

The following supplement accompanies the article

Hatching and emergence success of green turtle *Chelonia mydas* nests in the Galápagos Islands

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Supplement. Additional data

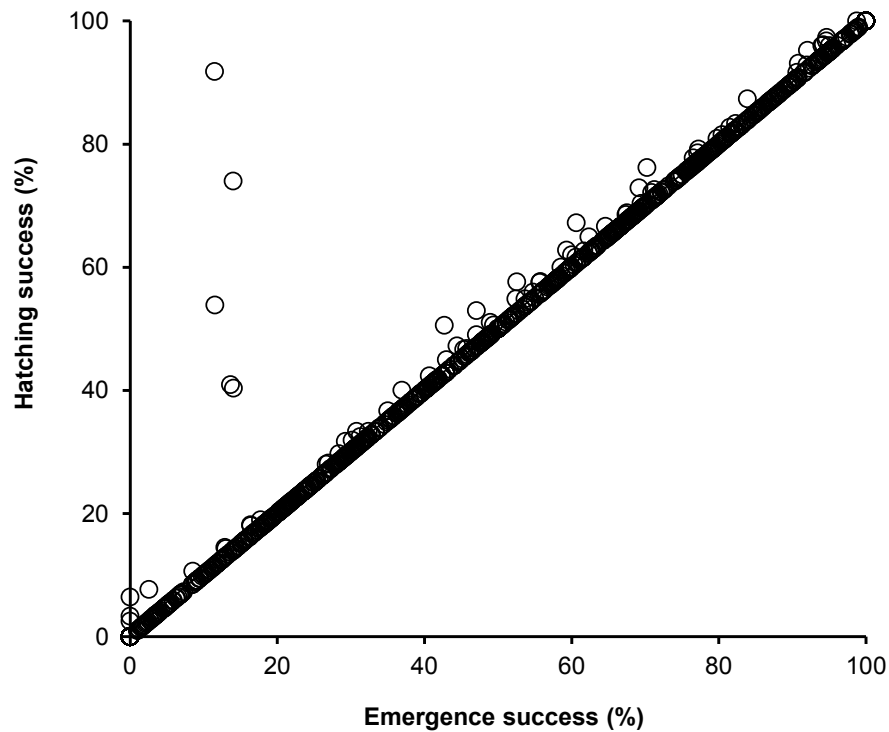


Fig. S1. *Chelonia mydas*. Hatching and emergence success for the 1039 nests examined in this study at key nesting beaches from 2003 to 2007 in the Galápagos Islands. Each open circle represents a single nest ($y = 0.9984x + 0.6597$, $R^2 = 0.9883$)

Table S1. Physical features of nesting beaches in the Galápagos Islands. Intertidal zone is the distance between high and low tide. Beach slope represents the incline of the foreshore or beach face. Range of nesting zone represents the potentially usable nesting zone width in the dune zone and is measured from the high tide line to littoral vegetation or to the transition between sand and solid soil. Beach area is the product of the beach length and the mean range of the nesting zone. Open access corresponds to the percentage of the length of the beach free of obstacles in the intertidal zone. Intertidal zone and beach slope are represented by mean (\pm SD)

| Beaches | Length (km) | Intertidal zone distance (m) | Beach slope ($^{\circ}$) | Range of nesting zone | Beach area (km ²) | Open access |
|----------------|-------------|------------------------------|----------------------------|-----------------------|-------------------------------|-------------|
| Quinta Playa | 2 | 60.4 \pm 10.3 | 3 \pm 0.5 | 3-40 | 7.4 | 80 |
| Bahía Barahona | 1.2 | 46.7 \pm 18.3 | 5 \pm 0.9 | 2-30 | 6.8 | 60 |
| Las Bachas | 0.96 | 5.9 \pm 2.1 | 8.9 \pm 1.4 | 12-80 | 9.6 | 40 |
| Las Salinas | 0.84 | 7.3 \pm 1.3 | 13.7 \pm 2.9 | 6-40 | 6.6 | 30 |

