacacão, 20 February 2014 (JR), one at ilhéu de Curral Velho, 13 March 2014 (PLS), and again one in the same area, 21 March 2014 (PLS), presumably all concerned the same individual and are here counted as a single record. Previously, 4-6 birds were seen in Santiago, Sal and Boa Vista in March-December 2007. There is a single 20th century record (March 1924) and scant 19th century reports from São Vicente, Raso, São Nicolau and Boa Vista. In West Africa, it is a locally common to uncommon breeding bird from Mauritania to Guinea, said to be resident (Borrow & Demey 2014), but some dispersal evidently takes place, as shown by the Cape Verde records in 2007 and 2014.

Fig. 11. White-breasted cormorant *Phalacrocorax lucidus*, Lacacão, Boa Vista, 20 February 2014 (Janne Riihimäki).

Great white Pelican *Pelecanus onocrotalus* Linnaeus, 1758

(0, 3) BOA VISTA: a bird in poor condition was present, first at the Sal Rei saltpans and then at Lagoa de Rabil (Ribeira d'Agua), from 16 September 2013 onwards; it died 11 October, suffering from a massive subcutaneous enfisema and being seriously emaciated (PLS). Previous records, all from Boa Vista, are of a bird photographed at Sal Rei, July-August 2000, and a skull found in September 2007. In West Africa, great white pelican is a scarce to locally common resident or intra-African migrant, the movements of which are however unclear (Borrow & Demey 2014).

Fig. 12. Great white pelican *Pelecanus onocrotalus*, Lagoa de Rabil (Ribeira d'Agua), 7 October 2013 (Pedro López Suárez).

Little bittern *Ixobrychus minutus* (Linnaeus, 1766)

(1, 4) SANTIAGO: an adult male at Barragem de Poilão, 4-10 March 2013 (HD, UF). The four post-1980 records are all from the Barragem de Poilão in March, the earlier being of one collected in Brava in November 1969. In West Africa, little bittern is both an uncommon to locally fairly common resident and a Palearctic visitor (Borrow & Demey 2014). The single specimen record was of nominate *minutus*, not Afrotropical *payesii* (Hazevoet 1999b, *pace* Frade 1976).

Black-crowned night heron *Nycticorax nycticorax* (Linnaeus, 1758)

(1, 21) SANTIAGO: two at Barragem de Poilão, 16 April 2012 (KD), 1-5 (both adults and immatures) there, 3-10 March 2013 (HD, UF), and 1-2 (an adult and a juvenile) there, 24 November 2013-13 January 2014 (AP); 2-3 at Barragem de Faveta, 4-5 November 2014 (HD). BOAVISTA: an adult at Ribeira do Rabil, 19 March 2012 (CG). Black-crowned night heron has been reported (August-May) from Santiago (14), São Vicente (1), Raso (1) and Boa Vista (6). In West Africa, both local residents and northern migrants occur alongside each other during the northern winter (Borrow & Demey 2014). Birds seen in Cape Verde are likely to be Palearctic migrants, although, in view of the occurrence of other Afrotropical herons, a (partly) West African origin cannot be excluded.

Squacco heron *Ardeola ralloides* (Scopoli, 1769)

(2, 16) SANTIAGO: one at Barragem de Poilão, 29 May 2012 (RF); one there, 11 November 2012 & 13 January 2013 (UF), 1-2 there, 3-10 March 2013 (HD, UF), 2-6 there, 22 November 2013-13 January 2014 (AP); one at Barragem de Faveta, 4 November 2014 (HD). Squacco heron has been reported (in all months except August) from Santiago (15), São Nicolau (1), Sal (1) and Boa Vista (1). In West Africa, it is a locally common resident and a Palearctic visitor (Borrow & Demey 2014). As in black-crowned night heron, birds seen in Cape Verde are likely to be Palearctic visitors, although a (partly) West African origin cannot be excluded.

Black heron *Egretta ardesiaca* (Wagler, 1827)

(0, 8) SANTIAGO: one at Barragem de Poilão, 19 April- 5 May 2012 (AN, UF), one there, 3 March-22 April 2013 (HD, KH, MF, PC, RS, UF), and 1-2 there, 13 January-24 March 2014 (AP, GM). Black heron has been recorded (January-May) from Santiago (5), São Vicente (1), Raso (1) and Boa Vista (1). In West Africa, it is an uncommon to locally common resident (Borrow & Demey 2014), but some dispersal apparently takes place, as demonstrated by its occurrence in Cape Verde.

Fig. 13-14. Black heron *Egretta ardesiaca,* Barragem de Poilão, Santiago, 19 April 2012 (Alberto Nava).

Western reef heron *Egretta gularis* (Bosc, 1792)

SANTO ANTÃO: one (dark morph) at Ribeira Grande, 28 November-1 December 2012 (MR, RP). SAL: one (dark morph) at the sewage works near Santa Maria, 30 January-5 February 2013 (JLI). BOA VISTA: one (white morph) at Praia de Santa Monica, 25 December 2013 (FS).

This is the first record for Sal, only the second for Santo Antão and a rare report of a white morph bird. Western reef heron is a regular Afrotropical migrant visitor to Cape Verde, most often reported from Santiago and Boa Vista, but with only scarce records from Santo Antão, São Vicente, Raso and Maio. In West Africa, it is a common resident, largely confined to coastal areas (Borrow & Demey 2014). Although regularly seen in Cape Verde, no breeding has been documented so far.

Fig. 15. Western reef heron *Egretta gularis*, Praia de Santa Monica, Boa Vista, 25 December 2013 (Fredrik Ström).

Intermediate egret *Egretta intermedia* (Wagler, 1829)

(1, 23) SANTIAGO: > 10 at Barragem de Poilão, 16 April 2012 (KD), and 1-2 there, 19 April-5 May 2012 (AN, UF), are here counted as a single record; one there, 8-15 July 2012 (UF), again one there, 4 March-23 April 2013 (HD, KH, MF, PC, RS), and two there, 31 October 2013 (JC); two at Barragem de Faveta, 25 March 2014 (GM); 1-3 at Barragem de Poilão, 3-5 November 2014 (HD). SAL: one at Vila Verde (Ponta Preta), 4-5 January 2013 (JLE), and one at the sewage farm near Santa Maria, 3-5 February 2013 (JLI). BOA VISTA: three near Rabil, roosting together with cattle egrets, 27-28 January 2013 (SC); one at Ribeira do Rabil (Monte Trigo area), 6 February 2013 (PLS). Intermediate egret has been recorded in all months (except September) from Santiago (9), Santo Antão (2), São Vicente (3), Sal (4) and Boa Vista (6). This is one of the Afrotropical herons most often recorded at Barragem de Poilão, but it is difficult to establish how many individual birds have been involved. In West Africa, it is a fairly common to uncommon resident, with local movements being recorded (Borrow & Demey 2014). With at least 23 records (and many more individuals involved) since 1983, it is clear that intermediate egret is a regular migrant visitor to the Cape Verde Islands and, apart from new island records or exceptional numbers or circumstances, it will not be included in future reports anymore.

