

New records of the olive ridley sea turtle *Lepidochelys olivacea* (Eschscholtz, 1829) from the Cape Verde Islands

Nuria Varo-Cruz¹, Pedro López-Suárez^{2,3}, Jacquie Cozens⁴, Ana Liria-Loza^{1,3}, Jacques Fretey⁵ & Luis Felipe López-Jurado^{1,3}

Keywords: marine turtle, olive ridley, *Lepidochelys olivacea*, stranded, distribution, Atlantic, Africa, Cape Verde Islands

ABSTRACT

The olive ridley sea turtle *Lepidochelys olivacea* has been recorded in the Cape Verde Islands, but the most recent published data (1998-2000) are of stranded individuals and remains only. This article presents new data on olive ridleys recorded during the years 2001-2011 on Boavista and Sal islands. The presence of this species does not appear to be related to nesting activity. The possible geographical origin of these turtles is discussed. In addition, we propose some studies that could help to reinforce the conservation of sea turtles in West Africa.

RESUMO

A tartaruga olivácea *Lepidochelys olivacea* tem sido descrita nas ilhas de Cabo Verde. Os dados publicados mais recentes (1998-2000) dão conta de indivíduos encalhados e a restos encontrados nas praias. Este artigo reúne novos dados desta espécie registados nos últimos anos (2001-2011) nas ilhas de Boavista e Sal. A presença desta tartaruga nas águas do arquipélago não parece ter relação com a actividade de desova. Para esclarecer a possível origem destas tartarugas em Cabo Verde são discutidas algumas hipóteses. São igualmente propostas algumas pesquisas que poderiam contribuir para fortalecer a conservação das tartarugas marinhas na África Ocidental.

¹ Dpto. de Biología, Universidad de Las Palmas de Gran Canaria, Campus de Tafira, 35017 Las Palmas de Gran Canaria, Gran Canaria, Spain; e-mail nuriavaro@hotmail.com

² Naturalia Capa Verde Lda, Sal Rei, Boavista, Republic of Cape Verde

³ Cabo Verde Natura 2000, Sal Rei, Boavista, Republic of Cape Verde

⁴ SOS Tartarugas, Santa Maria, Sal, Republic of Cape Verde

⁵ Centre de conservation des tortues marines – Chélonée, Mas du Ringué, 46260 Beauregard, France

INTRODUCTION

On a global scale, the olive ridley sea turtle *Lepidochelys olivacea* is considered the most abundant species of marine turtle (Marcovaldi 2001), although its conservation status varies among different populations (Spotila 2004). At present the species is categorized as vulnerable on the IUCN Red List (IUCN 2011). The species is distributed in tropical and subtropical waters worldwide. In the Pacific Ocean, the nesting distribution ranges from the beaches of southern Mexico to Ecuador (Spotila 2004, Alava *et al.* 2007). In the central Indian Ocean, the beach holding the largest number of nests is located on the eastern coast of India, while nesting also occurs in Sri Lanka, Pakistan and Bangladesh (Spotila 2004). In the western Indian Ocean basin there are nesting beaches in Oman, Kenya, Tanzania and Mozambique (Spotila 2004). In the western Atlantic Ocean, nesting areas are scarce, with some nesting areas in the Guyanas and Brazil (Reichart & Fretey 1993, Marcovaldi 2001, da Silva *et al.* 2007, Kelle *et al.* 2009). Olive ridleys nest *en masse* on some beaches, especially in Ostional and Nancite (Costa Rica), La Escobilla (Mexico) and Gahirmatha (India) (Spotila 2004). This kind of event is known as *arribada* and consists of thousands of females emerging to nest on the same beach, with each laying event lasting several days (Marcovaldi 2001). Nevertheless, solitary nesting is the more common laying strategy on most nesting grounds (IUCN 2011).

The olive ridley sea turtle is an omnivorous species, with a rather unspecialized diet. Like the loggerhead sea turtle *Caretta caretta*, it appears to show a more plastic foraging behavior than other sea turtle species (McMahon *et al.* 2007). While Australian females feed in neritic waters (McMahon *et al.* 2007, Whiting *et al.* 2007), males and females from the eastern tropical Pacific spend most of their time outside the breeding

season in an oceanic environment and have been characterized as nomadic, highly migratory oceanic wanderers (Plotkin 2010). On the other hand, some adult females from Oman appear to be sedentary (Papathanasopoulou 2009). Thus far, little is known about the early life ecology and movements of olive ridleys (Spotila 2004). In the Central Pacific, juveniles from both eastern and western Pacific populations are found in an oceanic habitat (Polovina *et al.* 2004).