Table S2. *Chelonia mydas*. Variables measured for female green turtles and nests from 2004 through 2007. N: number of nests; CCL: curved carapace length; CCW: curved carapace width; HWM: high water mark

| Variable | N | Mean | SD | Min. | Max. |
|--------------------|------|------|------|------|------|
| Female CCL (cm) | 1037 | 85.0 | 5.5 | 69 | 110 |
| Female CCW (cm) | 1037 | 81.7 | 4.9 | 68 | 103 |
| Yolked eggs | 1039 | 71.2 | 18.3 | 21 | 127 |
| Yolkless eggs | 1039 | 1.7 | 2.9 | 0 | 23 |
| Chamber depth (cm) | 679 | 37.4 | 7.6 | 16.5 | 75 |
| Nest to HWM (m) | 690 | 3.5 | 3.4 | 0 | 35 |

Table S3. *Chelonia mydas*. Percentages of nests and eggs affected by fungus by beach and year in the Galápagos Islands. Standard deviations are in parentheses

| Beach | Year | Nests | Eggs |
|----------------|-----------|-------|-------------|
| Bahía Barahona | 2004 | 69.3 | 22.5 (26.9) |
| Bahía Barahona | 2005 | 87.4 | 40.4 (29.1) |
| Bahía Barahona | 2006 | 69.2 | 36.8 (33.9) |
| Quinta Playa | 2004 | 56.4 | 17.4 (25.1) |
| Quinta Playa | 2005 | 59.7 | 14.2 (21.3) |
| Quinta Playa | 2006 | 62.0 | 34.4 (34.4) |
| Quinta Playa | 2007 | 73.3 | 41.0 (34.8) |
| Las Bachas | 2004 | 89.1 | 30.7 (24.8) |
| Las Bachas | 2005 | 80.9 | 27.5 (25.3) |
| Las Salinas | 2004 | 82.5 | 15.1 (19.4) |
| Las Salinas | 2005 | 79.6 | 23.7 (23.4) |
| All beaches | All years | 71.6 | 29.7 (30.7) |

Table S4. *Chelonia mydas*. Hatching and emergence success from natural nests. If only 1 value is given for hatching or emergence success, it is the mean value. Standard deviations (SD) and ranges are presented when available

| Location | Hatching success | Emergence success | Year | Number of nests | Sources |
|---------------------------------------|------------------|-------------------|-----------|-----------------|---------------------------|
| | Mean (SD) | Mean (SD) | | | |
| | Range | Range | | | |
| Pacific/Indian Ocean | | | | | |
| Revillagigedo Is, Mexico | 89.7(16.9) | - | | 61 | Juárez-Cerón et al. 2003 |
| Bahía Barahona, Galápagos Is, Ecuador | 74.2 | 72.9 | 1979 | 69 | Green & Ortiz-Crespo 1982 |
| Bahía Barahona, Galápagos Is, Ecuador | 41.2(30.5) | 41.0(30.5) | 2004-2006 | 345 | Present study |
| | 0-100 | 0-100 | | | |
| Las Bachas, Galápagos Is, Ecuador | 80.4 | 78.4 | 1979 | 22 | Green & Ortiz-Crespo 1982 |
| Las Bachas, Galápagos Is, Ecuador | 62.3(28.1) | 61.8(28.4) | 2004-2005 | 102 | Present study |
| | 0-100 | 0-100 | | | |
| Las Salinas, Galápagos Is, Ecuador | 72.1 | 69.7 | 1976 | 94 | Green & Ortiz-Crespo 1982 |
| Las Salinas, Galápagos Is, Ecuador | 52.2 | 49.7 | 1977 | 21 | Green & Ortiz-Crespo 1982 |
| Las Salinas, Galápagos Is, Ecuador | 71 | 69.8 | 1978 | 38 | Green & Ortiz-Crespo 1982 |
| Las Salinas, Galápagos Is, Ecuador | 71.1 | 69.9 | 1979 | 22 | Green & Ortiz-Crespo 1982 |
| Las Salinas, Galápagos Is, Ecuador | 71.5(28.9) | 71.1(29.1) | 2004-2005 | 89 | Present study |
| | 0-100 | 0-100 | | | |
| Quinta Playa, Galápagos Is, Ecuador | 38.6 | 37.8 | 1976 | 120 | Green & Ortiz-Crespo 1982 |
| Quinta Playa, Galápagos Is, Ecuador | 43.7 | 40.5 | 1977 | 101 | Green & Ortiz-Crespo 1982 |
| Quinta Playa, Galápagos Is, Ecuador | 43.5 | 41.2 | 1978 | 40 | Green & Ortiz-Crespo 1982 |
| Quinta Playa, Galápagos Is, Ecuador | 48.7 | 47.7 | 1979 | 67 | Green & Ortiz-Crespo 1982 |
| Quinta Playa, Galápagos Is, Ecuador | 41.4(33.9) | 41.0(33.9) | 2004-2007 | 503 | Present study |
| | 0-100 | 0-100 | | | |