Great white egret *Casmerodius albus* (Linnaeus, 1758)

(0, 10) SANTIAGO: one at Barragem de Poilão, 4-5 March 2013 (HD). SANTO ANTÃO: two at Tanque, 28 December 2012 (CGR). SÃO VICENTE: one at the sewage works, 29-30 December 2012 (CGR). BOA VISTA: one at Lacacão, 21 February 2014 (JR); one at Lagoa de Rabil (Ribeira d'Agua), 22 March 2014 (NA). MAIO: one at Casas Velhas, 10 December 2012 (CGR). Great white egret has been reported (February-July) from Santiago (2), Santo Antão (1), São Vicente (2), Boa Vista (4) and Maio (1). In West Africa, it is a common to uncommon resident (*melanorhynchos*), while Palearctic migrants (*albus*) may also occur (Borrow & Demey 2014), but probably remain largely undetected among local birds. One in São Vicente in March 2012 showed characters of Nearctic *egretta*, but has not been formerly accepted as such.

Fig. 16. Intermediate egret *Egretta intermedia*, Barragem de Poilão, Santiago, 19 April 2012 (Alberto Nava).
Fig. 17. Great white egret *Casmerodius albus*, Lacacão, Boa Vista, 21 February 2014 (Janne Riihimäki).

Purple heron *Ardea purpurea* Linnaeus, 1766

(2, 11) SANTIAGO: one at Barragem de Poilão, 3 November 2014 (HD). SAL: one at the sewage works near Santa Maria, 3-4 February 2013 (JLI). Purple heron has been reported (September, December-April, June, July) from Santiago (3), São Vicente (3), Sal (2) and Boa Vista (4). In West Africa, it is a uncommon to locally common Palearctic visitor and resident (Borrow & Demey 2014). Birds seen in Cape Verde are supposedly Palearctic migrants. For Cape Verde purple heron *A. bournei,* see section on breeding birds above.

Fig. 18-19. Purple heron *Ardea purpurea*, Barragem de Poilão, Santiago, 3 November 2014 (Hugues Dufourny).

***Black stork** *Ciconia nigra* (Linnaeus, 1758)

(0, 1) BOA VISTA: one just south of Rabil, 27 December 2013 (FS). This is the first record of black stork, a Palearctic migrant visitor, for the Cape Verde Islands. In West Africa, it is a rare or scarce to uncommon visitor from September to May (Borrow & Demey 2014).

Fig. 20. Black stork *Ciconia nigra*, near Rabil, Boa Vista, 27 December 2013 (Fredrik Ström).
Fig. 21. White stork *Ciconia ciconia*, sewage works, São Vicente, 3 December 2012 (René Pop).

***White stork** *Ciconia ciconia* (Linnaeus, 1758)

(0, 3) SÃO VICENTE: one at the sewage works, 30 September-31 December 2012 (JB, MR, RP, CGR). BOA VISTA: one at Ervatão, 5 February 2014 (MSR), and one seen at Curral Velho on several occasions during mid July 2014 (AM), may have been the same individual, but as this cannot be verified the records in February and July are here counted separately. These are the first records of white stork, a Palearctic migrant, for the Cape Verde Islands. In West Africa, it is an uncommon or rare to locally fairly common visitor (Borrow & Demey 2014).

Glossy ibis *Plegadis falcinellis* (Linnaeus, 1766)

(1, 8) BOA VISTA: two at Lagoa de Rabil (Ribeira d'Agua), 26 December 2013 (FS). Glossy ibis has been reported (October-December, February-April) from Santiago (5), Boa Vista (3) and Maio (1). In West Africa, it is a locally fairly common to scarce Palearctic visitor, with breeding recorded in Mali and suspected in Senegal (Borrow & Demey 2014).

***Pallid harrier** *Circus macrourus* (S.G. Gmelin, 1770)

(0, 1) SAL: a juvenile near Palmeira, 26 October, and north of Murdeira, 27 October 2013 (BD). This is the first record of pallid harrier for the Cape Verde Islands. In West Africa, it is an uncommon to locally common Palearctic visitor (Borrow & Demey 2014). In addition, there was a record of an unidentified female or immature *Circus pygargus/macrourus* at ilhéu do Sal Rei, Boa Vista, 3 March 2013 (HD), adding to five earlier records of unidentified harriers.

Fig. 22-23. Pallid harrier *Circus macrourus*, north of Murdeira, Sal, 27 October 2013 (Ricardo van Dijk).

***Lesser kestrel** *Falco naumanni* Fleischer, 1818

(0, 1) SANTA LUZIA: a male in poor condition, which died the same day, found in September 2011 (precise date unknown), was ringed in Sevilla, Spain, in 2010, but further details are as yet lacking (AM, PD, TM). This is the first record of lesser kestrel for the Cape Verde Islands. In West Africa, it is a locally common to rare Palearctic visitor, often in small or even large groups over various open habitats (Borrow & Demey 2014).

Spotted crake *Porzana porzana* (Linnaeus, 1766)

(0, 4) SANTIAGO: one at Barragem de Poilão, 4-5 March 2013 (HD). First reported in 2005, there are now records from Santiago (3) and São Vicente (1), from January to March. In West Africa, it is a generally rare (but probably overlooked) Palearctic visitor, fairly common in the Senegal delta (Borrow & Demey 2014).

American purple gallinule *Porphyrula martinica* (Linnaeus, 1766)

(0, 2) SANTIAGO: a 1st year bird at Barragem de Faveta, 4 November 2014 (HD). This is the second record for the Cape Verde Islands, the previous being of one at Barragem de Poilão in February-March 2008. American purple gallinule is known for its capacity for long-distance vagrancy and there are records from the Canary Islands (Ramos 2008) and Madeira (Zino *et al.* 1995), but not from the West African mainland (Borrow & Demey 2014).

Eurasian coot *Fulica atra* Linnaeus, 1758

(0, 5) SANTIAGO: one at Barragem de Poilão, 26 November and 8 December 2013 (AP). Only first reported in 2010, there are now records of Eurasian coot from Santiago (3), Sal (1) and Boa Vista (1) from November to March. In West Africa, it is a rare to locally fairly common Palearctic visitor to desert oases and wetlands in the Sahel, with breeding recorded once in northern Senegal (Borrow & Demey 2014).

Eurasian oystercatcher *Haematopus ostralegus* Linnaeus, 1758

(2, 14) BOA VISTA: one at Sal Rei, 28 January 2013 (SC), and one at Lagoa de Rabil (Ribeira d'Agua), 2 May 2013 (PLS). Oystercatcher has been recorded (August-May) from Santiago (2), Cima (1), Santo Antão (1), São Vicente (4), Santa Luzia (1), Branco (1), São Nicolau (1), Sal (1) and Boa Vista (4). In West Africa, it is an uncommon or scarce to locally common Palearctic visitor to coastal areas (Borrow & Demey 2014).