Compared to other areas, knowledge about the life cycle and distribution of marine turtles in the eastern Atlantic is poor (Formia *et al.* 2003, Fretey 2001). According to current knowledge, the olive ridleys' northern limit of distribution could be in Mauritania (Carr 1957), as its presence there was recently confirmed by at sea captures of adult individuals (Mint-Hama *et al.* in press). The occurrence of olive ridleys north of the Canary Islands and Madeira seems to be accidental (Fretey 2001).

Along the western African coast, the olive ridley sea turtle nests from Guinea Bissau (Bijagós archipelago) to Angola, regularly at some localities and incidental at others (Carr & Campbell 1995, Fretey 1999, Fretey *et al.* 2005, Pauwels & Fretey 2008, Godgender *et al.* 2009, Catry *et al.* 2010, Ségniagbeto *et al.* in press, J. Gómez pers. comm.). The possibility of the olive ridley nesting in southern Senegal (Casamance region) cannot be dismissed, but there are as yet no confirmed records (Diagne 1999).

Immature olive ridleys have been captured incidentally (Angoni *et al.* 2010) along the coast of Cameroon, suggesting that these waters (which are rich in sediment and shrimp) may be developmental areas. Adults are widespread year-round in oceanic waters off Angola (Weir *et al.* 2007) and in waters off Congo (Godgender *et al.* 2009) and this area probably constitutes a

feeding ground for turtles nesting along these coasts.

In the Cape Verde Islands, most recent (1998-2000) records of olive ridleys are of stranded individuals (both dead and alive) and remains (carapaces) (Fretey 2001). L.F. López-Jurado (in Fretey 2001) reported carapaces displayed in gift shops on Sal island and mentioned stranded olive ridley turtles on Sal and São

Nicolau. Fretey (2001) reported six records of carapaces or remains of dead turtles on Maio (1), Santa Luzia (1), Santiago (1) and Boavista (3), as well as an entangled live individual on Boavista. Here we present new data on olive ridleys recorded during the past decade (2001-2011) on two islands in the Cape Verde archipelago (Boavista and Sal) and discuss their possible geographical origin.



Fig. 1. Olive ridley *Lepidochelys olivacea*, found at Atalanta beach, Boavista, 4 November 2004 (Nuria Varo-Cruz). Fig. 2. Olive ridley, Baía Grande, Boavista, 26 January 2010 (Jon Crighton).

RECENT OCCURRENCES IN THE CAPE VERDE ISLANDS

The records here reported were brought to our attention by fishermen and local inhabitants as well as tourists, who informed Cabo Verde Natura 2000 or SOS Tartarugas, both NGOs working in the archipelago.

On 4 November 2004, an olive ridley was delivered alive to the staff of Cabo Verde Natura 2000. This turtle was found stranded along the shore of Atalanta beach, northern Boavista, showing obvious dehydration symptoms, malnutrition and buoyancy difficulties. Despite treatment, it died after a few days (Fig. 1).

On 26 January 2010, an olive ridley was found at Baía Grande beach, northern

Boavista. The turtle was floating near the shore and appeared to be in poor shape. After pictures being taken, the turtle was released (Fig. 2).

On 27 November 2010, local fishermen caught an olive ridley, with a deformed carapace and both left flippers missing, off southern Sal. This turtle was delivered to the staff of SOS Tartarugas and after a veterinarian checkup an euthanasia was done. The deformity of the carapace entailed a strong shift in the configuration of scutes and scales (Fig. 3).

On 28 March 2011, tourists found an entangled olive ridley at Atalanta beach, northern Boavista. After being disentangled it was released into the sea (Fig. 4).



Fig. 3. Olive ridley *Lepidochelys olivacea* with deformed carapace, captured off Santa Maria, Sal, 27 November 2010 (Jacquie Cozens/SOS Tartarugas Cabo Verde). Fig. 4. Olive ridley, Atalanta beach, Boavista, 28 March 2011 (Ian Ford).