| | | | | | |
|--------------------------------------|------------|------------|-----------|------|---------------------------|
| Espumilla, Galápagos Is, Ecuador | 1.9 | 1.9 | 1979 | 122 | Green & Ortiz-Crespo 1982 |
| Bartolomé, Galápagos Is, Ecuador | 50 | 47.2 | 1979 | 15 | Green & Ortiz-Crespo 1982 |
| La Picona, Galápagos Is, Ecuador | 60.9 | 66.5 | 1982 | 30 | Hurtado 1984 |
| French Frigate Shoals, Hawaii, USA | - | 70.8 | - | 40 | Balazs 1980 |
| French Frigate Shoals, Hawaii, USA | 78.6 | 71.1 | 1986-1991 | 428 | Niethammer et al. 1997 |
| Raine Is, Australia | 85.5(13.1) | 83.9(13.3) | 1983 | 16 | Limpus et al. 2003 |
| Raine Is, Australia | 79.5(14.9) | 78.6(15.2) | 1984 | 162 | Limpus et al. 2003 |
| Heron Is, Australia | 55 | - | - | - | Moorhouse 1933 |
| Heron Is, Australia | - | 88 | 1966-7 | 26 | Bustard 1972 |
| Heron Is, Australia | - | 85 | 1967-8 | 40 | Bustard 1972 |
| Long Is, Papua New Guinea | - | 89 | - | 1 | Spring unpubl data |
| Mak Kepit, Pulau Redang Is, Malaysia | - | 81.4(22.3) | 2002 | 214 | Ali & Ibrahim 2002 |
| Wan-an Is, Taiwan | 72.2(30.2) | 47(39.1) | 1997-2006 | 242 | Cheng et al. 2008 |
| Lanyu Is, Taiwan | 80.7(27.8) | 64.1(39.7) | 1997-2006 | 166 | Cheng et al. 2008 |
| Baguan Is, Philippines | 87.1 | 85.7 | - | 146 | Trono 1991 |
| Bearu Archipelago, Indonesia | 81.9(6.6) | - | - | 7446 | Reischig et al. 2012 |
| Mangrol-Porbandar, India | 79 | 76 | 2000-2002 | 194 | Venkatesan et al. 2004 |
| Karan Is, Saudi Arabia | - | 81.7 | - | 4 | Miller 1989 |
| | | 60.9-95 | | | |
| Abdul Wadi, Yemen | - | 48 | - | 1 | Hirth & Carr 1970 |
| South Coast, Kenya | 32 | - | 1997 | 1 | Okemwa et al. 2004 |
| Mombasa, Kenya | 82 | - | 1997 | 51 | Okemwa et al. 2004 |
| Mombasa, Kenya | 79 | - | 1998 | 10 | Okemwa et al. 2004 |
| Mombasa, Kenya | 95 | - | 1999 | 35 | Okemwa et al. 2004 |
| Mombasa, Kenya | 84 | - | 2000 | 60 | Okemwa et al. 2004 |
| Kiunga, Kenya | 66 | - | 1997 | 15 | Okemwa et al. 2004 |