Fig. 24-25. Collared pratincole *Glareola pratincola*, Barragem de Poilão, Santiago, 19 April 2012 (Alberto Nava).

Collared pratincole *Glareola pratincola* (Linnaeus, 1758)

(2, 9) SANTIAGO: one at Barragem de Poilão, 19 April 2012 (AN). Collared pratincole has been recorded (September-May) from Santiago (3), São Vicente (2), Sal (1) and Maio (5). In West Africa, it is a widespread, fairly common to uncommon and local resident, intra-African migrant and Palearctic visitor (Borrow & Demey 2014), hence it is as yet unclear what the geographical origin is of collared pratincoles seen in Cape Verde.

Semipalmated plover *Charadrius semipalmatus* Bonaparte, 1825

(0, 11) SANTO ANTÃO: one near Porto Novo, 17 October 2012 (SB, LB). SÃO VICENTE: two at the sewage works, 2 December 2012 (MR, RP). Semipalmated plove, a Nearctic vagrant, has been recorded (October-December, February-April) from Santiago (3), Santo Antão (2), São Vicente (4) and Sal (2). There appear to be as yet no records from the West African mainland (cf. Borrow & Demey 2014).

Fig. 26. Semipalmated plover *Charadrius semipalmatus*, Porto Novo, Santo Antão, 17 October 2012 (Lucas Baliteau). Fig. 27. American golden plover *Pluvialis dominicus*, 28 December 2013 (Fredrik Ström).

American golden plover *Pluvialis dominicus* (Statius Müller, 1776)

(3, 18) SANTIAGO: a juvenile at Ribeira Filipe, Praia, 5 November 2014 (HD). SANTO ANTÃO: one at Ponta do Sol, 28-30 November 2012 (MR, RP). SÃO VICENTE: 2-3 juveniles at the sewage works, 1-3 November 2012 (JB). SAL: one at the sewage works near Santa Maria, 6 December 2012 (CGR), and again one there, 4-5 February 2013 (JLI). BOA VISTA: one in first summer plumage at Lacacão, 7-8 March 2013 (HD); one at Lagoa de Rabil (Ribeira d'Agua), 28 December 2013 (FS); 1-2 at Lagoa de Rabil (Ribeira d'Agua), 2-8 November 2014 (HD). With 18 records since 1980, American golden plover is the second commonest Nearctic migrant wader in Cape Verde, with records (September-May) from Santiago (3), Santo Antão (3), São Vicente (9), Raso (1), Sal (2) and Boa Vista (3). In West Africa, there are records from coastal areas from southern Mauritania in the north to Gabon in the south (Borrow & Demey 2014).

Eurasian golden plover *Pluvialis apricaria* (Linnaeus, 1758)

(0, 2) SÃO VICENTE: one at the sewage works, 28-30 December 2012 (CGR). This is only the second record of Eurasian golden plover, the previous being of one at Tarrafal, Santiago, in March 2006. In West Africa, it is a Palearctic vagrant, recorded in Mauritania, Senegal and Gambia (Borrow & Demey 2014).

Red knot *Calidris canutus* (Linnaeus, 1758)

(1, 13) BOA VISTA: one at Lagoa de Rabil (Ribeira d'Agua), 18 December 2013 (FS). Red knot has been recorded (September-January, March-April) from Santiago (2), São Vicente (2), Sal (2), Boa Vista (7) and Maio (1). In West Africa, it is a common (south to Guinea) to uncommon or scarce Palearctic visitor (Borrow & Demey 2014). Its scarcity in Cape Verde, compared to the adjacent African mainland, is likely due to the limited availability of red knot's preferred habitat, i.e. tidal mudflats and estuaries, in the islands.

Temminck's stint *Calidris temminckii* (Leisler, 1812)

(0, 7) SAL: two at the Santa Maria saltpans, 29 October 2013 (BD). MAIO: one at Ribeira Dom João, 11 December 2012 (CGR). With seven records since 1989 (when first reported), Temminck's stint remains a scarce Palearctic migrant visitor in Cape Verde. It has been reported (October-December, March) from Santiago (1), São Vicente (1), Sal (2), Boa Vista (2) and Maio (1). In West Africa, it is an uncommon to rare visitor (Borrow & Demey 2014).

Least sandpiper *Calidris minutilla* (Vieillot, 1819)

(0, 6) SAL: one near Santa Maria, 2 February 2013 (JLI). BOAVISTA: one at Lacacão, 30 March-14 April 2012 (AC, AN). This Nearctic vagrant has been reported (February-April) from São Vicente (2), Sal (2) and Boa Vista (2). There are as yet no records from the West African mainland (Borrow & Demey 2014).

White-rumped sandpiper *Calidris fuscicollis* (Vieillot, 1819)

(0, 10) SÃO VICENTE: an adult and 3-7 juveniles (1st winter) at the sewage works, 31 October-3 November 2012 (JB). BOA VISTA: one at Lacacão, 23 January 2013 (SC); a juvenile at Lacacão, 6-7 November 2014 (HD). White-rumped sandpiper, a Nearctic vagrant, has been recorded (October-January) from Santiago (1), São Vicente (3), Sal (2) and Boa Vista (4). In West Africa, there are records from Ivory Coast and Ghana (Borrow & Demey 2014).

Baird's sandpiper *Calidris bairdii* (Coues, 1861)

(0, 2) SÃO VICENTE: a juvenile at the sewage works, 1-3 November 2012 (JB). This is only the second record for Cape Verde of this Nearctic vagrant, the previous – one in Sal in October 2007 – being currently under revision. In West Africa, Baird's sandpiper has been reported from Mauritania, Senegal and Gambia (Borrow & Demey 2014).

Fig. 28. Baird's sandpiper *Calidris bairdii*, sewage works, São Vicente, 3 November 2012 (Juan Brown).

Pectoral sandpiper *Calidris melanotos* (Vieillot, 1819)

(0, 3) SAL: one at the Santa Maria saltpans, 29-30 October 2013 (BD). All three records of pectoral sandpiper are from October, with both previous ones being from Santiago. In West Africa, there are *ca.* 10 records of this Nearctic vagrant from Senegal in the north to Gabon in the south, mostly coastal, but some also inland (Borrow & Demey 2014).

Fig. 29-30. Pectoral sandpiper *Calidris melanotos*, Santa Maria, Sal, 29 October 2013 (Ricardo van Dijk).

Black-tailed godwit *Limosa limosa* (Linnaeus, 1758)

(2, 13) SANTIAGO: 1-4 at Barragem de Poilão, 14 April-18 June 2012 (KD, RF, UF), and 1-2 there, 4-10 March 2013 (HD, UF). SAL: 1-4 at the sewage works near Santa Maria, 31 January-5 February 2014 (JLI); one near Santa Maria, 23-25 August 2014 (JC). BOA VISTA: three at Lacacão, 12 April 2012 (KD). Black-tailed godwit, a Palearctic visitor, has been recorded (August-October, December-June) from Santiago (3), São Vicente (2), Sal (3), Boa Vista (5) and Maio (2). In West Africa, it is a common to scarce visitor in open, fresh to marine wetlands (Borrow & Demey 2014).