Table 1 summarizes information of records of olive ridley sea turtles in the Cape Verde Islands. Information obtained from photos and measurements taken of some individuals show that records no. 1 and 7 were the smallest turtles recorded, their size being indicative of juveniles (cf. Fretey 2001). These two records are of

carapaces found in a house at Praia Gonçal (Maio island) and in the capital Praia (Santiago island) and, therefore, we cannot be entirely sure that they were captured or found in Cape Verde. The remaining records may concern either adults or large juveniles.

Record	Date	Location	Island	CCL/CCW	A/D/C	Condition
1	22 August 1999	Praia Gonçal	Maio	47/48	C	unknown
2	20 October 1999	Praia do Castelo	S. Luzia	–	C	unknown
3	01 December 1999	Ponta do Sol	Boavista	66/68	D	S, E
4	02 December 1999	Praia Atalanta	Boavista	–	A	S, E
5	08 April 2000	Praia de Galeo	Boavista	60/64	C	unknown
6	09 April 2000	Baía Pedra Alvim	Boavista	71/71.5	C	unknown
7	16 April 2000	Praia	Santiago	20/–	C	unknown
8	04 November 2004	Praia Atalanta	Boavista	–	A	S
9	26 January 2010	Baía Grande	Boavista	–	A	S
10	27 November 2010	Off Santa Maria	Sal	–	A	F
11	28 March 2011	Praia Atalanta	Boavista	–	A	S, E

Table 1. Records of olive ridley sea turtle *Lepidochelys olivacea* in the Cape Verde Islands during the years 1999–2011. Record 1 from Varo-Cruz *et al.* (1999) and Fretey (2001), records 2–7 from Fretey (2001), records 8–11 this paper. CCL: curve carapace length (cm), CCW: curve carapace width (cm). A: alive, D: dead, C: carapace or remains, S: stranded, E: entangled; F: floating.

DISCUSSION

Two factors need to be considered in relation to Fretey's (2001) Cape Verde records and those presented in this paper: 1) the condition of the individual turtles and 2) the location of the records (Fig. 5). Nine individuals found along the shore were either entangled, in bad health or dead. Since 1998, intensive surveys of sea turtle nesting have been conducted on

large stretches of Boavista's beaches, during which no nesting olive ridleys have been recorded. Thus, the presence of olive ridley in the Cape Verde Islands does not appear to be related to nesting activity. Therefore, we must seek another explanation for the presence of this species in the archipelago.