| | | | | | |
|--|------------|------------|-----------|-------|---|
| Kiunga, Kenya | 63 | - | 1998 | 45 | Okemwa et al. 2004 |
| Kiunga, Kenya | 79 | - | 1999 | 10 | Okemwa et al. 2004 |
| Kiunga, Kenya | 77 | - | 2000 | 74 | Okemwa et al. 2004 |
| Watamu, Kenya | 81 | - | 1998 | 17 | Okemwa et al. 2004 |
| Watamu, Kenya | 81 | - | 1999 | 92 | Okemwa et al. 2004 |
| Watamu, Kenya | 77 | - | 2000 | 7 | Okemwa et al. 2004 |
| Mozambique | 85.1(21.1) | 80.5(24.2) | - | 321 | Silva et al. 2008 |
| Reunion Is, France | 95.8(4) | 77.4(9.9) | 2004-2005 | 5 | Ciccione & Bourjea 2006 |
| Europa Is, France | - | 84 | - | 5 | Servan 1976 |
| | | 71-96 | | | |
| Aride Is, Republic of Seychelles | 94(7) | 91(8) | 1982-2000 | 10 | Dugdale 2001 |
| Atlantic Ocean | | | | | |
| Melbourne, Florida, USA | - | 61.6(33.9) | - | 25 | Witherington & Ehrhart 1989 |
| Melbourne, Florida, USA | 54.3 | 53.4 | 1991 | 99 | Johnson & Ehrhart 1995 |
| Broward County, Florida, USA | - | 61.8 | - | 12 | Broward County Erosion Prevention District 1987 |
| Archie Carr National Wildlife Refuge, Brevard County, Florida, USA | 65.8(5.3) | - | 2006 | 185 | Balfour 2010 |
| Canaveral National Seashore, Florida, USA | 62(5) | - | 1985-2003 | >1000 | Antworth et al. 2006 |
| El Cuyo, Mexico | - | 86.5 | - | 15 | Rodríguez & Zambrano 1991 |
| El Cuyo, Mexico | 92 | 87 | 2002 | 165 | Xavier et al. 2006 |
| El Cuyo, Mexico | 89 | 87 | 2003 | 75 | Xavier et al. 2006 |
| El Cuyo, Mexico | 86 | 84 | 2004 | 35 | Xavier et al. 2006 |
| Guanahacabibes Peninsula, Cuba | >70 | - | 2001-2003 | - | Azanza et al. 2006 |
| Tortuguero, Costa Rica | - | 83.1 | 1977 | 134 | Fowler 1979 |
| Tortuguero, Costa Rica | - | 51.1(5.4) | 1986 | 49 | Horikoshi 1992 |
| Tortuguero, Costa Rica | - | 49.1(4.2) | 1988 | 88 | Horikoshi 1992 |

| | | | | | |
|---|------------|-----------|-----------|------|------------------------|
| Tortuguero, Costa Rica | - | 66.9(3.7) | 1989 | 113 | Horikoshi 1992 |
| Tortuguero, Costa Rica | 63.5 | 61.2 | 1998-2005 | 1416 | De Haro et al. 2008 |
| Tortuguero, Costa Rica | 86 | 96 | 2000 | 28 | Segura & Cajade 2010 |
| Boka Manzanina, Curacao | 71 | - | 1993 | 1 | Debrot & Pors 1995 |
| Suriname | - | 84 | - | 57 | Schulz 1975 |
| Krofajapasi, Suriname | - | 80.4(1.5) | - | 80 | Whitmore & Dutton 1985 |
| Matapica, Suriname | 85.5 | - | 2000 | 44 | Hilterman 2001 |
| Baboensanti, Suriname | 84.1 | - | 2000 | 17 | Hilterman 2001 |
| Trindade Is, Brazil | 84.4(21.5) | - | - | 313 | Almeida et al. 2011 |
| | 0-100 | | | | |
| Atol das Rocas, Brazil | 72 | - | 1993 | 94 | Bellini et al. 2012 |
| | 0-100 | - | | | |
| Atol das Rocas, Brazil | 78.6 | - | 1994 | 87 | Bellini et al. 2012 |
| | 0-100 | - | | | |
| Atol das Rocas, Brazil | 74.1 | - | 1995 | 76 | Bellini et al. 2012 |
| | 0-99.2 | | | | |
| Atol das Rocas, Brazil | 70 | | 1996 | 38 | Bellini et al. 2012 |
| | 69-100 | | | | |
| Atol das Rocas, Brazil | 70 | | 1997 | 131 | Bellini et al. 2012 |
| | 0-100 | | | | |
| Ascension Is, Great Britain | - | 54.4 | - | 1208 | Carr & Hirth 1962 |
| English Bay, Ascension Is, Great Britain | 76.3 | 63.8 | 1977-1978 | 6 | Mortimer 1990 |
| Hanny, Ascension Is, Great Britain | 50.6 | 45.4 | 1977-1978 | 9 | Mortimer 1990 |
| Long beach, Ascension Is, Great Britain | 85.8 | 84.1 | 1977-1978 | 17 | Mortimer 1990 |
| North East Bay, Ascension Is, Great Britain | 74.3 | 72.1 | 1977-1978 | 13 | Mortimer 1990 |
| Pebbly West, Ascension Is, Great Britain | 20.2 | 17.4 | 1977-1978 | 6 | Mortimer 1990 |