Hudsonian whimbrel *Numenius hudsonicus* Latham, 1790

(0, 2) BOA VISTA: one at Lagoa de Rabil (Ribeira d'Agua), 26 January 2013 (CS). This is the second record of this Nearctic vagrant for Cape Verde, the previous being of one in São Nicolau in February 1991. In West Africa, it has been recorded in Gambia and Sierra Leone (Borrow & Demey 2014).

Eurasian curlew *Numenius arquata* (Linnaeus, 1758)

(0, 10) BOA VISTA: 1-3 at Sal Rei, 22-29 January 2013 (SC). With only 10 records since 1989 (when first recorded), Eurasian curlew remains remarkably scarce in Cape Verde. It has been recorded (November, January-April) from Santiago (1), Santo Antão (1), Raso (1), Sal (2), Boa Vista (4) and Maio (1). In West Africa, it is a fairly common to scarce Palearctic visitor, recorded in all months (mainly in August-April) (Borrow & Demey 2014).

Spotted redshank *Tringa erythropus* (Pallas, 1864)

(0, 13) BOA VISTA: one at Lacacão, 24-30 July 2012 (MN). Spotted redshank has been recorded (July, September, November-March) from Santiago (1), São Vicente (5), Sal (1), Boa Vista (5) and Maio (1). In West Africa, it is a fairly common to scarce Palearctic visitor (Borrow & Demey 2014).

Fig. 31. Spotted redshank *Tringa erythropus*, Lacacão, Boa Vista, 30 July 2012 (Marc Newsome).
Fig. 32. Lesser yellowlegs *Tringa flavipes*, sewage works, São Vicente, 15 March 2013 (Kari Haataja).

Greenshank *Tringa nebularia* (Gunnerus, 1767)

SANTIAGO: a bird colour-ringed as a juvenile at Tarty, Ithan estuary, Scotland, 18 August 2008, was present at Barragem de Poilão, 4-5 March 2013 (HD), and again, 3-5 November 2014 (HD). The same individual had been seen in Santiago on several previous occasions, while no other sightings between Scotland and Santiago have been reported. In Cape Verde, greenshank is a regular and not uncommon Palearctic visitor.

Lesser yellowlegs *Tringa flavipes* (Gmelin, 1789)

(0, 23) SÃO VICENTE: 1-3 at the sewage works, 30 September-21 December 2012 (JB, MR, RP, CGR), and two there, 15 March 2013 (KH, KW). SAL: one at the sewage farm near Santa Maria, 3 February 2014 (JLI), and again one there, 31 March 2014 (TK). BOA VISTA: one near Curral Velho, 30 March 2012 (AC); two at Lacacão, 23-26 January 2013 (SC), again two there, 7-8 March 2013 (HD), and 2-4 there, 14-17 April 2013 (MK), are here counted as a single record; one at Lacacão, 14 April 2014 (MC); one at Lagoa de Rabil (Ribeira d'Agua), 7-8 November 2014 (HD). MAIO: one at Ribeira Dom João, 11 December 2012 (CGR). Lesser yellowlegs has been recorded (September-April) from Santiago (3), São Vicente (6), Sal (7), Boa Vista (6) and Maio (1). Lesser yellowlegs is the Nearctic vagrant wader most often recorded in Cape Verde. In West Africa, there are records (September-April) from Mauritania, Senegal, Gambia, Ghana and Nigeria (Borrow & Demey 2014).

Spotted sandpiper *Actitis macularius* (Linnaeus, 1766)

(0, 11) SANTIAGO: one at Pedra Badejo, 31 December 2011 (MMJ); one at Barragem de Poilão, 21 March 2012 (CH), is taken to have been the same bird seen there, 2 March 2012 (cf. Zoologia Caboverdiana 3: 21, 2012). SÃO VICENTE: 1-2 at the sewage works, 2-21 December 2012 (MR, RP, CGR). Spotted sandpiper, a Nearctic vagrant, has been recorded (October-March) from Santiago (3), Santo Antão (2) and São Vicente (6). In West Africa, there are single records from Senegal and Cameroon (Borrow & Demey 2014).

Grey phalarope *Phalaropus fulicaria* (Linnaeus, 1758)

(--, 14) CAPE VERDE SEAS: one at Tarrafal bay, off São Nicolau, 18 April 2012 (AN). Grey phalarope, a Holarctic visitor, has been recorded (October-May) from from São Vicente (1), Sal (1) and Cape Verde seas (12), but is probably largely overlooked due to its pelagic habits. In West Africa, it is a rare, mainly pelagic, visitor (Isenman *et al*. 2010, Borrow & Demey 2014).

Fig. 33. Grey phalarope *Phaloropus fulicaria*, Tarrafal bay, off São Nicolau, 18 April 2012 (Albero Nava).

Ruddy turnstone *Arenaria interpres* (Linnaeus, 1758)

SAL: a bird colour-ringed at Delaware Bay, New Jersey, USA, 20 May 2009, was sighted near Santa Maria, Sal, 25 October 2013 (see http://www.scvz.org/info0114.html). In Cape Verde, ruddy turnstone is a common and widespread, mainly coastal, Holarctic winter and passage migrant, recorded from all islands and islets.

Pomarine skua *Stercorarius pomarinus* (Temminck, 1815)

(--, 8) BOA VISTA: a 2nd year pale morph bird in poor condition was caught at sea and brought to Sal Rei, 26 May 2013, where it recovered and was later released (CR). The number of pre-1980 records, involving a few sightings of groups and individuals at sea, is unclear. During the years 1980-1996, there were four sightings of individual birds, but the present is only the second record since. The count of eight records since 1980 is a conservative estimate, as individual birds may in some cases have been re-sighted on different dates. The main wintering area of pomarine skua is in the Senegal upwelling zone between latitudes 08º and 20º N (Borrow & Demey 2014), but it apparently only rarely occurs west of longitude 20º W.

Fig. 34. Pomarine skua *Stercorarius pomarinus*, Sal Rei, Boa Vista, 26 May 2013 (Christian Roder).

Great skua *Stercorarius skua* (Brünnich, 1764)

(3, 14) BOA VISTA: one at sea heading north off Ponta Laginha, 28 January 2013 (SC). Most of the post-1980 records are from the Raso-Branco area, but the two most recent records are of birds seen off Boa Vista. In addition, there are a number of sightings of unidentified skuas *S. skua/maccormicki*. In West Africa, great skua is an uncommon to rare offshore Palearctic visitor (Borrow & Demey 2014).

Gull-billed tern *Gelochelidon nilotica* Gmelin, 1789

(0, 8) BOA VISTA: a juvenile at Lacacão, 1-7 November 2014 (HD). Gull-billed tern has now been recorded (October-January, April) from Santiago (1), Boa Vista (3) and Maio (4). In West Africa, it is a locally common to rare Palearctic visitor, both inland and coastal; breeds locally in Mauritania and Senegal (Borrow & Demey 2014).