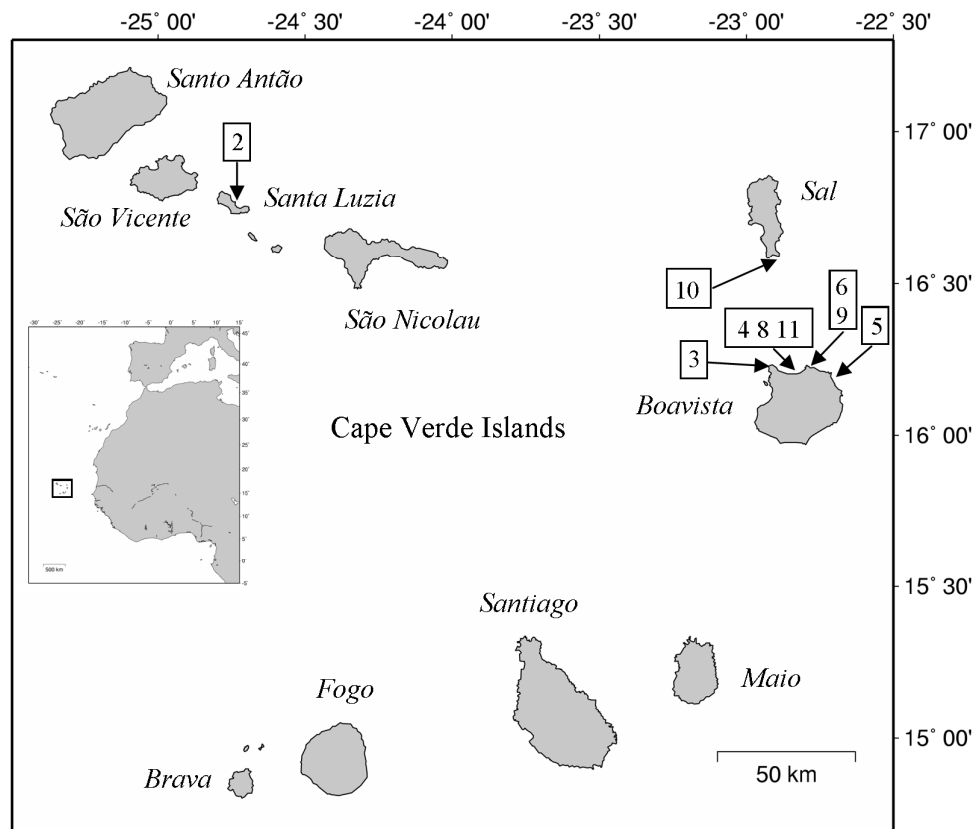


Fig. 5. Map of the Cape Verde Islands showing locations of records in Fretey (2001) and those reported in the present paper (except two carapaces found in private houses; Table 1: records 1 and 7). Adapted from seaturtle.org Maptool <http://www.seaturtle.org/maptool/> (accessed 6 September 2011).

The nesting beaches of olive ridleys in Guinea-Bissau (Catry *et al.* 2010), Sierra Leone (Fretey & Malaussena 1991) and Liberia (Stuart & Adams 1990) are not very far away from the Cape Verde Islands. There could exist neritic or oceanic feeding grounds in the waters of this region and sick individuals could drift to the inshore waters of Cape Verde.

As there are important nesting populations in Brazil and the Guyanas, an American origin for olive ridleys in Cape Verde must also be considered. Leatherback *Dermochelys coriacea* (Pritchard 1973, Ferraroli *et al.* 2004) and hawksbill turtles *Eretmochelys imbricata* (Marcovaldi & Filippini 1991, Bellini *et al.* 2000, Grossman *et al.* 2007) equipped

with satellite transmitters or monel tags in South America are known to have crossed the Atlantic from west to east. Olive ridleys belonging to western Atlantic breeding populations may have crossed the ocean and reached Cape Verde coasts.

Regardless of their origin and since olive ridley records in Cape Verde often concern sick or dead animals, they may have been displaced by the currents. Individuals feeding or moving in this part of the Atlantic, i.e. to the north of Cape Verde, may be displaced southwards by the Canary Current and appear on Cape Verde shores, which could perhaps account for the northern position in the archipelago of the stranded animals.

Many different threats to sea turtles in West Africa, including degradation and destruction of habitat, a high rate of by-catch in fisheries and the capture of females and nest poaching on nesting beaches, have been reported (e.g. Fretey 2001, Formia *et al.* 2003, Weir *et al.* 2007, Godgender *et al.* 2009). Our data show an indirect consequence of fisheries,

with several entangled individuals (cf. Table 1, records 3, 4, 11).

Nowadays satellite tracking provides accurate information about the routes followed and the areas used by animals equipped with a transmitter. Equipping olive ridleys from both sides of the Atlantic with such devices would disclose usage and distribution of olive ridley habitat and reveal the relative importance of Cape Verde waters for the species. Genetic characterization of African stocks, together with representative samples from the nesting area as a whole (published studies include only a small sample and from one location only; cf. Bowen *et al.* 1998) would allow to establish the genetic structure of the region's populations, the relationships amongst Atlantic and more widely studied (e.g. Bowen *et al.* 1998, López-Castro & Rocha-Olivares 2005) populations and to identify conservation units in the eastern Atlantic. All such information is essential for the much needed implementation of conservation measures for sea turtles, including the olive ridley, in West Africa.

ACKNOWLEDGEMENTS

Many thanks to Manuel Rodrigues ('Stravagante'), Jon Crighton and Ian Ford for reporting their turtle sightings to us and for providing photographs and further information. We are also grateful to Daniel Cejudo and Catalina Monzón-

Argüello for their comments and suggestions. Comments by two anonymous reviewers helped to improve the manuscript. The authors acknowledge the use of seaturtle.org's Maptool, <http://www.seaturtle.org/maptool>.

REFERENCES

- Angoni, H., A. Akoa, C.F. Bilong Bilong & J. Fretey, 2010. La tortue marine au Cameroun, genre *Lepidochelys*: nidification, biométrie de *Lepidochelys olivacea* (Eschsholtz, 1829) (Reptilia, Cheloniidae) dans la réserve de faune de Campo (Sud Cameroun). International Journal of Biological and Chemical Sciences 4: 649-656.
- Álava, J.J., P. Pritchard, J. Wyneken & H. Valverde, 2007. First documented record of nesting by the olive ridley turtle (*Lepidochelys olivacea*) in Ecuador. Chelonian Conservation and Biology 6: 282-285.