| | | | | | |
|---|---------|------|-----------|----|-----------------------|
| Porpoise Pt 1, Ascension Is, Great Britain | 94.5 | 91.6 | 1977-1978 | 4 | Mortimer 1990 |
| South West Bay, Ascension Is, Great Britain | 84.2 | 71.4 | 1977-1978 | 14 | Mortimer 1990 |
| South West Bay, Ascencion Is, Great Britain | 57(0.2) | - | 1998-1999 | 12 | Broderick et al. 2001 |
| Long Beach, Ascencion Is, Great Britain | 82(0.2) | - | 1998-1999 | 9 | Broderick et al. 2001 |
| North East Bay, Ascencion Is, Great Britain | 85(0.2) | - | 1998-1999 | 12 | Broderick et al. 2001 |
| Poilao, Bijagos Archipelago, Guinea-Bissau | 93.6 | - | 2000 | 58 | Catry et al. 2002 |
| | 69-100 | | | | |

Mediterranean Sea

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|------------------|-----------|------------|-----------|------|-------------------------|
| Akyatan, Turkey | 10.8 | - | 1993 | 10 | Brown & Macdonald 1995 |
| Akyatan, Turkey | 39.8-68.9 | - | 2006-2009 | 1094 | Turkozan et al. 2011 |
| Samandag, Turkey | 77.7(9.6) | - | 2001-2005 | 471 | Yalçin-Özdilek 2007 |
| Kazanli, Turkey | 87.7 | - | - | - | Durmus 1998 |
| Kazanli, Turkey | 83.7 | - | - | - | Aureggi 2001 |
| Alagadi, Cyprus | - | 85.3 | - | 34 | Godley & Broderick 1993 |
| Alagadi, Cyprus | 84.2 | - | 1992-1995 | 897 | Broderick & Godley 1996 |
| Alagadi, Cyprus | - | 70.2(27) | 1997 | 9 | Glen et al. 2005 |
| | | 1.2-97.4 | | | |
| Alagadi, Cyprus | - | 73.8(30.2) | 1998 | 29 | Glen et al. 2005 |
| | | 1.5-100 | | | |
| | 75.3 | - | 2002 | 67 | Ozdemir & Turkozan 2006 |