Fig. 35. Gull-billed tern *Gelochelidon nilotica*, Lacacão, Boa Vista, 1 November 2014 (Georges Olioso).

Fig. 36. Caspian tern *Hydroprogne caspia*, Lagoa de Rabil (Ribeira d'Agua), Boa Vista, 27 January 2013 (Sampsa Cairenius).

Caspian tern *Hydroprogne caspia* (Pallas, 1770)

(0, 14) BOA VISTA: one at Lagoa de Rabil (Ribeira d'Agua), 12-16 June 2012 (RF), and singles there, 27-29 January 2013 (SC), 6 February 2013 (PLS), 3 March 2013 (HD), 14 April 2013 (MK), and 2 May 2013 (PLS), with those in January-May 2013 here counted as a single record of a long-staying bird; one at Lagoa de Rabil (Ribeira d'Agua), 21-30 December 2013 (FS), one there, 30 January 2014 (PLS), and again one there, 20 March 2014 (NA). Caspian tern has been recorded (September, November-June) from São Vicente (1), Boa Vista (10), Maio (2) and at sea (1). In West Africa, it is a common to fairly common migrant visitor along the entire coast and a resident breeder from Mauritania to Guinea (Borrow & Demey 2014).

Common tern *Sterna hirundo* Linnaeus, 1758

(2, 15) SANTIAGO: one off Praia, 16 April 2013 (KD). Common tern has been recorded (October, December, January, April-June) from Santiago (5), Santo Antão (1), Sal (6), Boa Vista (3), Maio (1) and at sea (1). In West Africa, it is a common resident (breeds annually Mauritania and occasionally Senegal, Guinea-Bissau, Nigeria and Gabon) and intra-Afrian migrant and Palearctic visitor (Borrow & Demey 2014).

Arctic tern *Sterna paradisaea* Pontoppidan, 1763

(--, 5) CAPE VERDE SEAS: three at 16º11'57"N, 22º57'12"W, 4 May 2014 (PLS), and two at 16º08'44"N, 22º56'39"W, 11 May 2014 (AA, PLS), both off western Boa Vista. These are the first records of arctic tern since October 2001. Pre-1980 records are of flocks off several islands, difficult to tally down to an unequivocal number of sightings (cf. Lambert 1980). Arctic tern is probably a not uncommon Holarctic passage migrant, which remains largely unreported due to its pelagic habits during migration. In West Africa, it is a fairly common to rare, mostly pelagic visitor (Borrow & Demey 2014).

Fig. 37. Arctic tern *Sterna paradisaea*, off western Boa Vista, 4 May 2014 (Pedro López Suárez).

Little tern *Sternula albifrons* (Pallas, 1764)

(0, 21) BOA VISTA: one at Lagoa de Rabil (Ribeira d'Agua), 8-12 March 2012 (CG), one there, 29 January 2013 (SC), four there, 19-30 December 2013 (FS), and 2-3 there, 2-8 November 2014 (HD). All but one of little tern records in Cape Verde are from Lagoa de Rabil and the nearby shore in Boa Vista, where a few are usually present from October to April. The only record outside this area is of one in Maio in October 1988. Little tern breeds patchily along the coast and inland along large rivers and lakes in West Africa and also is a common to uncommon Palearctic winter visitor (Borrow & Demey 2014). Birds seen in Cape Verde are taken to be of the latter category.

***Whiskered tern** *Chlidonias hybrida* (Pallas, 1811)

(0, 1) SÃO VICENTE: one at the sewage works, 20-31 December 2012 (CGR). This is the first record of whiskered tern for Cape Verde. In West Africa, it is an uncommon to fairly common Palearctic visitor, mainly August-May, but recorded in all months (Borrow & Demey 2014).

Fig. 38. Whiskered tern *Chlidonias hybrida*, sewage works, São Vicente, 21 December 2012 (Tim Collins).

***White-winged tern** *Chlidonias leucopterus* (Temminck, 1815)

(0, 1) SANTIAGO: one at Barragem de Poilão, 29-31 December 2011 (MMJ). This is the first record of white-winged tern for the Cape Verde Islands. In West Africa, it is a fairly common to common Palearctic visitor, mainly from late October to early May (Borrow & Demey 2014).

Eurasian collared dove *Streptopelia decaocto* (Frivaldsky, 1838)

(0, > 25) SANTIAGO: two south of Pedra Badejo, 18 June 2012 (RF); two at Pedra Badejo lagoon, 22 August 2012 (CL); three at Cidade Velha, 25 August 2012 (CL); two at Achada Fazenda, 28 October 2012 (UF), and six there, 5 March 2013 (HD); two at Ribeira da Prata, 29 November 2013, three near Pedra Badejo, 30 November 2013 (AP); one at Santa Cruz, 29 May 2014 (SM); one at Calheta de São Miguel, 9 December 2014 (AP); five at Barragem de Poilão, 3-5 November 2014 (HD); one in flight at Ribeira Filipe, Praia, 5 November 2014 (HD). SAL: one at sea coming from a southwesterly direction, flying fast just above the water surface, and alighting at Pesqueirona, 9 April 1996 (CJH); one at the sewage works near Santa Maria, 17 October 2014 (JC). BOAVISTA: 1-2 at Rabil, 14-15 June 2012 (RF), 2-3 there, 24 January 2013 (SC), five there, 14 April 2013 (MK), one there, 27 December 2013 (FS), and four there, 2 November 2014 (HD); one a Ribeira do Norte, 2 November 2014 (HD).

Eurasian collared dove now appears to be well-established at several locations in Santiago, Sal and Boa Vista. There is also a record from São Nicolau in November 2009, but no further reports have come forward from that island, perhaps reflecting a lack of observers rather than an absence of doves. It seems almost certain that the taxon will continue its range expansion and will appear in other islands as well. Thus far, the first record for Cape Verde was taken to be of one in Sal in April 2006. A record, also from Sal, pre-dating that observation by 10 years, has been re-evaluated and accepted (see above). In West Africa, this Palearctic dove has now extended its range from Morocco to Mauritania (Borrow & Demey 2014).

Fig. 39. Eurasian collared dove *Streptopelia decaocto*, Rabil, Boa Vista, 24 January 2013 (Sampsa Cairenius).

Short-eared owl *Asio flammeus* (Pontoppidan, 1763)

(0, 12) SANTIAGO: one at Barragem de Poilão and one at Serra da Malagueta, 27 August 2012 (CL). Short-eared owl has been recorded (August, October-April) from Santiago (2), Raso (4), Sal (3) and Maio (1), with another two seen from ships at sea between the islands. In West Africa, it is a rare to uncommon Palearctic visitor (Borrow & Demey 2014).