- Bellini, C., T.M. Sanches & A. Formia, 2000. Hawksbill turtle tagged in Brazil captured in Gabon, Africa. *Marine Turtle Newsletter* 87: 11-12.
- Bowen, B.W., A.M. Clarck, F.A. Abreu-Grobois, A. Chaves, H.A. Reichart & R.J. Ferl, 1998. Global phylogeography of the ridley sea turtles (*Lepidochelys* spp.) as inferred from mitochondrial DNA sequences. *Genetica* 101: 179-189.
- Carr, A., 1957. Notes on the zoogeography of the Atlantic sea turtles of the genus *Lepidochelys*. *Revista de Biología Tropical* 5: 45-61.
- Carr, T. & C.L. Campbell, 1995. A management strategy outline for marine turtle conservation in Ghana. Appendix I: Survey of the sea turtles of Ghana. Report to the Wildlife Department, Republic of Ghana. Unpublished report. 23 pp.
- Catry, P., C. Barbosa. & B. Indjai, 2010. Tartarugas marinhas da Guiné-Bissau, Estatuto, biologia e conservação. Instituto da Biodiversidade e das Áreas Protegidas, Bissau. 127 pp.
- da Silva, A.C.C.D., J.C. de Castilhos, G. López & C.R. Barata, 2007. Nesting biology and conservation of the olive ridley sea turtle (*Lepidochelys olivacea*) in Brazil, 1991/1992 to 2002/2003. *Journal of the Marine Biological Association of the United Kingdom* 87: 1046-1056.
- Diagne, T., 1999. Tortues marines de la Réserve de la Biosphère du Delta du Saloum et de sa périphérie. Statuts, tendances et problématiques de la conservation. Rapport de consultation pour la formulation du plan de gestion de la Réserve de la Biosphère du Delta du Saloum (RBDS). Unpublished report, IUCN. 19 pp.
- Ferraroli, S., J.Y. Georges, P. Gaspar & Y.L. Maho, 2004. Endangered species: where leatherback turtles meet fisheries. *Nature* 429: 521-522.
- Formia, A., M. Tiwari, J. Fretey & A. Billes, 2003. Sea turtle conservation along the Atlantic coast of Africa. *Marine Turtle Newsletter* 100: 33-37.
- Fretey, J., 1999. Répartition des tortues du genre *Lepidochelys* Fitzinger, 1843. 1. l'Atlantique ouest. *Biogeographica* 75: 97-117.
- Fretey, J. 2001. Biogeography and conservation of marine turtles of the Atlantic coast of Africa. CMS Technical Series Publication No. 6. UNEP/CMS Secretariat, Bonn. 429 pp.
- Fretey, J. & J.P. Malaussena, 1991. Sea turtle nesting in Sierra Leone, West Africa. *Marine Turtle Newsletter* 54: 10-12.
- Fretey, J., A. Formia, J. Tomás, J.F. Dontaine, A. Billes & H. Angoni, 2005. Presence, nesting and conservation of *Lepidochelys olivacea* in the Gulf of Guinea. Pp. 172 in: M.S. Coyne & R.D. Clark (eds.), *Proceedings of the 21st Annual Symposium on Sea Turtle Biology and Conservation*, Philadelphia. NOAA Technical Memorandum NMFS-SEFSC-528.
- Godgender, M.C., N. Bréheret, G. Bal, K. N'Damite, A. Girard & M. Girondot, 2009. Nesting estimation and analysis of threats for critically endangered leatherback *Dermochelys coriacea* and endangered olive ridley *Lepidochelys olivacea* marine turtles nesting in Congo. *Oryx* 43: 556-563.
- Grossman, A., C. Bellini, A. Fallabrino, A. Formia, J. Mba-Mba, J. Nzi-Mba & C. Obama, 2007. Second TAMAR-tagged hawksbill recaptured in Corisco Bay, West Africa. *Marine Turtle Newsletter* 116: 26.
- IUCN 2011. The IUCN Red List of Threatened Species. Version 2011.2. www.iucnredlist.org. Downloaded 30 December 2011.
- Kelle, L., N. Gratiot & B. de Thoisy, 2009. Olive ridley turtle *Lepidochelys olivacea* in French Guiana: back from the brink of regional extirpation? *Oryx* 43: 243-246.