LITERATURE CITED

- Ali A, Ibrahim K (2002) Crab predation on green turtle (*Chelonia mydas*) eggs incubated on a natural beach and in turtle hatcheries. In: Proc 3rd Workshop on SEASTAR, 2000, p 95-100
- Almeida AP, Moreira LMP, Bruno SC, Thomé JCA, Martins AS, Bolten AB, Bjorndal KA (2011) Green turtle nesting on Trindade Island, Brazil: abundance, trends, and biometrics. *Endang Species Res* 14:193–201
- Antworth RL, Pike DA, Stiner JC (2006) Nesting ecology, current status, and conservation of sea turtles on an uninhabited beach in Florida, USA. *Biol Conserv* 130:10–15
- Aureggi M (2001) Marine turtle monitoring programme Kazanlı beach, Turkey. 2001 UNEP, Mediterranean Action Plan, Regional Activity Centre for Specially Protected Areas—Boulevard de l'Environnement, Cedex
- Azanza-Ricardo J, Ibarra-Martin ME, Diaz-Fernández R, Ruiz-Urquiola A, Ruisanchez-Carrasco Y, Luis-Castellanos CY, Rios-Tamayo D (2006) Reproductive success of *Chelonia mydas* in nesting areas of Guanahacabibes Peninsula, Cuba. In: Frick M, Panagopoulou A, Rees AF, Williams K (eds) Book of abstracts 26th annual symposium on sea turtle biology and conservation. International Sea Turtle Society, Athens, p 318 (abstract)
- Balazs GH (1980) Synopsis of biological data on the green turtle in the Hawaiian Islands. NOAA Tech Memo NMFS-SWFC-7: Honolulu-HA
- Balfour ME (2010) Abiotic differences between green turtle (*Chelonia mydas*) nests in natural beaches and engineered dunes: effects on hatching success. MSc dissertation, University of Central Florida, Orlando, FL
- Bellini C, Santos AJB, Grossman A, Marcovaldi MA, Barata PCR (2012) Green turtle (*Chelonia mydas*) nesting on Atol das Rocas, north-eastern Brazil, 1990–2008. *J Mar Biol Assoc UK* 93:1117–1132
- Broderick AC, Godley BJ (1996) Population and nesting ecology of the green turtle, *Chelonia mydas*, and the loggerhead turtle, *Caretta caretta*, in northern Cyprus. *Zool Middle East* 13:27–46
- Broderick AC, Godley BJ, Hays GC (2001) Metabolic heating and the prediction of sex ratios for green turtles (*Chelonia mydas*). *Physiol Biochem Zool* 74:161–170
- Broward County Erosion Prevention District (1987) Sea turtle conservation project Broward County, Florida, 1987 Report. Broward County Environmental Quality Control Board, Ft. Lauderdale, FL
- Brown L, Macdonald DW (1995) Predation on green turtle *Chelonia mydas* nests by wild canids at Akyatan Beach, Turkey. *Biol Conserv* 71:55–60
- Bustard HR (1972) Sea turtles: their natural history and conservation. W Collins & Sons, London
- Carr A, Hirth H (1962) The ecology and migrations of sea turtles, 5 comparative features of isolated green turtle colonies. *Am Mus Novit* 2091:1–42
- Catry P, Barbosa C, Indjai B, Almeida A, Godley BJ, Vié JC (2002) First census of the green turtle at Poilão, Bijagós Archipelago, Guinea-Bissau: the most important nesting colony on the Atlantic coast of Africa. *Oryx* 36:400–403
- Cheng IJ, Dutton PH, Chen CL, Chen HC, Chen YH, Shea JW (2008) Comparison of the genetics and nesting ecology of two green turtle rookeries. *J Zool (Lond)* 276:375–384
- Ciccione S, Bourjea J (2006) Nesting of green turtles in Saint Leu, Reunion Island. *Mar Turtle Newsl* 112:1–3
- De Haro A, Troeng S, Harrison E (2008) How can monitoring of hatching success guide sea turtle management? In: Rees AF, Frick M, Panagopoulou A, Williams K (eds) Proceedings of the 27th annual symposium on sea turtle biology and conservation. NOAA Tech Memo NMFS-SEFSC 569:88–89
- Debrot AO, Pors LPJJ (1995) Sea turtle nesting activity on northeast coast beaches of Curacao, 1993. *Caribb J Sci* 31:333–338
- Dugdale HL (2001) Breeding status of the hawksbill turtle *Eretmochelys imbricata* and green turtle *Chelonia mydas* on Aride Island. In: Self C, Macrae F (eds) Aride Island Nature Reserve, Seychelles: annual report 2001. RSNC, Newark
- Durmus SH (1998) An investigation on biology and ecology of sea turtle population on Kazanlı and Samandag beaches. Ph D dissertation, Dokuz Eylül University, Izmir
- Fowler LE (1979) Hatching success and nest predation in the green sea turtle, *Chelonia mydas*, at Tortuguero, Costa Rica. *Ecology* 60:946–955
- Glen F, Broderick AC, Godley BJ, Hays GC (2005) Patterns in the emergence of green (*Chelonia mydas*) and loggerhead (*Caretta caretta*) turtle hatchlings from their nests. *Mar Biol* 146:1039–1049