Plain swift *Apus* cf. *unicolor* (Jardine, 1830)

BOA VISTA: up to five around Riu Touareg Hotel (Lacacão), 27-30 July 2012 (MN), were tentatively identified as plain swifts. Expert advise on the taxonmic identity of the swifts depicted in Fig. 40-42 was sought, but did not lead to an unequivocal opinion, with some being in favour of *unicolor*, while others maintained that it could not possibly be that taxon, suggesting a variety of alternatives. Further comments by anyone feeling qualified to do so will be welcomed by the author. Two accepted records (February 1999 and March 2000) of plain swift were also from Boa Vista. Plain swift breeds in Madeira and the Canary Islands, but its wintering area in West Africa – presumably from Morocco southwards to at least Mauritania – remains largely undefined. It has been recorded in Mauritania from October to March and in June (Isenmann *et al.* 2010).

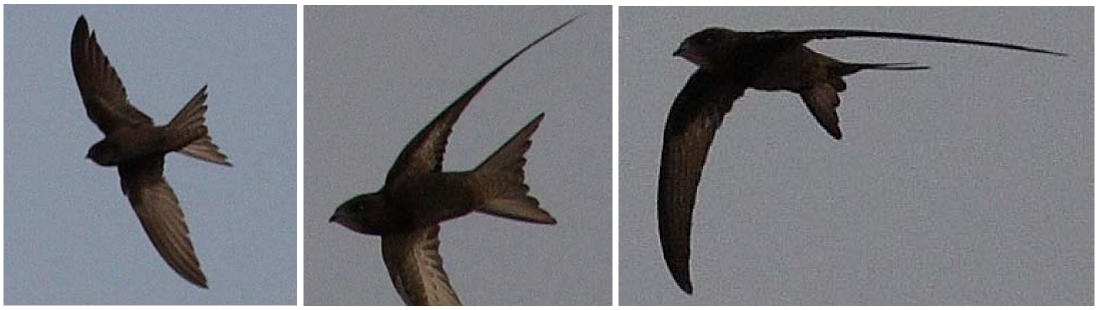

Fig. 40-42. Plain swift *Apus* cf. *unicolor*, Lacacão, Boa Vista, 27 July 2012 (Marc Newsome).

***Little swift** *Apus affinis* (J.E. Gray, 1830)

(0, 1) BOA VISTA: three around Hotel Karamboa (Praia de Chaves), 20-21 December 2013 (FS). This is the first record of little swift for the Cape Verde Islands. In West Africa, it is a common resident (Borrow & Demey 2014), but some dispersal apparently takes place, as demonstrated by the present record in Boa Vista. As it often builds nests on man-made structures, observers should remain alert for the possibility of breeding in Cape Verde.

Fig. 43-44. Little Swift *Apus affinis*, Hotel Karamboa (Praia de Chaves), Boa Vista, 21 December 2013 (Fredrik Ström).

European bee-eater *Merops apiaster* Linnaeus, 1758

(1, 8) SANTIAGO: one at Tarrafal, 17 April 2012 (KD). SÃO VICENTE: two at the sewage works, 29-30 December 2014 (CGR). European bee-eater has been recorded (August-May) from Santiago (1), São Vicente (2), São Nicolau (1), Sal (2) and Boa Vista (3). In West Africa, it is a locaaly fairly common to scarce Palearctic visitor (Borrow & Demey 2014).

Hoopoe *Upupa epops* Linnaeus, 1758

(1, 8) FOGO: one at Achada Grande, 11 November 2013 (SM). BOA VISTA: one at Curral Velho, 2 August 2013 (SM). Hoopoe has been recorded (August-May) from Fogo (1), Santo Antão (1), São Vicente (1), Sal (3) and Boa Vista (3). In West Africa, it is a fairly common to scarce Palearctic visitor and resident breeder (Borrow & Demey 2014). Birds seen in Cape Verde are most likely Palearctic migrant visitors.

Common sand martin *Riparia riparia* (Linnaeus, 1758)

(2, 21) SANTA LUZIA: one on 6 October 2012 (JB). BOA VISTA: one near the Riu Touareg Hotel (Lacacão), 17 April 2013 (MK). Common sand martin has been recorded (August-October, February-April) from Santiago (2), São Vicente (5), Santa Luzia (1), Raso (1), São Nicolau (5), Sal (8) and Boa Vista (1). In West Africa, it is an uncommon or rare to locally common Palearctic visitor (Borrow & Demey 2014). With 21 records since 1988, it is clear that sand martin is a scarce but regular migrant visitor to the Cape Verde Islands and, apart from new island records or exceptional numbers or circumstances, it will not be included in future reports.

***Rock martin** *Ptyonoprogne fuligula* (Lichtenstein, 1842)

(0, 1) SAL: one at Ribeira da Fontona, 8 January 2008 (CGR). This is the first record of rock martin for the Cape Verde Islands. This bird was mistakenly reported as crag martin *P. rupestris* in the 6th Cape Verde Bird Report (cf. Zoologia Caboverdiana 1: 38, 2010) and – the erroneous record being the only one – crag martin should be removed from the Cape Verde list. In West Africa, rock martin is a locally fairly common to common resident (Borrow & Demey 2014).

Red-rumped swallow *Cecropis daurica* (Laxmann, 1769)

(0, 20) SANTIAGO: one at Barragem de Poilão, 14 April 2012 (KD). SÃO VICENTE: one at the sewage works, 20-21 December 2012 (CGR). SAL: at least one at Santa Maria, 30 April 2014 (JC). BOA VISTA: one at Povoação Velha, 17 March 2012 (CG). Red-rumped swallow has been recorded (December-April) from Santiago (3), São Vicente (6), Branco (1), São Nicolau (3), Sal (5) and Boa Vista (2). In West Africa, it is a generally uncommon Palearctic visitor (Borrow & Demey 2014). Red-rumped swallow and West African swallow *C. domicella* are often treated as conspecific, the latter being a scarce to locally common resident and partial intra-African migrant (Borrow & Demey 2014). Birds seen in Cape Verde are most likely *daurica* rather than *domicella*.

Tree pipit *Anthus trivialis* (Linnaeus, 1758)

(0, 7) SANTA LUZIA: one on 3 October 2012 (JB). Tree pipit has been recorded (September-November, March-April) from Santa Luzia (1), Raso (1), São Nicolau (1), Sal (1), Boa Vista (2) and Maio (1). In West Africa, it is a common to uncommon Palearctic visitor from September to April (Borrow & Demey 2014).

Fig. 45. Red-throated pipit *Anthus cervinus*, Ribeira d'Agua, Boa Vista, 28 December 2013 (Fredrik Ström).

Red-throated pipit *Anthus cervinus* (Pallas, 1811)

(0, 9) BOA VISTA: one at Lagoa de Rabil (Ribeira d'Agua), 27-28 December 2013 (FS). Red-throated pipit has been recorded (December-March) from São Vicente (3), Sal (5) and Boa Vista (1), those from São Vicente and Sal all being from the sewage works in these islands. In West Africa, it is a locally common to scarce Palearctic visitor from September to May (Borrow & Demey 2014).