- López-Castro, M.C. & A. Rocha-Olivares, 2005. The panmixia paradigm of eastern Pacific olive ridley turtles revised: consequences for their conservation and evolutionary biology. *Molecular Ecology* 14: 3325-3334.
- Marcovaldi, M.A., 2001. Status and distribution of the olive ridley turtle, *Lepidochelys olivacea*, in the Western Atlantic Ocean. Pp. 52-56 in: K.L. Eckert & F.A. Abreu Grobois (eds.), *Proceedings of the Regional Meeting 'Marine Turtle Conservation in the Wider Caribbean Region: A Dialogue for Effective Regional Management'*, Santo Domingo, 16-18 November 1999. WIDECAST, IUCN-MTSG, WWF & UNEP-CEP.
- Marcovaldi, M.A. & A. Filippini, 1991. Trans-Atlantic movement by a juvenile hawksbill turtle. *Marine Turtle Newsletter* 52: 3.
- McMahon, C.R., C.J.A. Bradshaw & G.C. Hays, 2007. Satellite tracking reveals unusual diving characteristics for a marine reptile, the olive ridley turtle *Lepidochelys olivacea*. *Marine Ecology Progress Series* 329: 239-252.
- Mint-Hama, L., J. Fretey & M. Aksissou, in press. Nouvelles données sur le statut des tortues marines en Mauritanie. *Bulletin de la Société Herpétologique de France*.
- Papathanasopoulou, N., 2009. Olive ridley turtles of Masirah Island: secrets unraveled for the first time. *Wildlife Middle East* 3 (4): 3.
- Pauwels, O.S.G. & J. Fretey, 2008. Les Cheloniidae du Gabon. Pp. 52-58 in: O.S.G. Pauwels & J.P. Vandeweghe (eds.), *Les reptiles du Gabon*. Smithsonian Institution, Washington, D.C.
- Plotkin, P.T., 2010. Nomadic behavior of the highly migratory olive ridley sea turtle *Lepidochelys olivacea* in the eastern tropical Pacific Ocean. *Endangered Species Research* 13: 33-40.
- Polovina, J.J., G.H. Balazs, E.A. Howell, D.M. Parker, M.P. Seki & P.H. Dutton, 2004. Forage and migration habitat of loggerhead (*Caretta caretta*) and olive ridley (*Lepidochelys olivacea*) sea turtles in the central North Pacific Ocean. *Fisheries Oceanography* 13: 36-51.
- Pritchard, P.C.H., 1973. International migrations of South American sea turtles (Cheloniidae and Dermochelyidae). *Animal Behaviour* 21: 18-27.
- Reichert, H.A. & J. Fretey, 1993. Widecast sea turtle recovery action plan for Surinam. UNEP-CEP Technical Report. 24 pp.
- Ségniagbeto, G.H., J. Fretey, J.E. Bowéssidjaou, J. Dossou-Bodjrenou, I.A. Glitho, P. Sagbo, G.K. Kétoh & T. Kpatcha, in press. Suivi des populations de tortues marines au cours de la période de nidification 2002-2003 au Togo et au Bénin. *Bulletin de la Société Herpétologique de France*.
- Stuart, S.N. & R.J. Adams, 1990. Biodiversity in sub-Saharan Africa and its islands. Conservation, management and sustainable use. Occasional Papers of the IUCN Species Survival Commission No. 6. IUCN, Gland. 242 pp.
- Spotila, J.R., 2004. Sea turtles. A complete guide to their biology, behavior, and conservation. The Johns Hopkins University Press, Baltimore. 240 pp.
- Weir, C.R., T. Ron, M. Morais & A.D.C. Duarte, 2007. Nesting and at-sea distribution of marine turtles in Angola, West Africa 2000-2006: occurrence, threats and conservation implications. *Oryx* 41: 224-231.
- Varo-Cruz, N., L. Vallel-Valls & L.F. López-Jurado, 1999. Informe preliminar sobre la conservación de las tortugas marinas en la isla de Maio. Unpublished report, Universidad de Las Palmas de Gran Canaria. 14 pp.

Whiting, S.D., J.L. Long & M. Coyne,
2007. Migration routes and foraging
behavior of olive ridley turtles

Lepidochelys olivacea in northern
Australia. *Endangered Species
Research* 3: 1-9.

Received 28 September 2011

Revised 27 November 2011

Accepted 20 December 2011