Common nightingale *Luscinia megarhynchos* (C.L. Brehm, 1831)

(0, 2) SANTA LUZIA: one in acacia trees at Portinho, 4 October 2012 (JB). This is only the second record of common nightingale for Cape Verde, the previous being of one at Curral Velho, Boa Vista, in September 1988. In West Africa, it is an uncommon to common Palearctic visitor from late August to early May (Borrow & Demey 2014).

Common redstart *Phoenicurus phoenicurus* (Linnaeus, 1758)

(0, 4) SANTA LUZIA: one in acacia trees at Portinho, 4 October 2012 (JB). Common Redstart has been recorded (October, March) from Santa Luzia (1), Sal (2) and Boa Vista (1). In West Africa, it is a fairly common to uncommon Palearctic visitor from September to May (Borrow & Demey 2014).

Willow warbler *Phylloscopus trochilus* (Linnaeus, 1758)

(0, 10) SANTA LUZIA: one in acacia trees at Portinho, 15-16 October 2012 (JB). Willow warbler has been recorded (September, October, December, January, March) from São Vicente (1), Santa Luzia (1), Raso (1), São Nicolau (3), Sal (1) and Boa Vista (3). In West Africa, it is a common Palearctic visitor, mainly from September to May (Borrow & Demey 2014).

***Yellow-browed warbler** *Phylloscopus inornatus* (Blyth, 1842)

(0, 2) SANTIAGO: one at São Jorge dos Orgãos, 11 March 2013 (PK). SÃO NICOLAU: > 3 at Parque Natural do Monte Gordo, 5 January, and singles there, 6-9 January 2014 (AP). These are the first records of yellow-browed warbler for the Cape Verde Islands. In West Africa, there are single records from Senegal and Gambia (Borrow & Demey 2014).

Fig. 46. Yellow-browed warbler *Phylloscopus inornatus*, São Jorge dos Orgãos, 11 March 2013 (Petri Kuhno). Fig. 47. Yellow-browed warbler *Phylloscopus inornatus*, PN Monte Gordo, São Nicolau, 5 January 2014 (Andrew Power).

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Short Note | Nota Breve

A recent record of *Cymindis alutacea* Wollaston, 1867 (Coleoptera: Carabidae) from São Nicolau, Cape Verde Islands

Joshua Jenkins Shaw

Keywords: Coleoptera, Carabidae, *Cymindis alutacea*, rediscovery, São Nicolau Island, Cape Verde Islands

The ground beetle genus *Cymindis* is the most species rich amongst genera in the carabid subtribe Cymindidina (tribe Lebiini). Four subgenera are often recognized, i.e. *Cymindis* (*sensu stricto*) Latreille, *Afrotarus* Jeannel, *Taridius* Chaudoir and *Pinacodera* Schaum. *Cymindis* (*sensu stricto*) has a predominately Holarctic distribution (Hunting 2013) and includes *Cymindis alutacea* Wollaston, *C. dohrnii* Wollaston and *C. anchomenoides* Wollaston (the last one sometimes placed in *Tarulus* Bedel, either ranked as a genus or a subgenus), all three endemic to the Cape Verde Islands (Geisthardt 1988, 1996).

Fig. 1. Satellite image with yellow marker indicating the site where the two specimens of *Cymindis alutacea* were collected in São Nicolau, providing some context of the locality with regard to altitude (Google Earth).

During ornithological research in the island of São Nicolau, Cape Verde Islands, two ground beetles (Carabidae) were collected from under stones in Parque Natural do Monte Gordo, *ca*. 1 km from the village of Cachaço (Fig. 1 & 4), 5 January 2014. The specimens (now deposited in the author's private collection; Fig. 3) were collected at approximately 16°37'11"N, 24°20'37"W by fellow research assistant Andrew Power and the author. The altitude of the location was subsequently determined to be 984 m, using the online resource Daft Logic http://tinyurl.com/abv4lx. Upon return to the United Kingdom, the specimens were taken to the Natural History Museum (BMNH) in London for identification. The collection of Thomas Vernon Wollaston forms the major catalogue of the coleopterous fauna from the Cape Verde Islands and the two specimens collected in January 2014 were compared to specimens from Wollaston's collection. These were collected by John Gray and the Rev. R. T. Lowe during a six weeks long sojourn in the Cape Verde Islands, from mid February to early April 1864, aboard the yacht *The Garland*. Wollaston himself was in the Cape Verde Islands, together with Gray and Lowe and aboard the same yacht, in January and February 1866, but he did not visit São Nicolau.

The recent specimens were clearly similar to those of *Cymindis alutacea* in the Wollaston collection. Further comparison of the specimens collected in 2014 with Wollaston's specimens under a microscope revealed the following characters (the combination of which is considered diagnostic for *C. alutacea*) were identical: antennal segments 1 to 4 sparsely pubescent, segments 5 to 11 densely pubescent, antennal segments 5 to 11 slightly darker than segments 1 to 4, mandibles produced forward, two setae on the inner margin of each eye, 2 to 3 legions between the frons and each eye, light but dense punctuation in the pronotal foveae, front angles of the pronotum slightly produced, pronotum with visible microsculpture, pronotal hind angles slightly toothed, scutellum on the waist, shoulder of elytra evenly rounded, claws toothed internally, femora, tibia and tarsi unicolourous pale brown.

Fig. 2. Specimens of *Cymindis alutacea* in the Thomas Vernon Wollaston collection housed at the Natural History Museum (BMNH), London; the far left specimen is the type. Fig. 3. One of the specimens of *Cymindis alutacea* collected at Monte Gordo, São Nicolau, 5 January 2014, in the private collection of the author (photos by Joshua Jenkins Shaw).

Fig. 4. Habitat near the collecting site of *Cymindis alutaceus*, Parque Natural do Monte Gordo, São Nicolau, Cape Verde Islands, 5 January 2014 (photo by Joshua Jenkins Shaw).

In the Wollaston collection, *Cymindis alutacea* is labelled as *Cymindis alutaceus* under the following taxonomy: Subf. Lebiades.: Platytarus, Fairm.: Faminii, Dej.: *Tarus*, Clairv.: *Cymindis*, Latr. Five specimens of *C. alutacea* exist in Wollaston's collection, including the type specimen (Fig. 2). No other specimens of *C. alutacea* are catalogued in the collections of BMNH (Max Barclay *pers. comm*.). The five specimens were all collected in São Nicolau, as indicated by the presence of blue on the bottom right corner of the card on which the specimens are glued. Wollaston (1867: 8) stated about *Tarus alutaceus* n. sp. (= *Cymindis alutacea*): "Several examples of this fine *Tarus* were taken by Mr. Gray and the Rev. R. T. Lowe, from beneath stones, on Monte Gordo, the highest peak in S. Nicolao, during February 1864. Its large size, reddish-brown hue, and alutaceous (but almost unpunctulated) surface, combined with its rather wider and more margined prothorax, and the somewhat more obtusely rounded humeral angles of its slightly wider elytra, will readily separate it from the following two species." The 'two following species' Wollaston referred to are *Tarus dohrnii* Wollaston 1867 and *Tarus anchomenoides* Wollaston 1867 (both of which are usually placed in *Cymindis* today), collected in Santo Antão and São Vicente, respectively, the former by Heinrich Dohrn of Stettin, who was in the Cape Verde Islands from December 1864 to March 1865 (Groh 2012), the latter by Gray and Wollaston during their visit to the Cape Verdes in 1866. As for *C. dohrnii*, Alluaud (1925: 87) remarked: "Probablement simple variété du précédent" (i.e. *C. alutacea*), but this view has not been endorsed by subsequent workers (cf. Mateu 1964, Geisthardt 1988, 1996). However, it should be noted that Wollaston (1867: 8-9) also reflected on the possibility that *C. dohrnii* "may represent but a permanent insular state of the preceding species [i.e. *C. alutacea*], peculiar to S. Antão", but having only a single specimen at his disposal did "not think it would be safe to treat it practically as such" and "therefore retained it as disinct". Mateu (1964) speculated that *C. alutacea* and *C. dohrnii* share a common ancestor that arrived in the archipelago relatively recently, with the populations in the islands of São Nicolau and Santo Antão only having differentiated after becoming settled on their respective islands.

C. alutacea appears to have not been collected or reported alive since Wollaston (1867) and its status was given as 'indeterminate' by Geisthardt (1996). The specimens collected at Monte Gordo in January 2014 provide evidence that this endemic ground beetle persists at or very close to the type locality.

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Short Note | Nota Breve

First breeding records of black-winged stilt *Himantopus himantopus* (Linnaeus, 1758) in the island of Maio

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Keywords: Recurvirostridae, *Himantopus*, black-winged stilt, breeding, Cape Verde Islands, Island of Maio

Black-winged stilt *Himantopus himantopus* (Linnaeus, 1758) has a wide geographical distribution, including France and southern Iberia to sub-Saharan Africa and Madagascar, and east to central Asia and northern central China, India, Sri Lanka, Indochina and Taiwan (Pierce 1996). On the African mainland, breeding sites nearest to the Cape Verde Islands are in Mauritania and Senegal (Isenmann *et al.* 2010, Borrow & Demey 2014).

Black-winged stilt breeds in a wide range of habitats, which may include freshwater areas or saline environments, such as coastal lagoons with broad areas of mudflats, salt meadows (Johnsgard 1981), saltpans, coastal marshes and swamps (Cramp 1983, Pierce 1996). Usually, black-winged stilts breed in colonies typically of 2-50 pairs, and incubation is done by both sexes, lasting between 22 and 26 days (Pierce 1996). Nests are usually widely spaced on the ground, near water (Cuervo 2003), and are very diverse, ranging from a shallow scrape with little lining to quite substantial nests of available vegetation (Cramp 1983).

Fig. 1-2. Nests and eggs of black-winged stilt *Himantopus himantopus*, Salinas do Porto Inglês, Maio, Cape Verde Islands, 5 June 2014 (© Fundação Maio Biodiversidade).

Fig. 3. Chicks of black-winged stilt *Himantopus himantopus*, Salinas do Porto Inglês, Maio, Cape Verde Islands, 18 June 2014 (© Fundação Maio Biodiversidade).

The only regular breeding site of black-winged stilt in the Cape Verde Islands is at the Pedra de Lume saltpans in Sal Island (Hazevoet 1995), where it was first found breeding during the early 1960s (Naurois 1965, Naurois & Bonnaffoux 1969). During the mid 1960s, the population at Pedra de Lume was estimated at 30-40 pairs (Naurois & Bonnaffoux 1969), while counts during the years 1987-1990 yielded *ca.* 75 birds, including juveniles (Hazevoet 1995). During the past decade, 1-2 pairs occassionally bred at the Santa Maria saltpans, also in Sal Island (Hazevoet 2010, J. Cozens *in litt.*). Sightings of non-breeding black-winged stilts, presumably wanderers from the Sal population, have been recorded in the islands of Santiago, São Vicente, Boavista and Maio (Hazevoet 1995, 2010). Non-breeding birds had been collected in the Cape Verde Islands as early as 1924, these being the only reports from the archipelago before it was found breeding during the 1960s (Hazevoet 1995). Here we report the first breeding records of black-winged stilt for the island of Maio, giving details on clutch size and egg measurements.

On 21 May 2014, we observed a pair of black-winged stilts mating at Salinas do Porto Inglês, a saltpan area located in the southwest of the island of Maio. A few weeks later, on 5 June 2014, we returned to the same area and found two black-winged stilt nests, placed on the ground and close to water. The clutch-size of the two nests was 3 (15°8'42"N, 23°13'18"W; Fig. 1) and 4 eggs (15°8'45"N, 23°13'20"W; Fig. 2), respectively. We measured the length and width of each egg with a sliding calliper. The 3-egg clutch had a mean egg length of 39.73 mm and a mean egg width of 28.03 mm. The mean egg length of the 4-egg clutch was 40.15 mm and the mean width 27.73 mm. We found a third black-winged stilt nest at Salinas do Porto Inglês (15°8'50"N, 23°13'27"W) one month later, on 5 July 2014, with a clutch composed of 4 eggs. These eggs had a mean length of 37.68 mm and a mean width of 25.88 mm. Although the clutch-size of the nests we found at Salinas do Porto Inglês are within the normal clutch size of the species (i.e. 3-5 eggs) (Cuervo 2003), the egg dimensions are below the average. Cramp (1983) and Pierce (1996) reported an average dimension of 44 mm in length and 31 mm in width for black-winged stilt's eggs. Adamou *et al.* (2009) linked an egg size decreasing tendency with a progressive drying of a wetland area, thus decreasing habitat quality and making the access of predators to clutches easier. However, we cannot test this assumption without a habitat quality assessment and a bigger sample size.

A few days after finding the first two nests, we returned to Salinas do Porto Inglês, on 18 June 2014, and found two newborn black-winged stilt chicks (15°8'48"N, 23°13'22"W; Fig. 3). The chicks were close to the 3-egg clutch nest we had previously found and the adult birds were nearby. We collected blood samples for posterior analysis and measured their right tarsus (chick 1 = 28.0 mm; chick 2 = 25.8 mm), bill (chick 1 = 12.5 mm; chick 2 = 9.70 mm), and weight (chick 1 = 10.62 g; chick 2 = 12.36 g). Another chick was sighted (15°13'24"N, 23°12'58"W) on 15 June 2014, near to adult birds, in a small lagoon close to Calheta de Baixo, suggesting this is another breeding locality of black-winged stilt in the island of Maio. Our breeding dates agree with those from Pedra de Lume in Sal, where breeding has been reported from late February to July, with both eggs and downy young found throughout these months (Naurois & Bonnaffoux 1969, Naurois 1986, Hazevoet 1995).

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