- Godley B, Broderick A (1993) Glasgow University turtle conservation expedition to northern Cyprus, 1992. Expedition report, Dept. Veterinary Anatomy, Glasgow University Veterinary School, Glasgow
- Green D, Ortiz-Crespo F (1982) Status of sea turtle populations in the central eastern Pacific. In: Bjorndal KA (ed) Biology and conservation of sea turtles. Smithsonian Institution Press, Washington, DC, p 65–68
- Hilterman ML (2001) The sea turtles of Suriname, 2001. Biotopic Foundation, Amsterdam
- Hirth H, Carr A (1970) The green turtle in the Gulf of Aden and the Seychelles Islands. Ver de Kon Ned Adad van Wet Afd Natur Tweede Reeks, 58:1–44
- Horikoshi K (1992) Egg survivorship and primary sex ratio of green turtles, *Chelonia mydas*, at Tortuguero, Costa Rica. PhD dissertation, University of Florida, Gainesville, FL
- Hurtado M (1984) Registro de la anidación de la tortuga negra, *Chelonia mydas* en las islas Galápagos. Bol Cient Téc Inst Nac Pesca Ecuad 4:77–106
- Johnson SA, Ehrhart LM (1995) Reproductive ecology of the Florida green turtle (*Chelonia mydas*) at Melbourne Beach, Florida. In: Richardson JI, Richardson TH (eds) Proceedings of the 12th symposium on sea turtle biology and conservation. NOAA Tech Memo NMFS-SEFSC 361:54–56
- Juárez-Cerón JA, Sarti-Martínez AL, Dutton PH (2003) First study of the green/black turtles of the Revillagigedo Archipelago: a unique nesting stock in the eastern Pacific. In: Seminoff JA (ed) Proceedings of the 22nd annual symposium on sea turtle biology and conservation. NOAA Tech Memo NMFS-SEFSC 503:70
- Limpus CJ, Miller JD, Parmenter CJ, Limpus DJ (2003) The green turtle, *Chelonia mydas*, population of Raine Island and the northern Great Barrier Reef: 1843–2001. Mem Queensl Mus 49:349–440
- Miller JD (1989) Marine turtles, Vol 1. An assessment of the conservation status of marine turtles in the Kingdom of Saudi Arabia. MEPA Coastal and Marine Management Series, Report No. 9. Ministry of Defence and Aviation, Jeddah
- Moorhouse FW (1933) Notes on the green turtle (*Chelonia mydas*). Rep Great Barrier Reef Comm 4:1–22
- Mortimer JA (1990) The influence of beach sand characteristics on the nesting behavior and clutch survival of green turtles (*Chelonia mydas*). Copeia 1990:802–817
- Niethammer KR, Balazs GH, Hatfield JS, Nakai GL, Megyesi JL (1997) Reproductive biology of the green turtle *Chelonia mydas* at Tern Island, French Frigate Shoals, Hawaii 1997. Pac Sci 51:36–47
- Okemwa GM, Nzunki S, Mueni EM (2004) The status and conservation of sea turtles in Kenya. Mar Turtle Newsl 105:1–6
- Ozdemir B, Turkozan O (2006) Hatching success of original and hatchery nests of the green turtle *Chelonia mydas* in northern Cyprus. Turk J Zool 30:377–381
- Reischig T, Rachmand Basuki N, Ahang Moord V, Cordes H, Latorra R (2012) Green turtles (*Chelonia mydas*) in the Berau Archipelago, Indonesia: population assessment, nesting activities and protection status. In: Todd J, Wallace B (eds) Proceedings of the 31st annual symposium on sea turtle biology and conservation. NOAA Tech Memo NOAA-NMFS-SEFSC 631:228
- Rodríguez E, Zambrano R (1991) Caracterización de la temporada de anidación de tortuga Carey (*Eretmochelys imbricata*) y tortuga blanca (*Chelonia mydas*) en El Cuyo, Yucatan. Internal report, ProNatura Peninsula de Yucatan, Merida
- Schulz JP (1975) Sea turtles nesting in Suriname. Nederl Comm Int Natuurbes, Stich Natuurbes Sur 23:1–143
- Segura LN, Cajade R (2010) The effects of sand temperature on pre-emergent green sea turtle hatchlings. Herp Conserv Biol 5:196–206
- Servan J (1976) Ecologie de la tortue verte a l'Île Europa (Canal de Mozambique). Rev Ecol Terre Vie 30:421–464
- Silva IM, Godley B, Hill N, Barr R, Shaw A, Garnier J (2008) The Maluane community-based conservation programme in Mozambique. In: Rees AF, Frick M, Panagopoulou A, Williams K (eds) Proceedings of the 27th annual symposium on sea turtle biology and conservation. NOAA Tech Memo NMFS-SEFSC 569:248–249
- Trono RB (1991) Philippine marine turtle conservation program. Mar Turtle Newsl 53:5–7
- Turkozan O, Yamamoto K, Yilmaz C (2011) Nest site preference and hatching success of green (*Chelonia mydas*) and loggerhead (*Caretta caretta*) sea turtles at Akyatan Beach, Turkey. Chelonian Conserv Biol 10:270–275
- Venkatesan S, Kannan P, Rajagopalan P, Vivekanandan E (2004) Nesting ecology of the green sea turtle *Chelonia mydas* along the Saurashtra coast. J Mar Biol Assoc India 46:169–177

- Whitmore CP, Dutton PH (1985) Infertility, embryonic mortality, and nest-site selection in leatherback and green sea turtles in Suriname. *Biol Conserv* 34:251–272
- Witherington BE, Ehrhart LM (1989) Status and reproductive characteristic of green turtles (*Chelonia mydas*) nesting in Florida. In: Ogren L, Berry F, Bjorndal K, Kumpf H, Mast R, Medina G, Reichart H, Witham R (eds) Proceedings of the 2nd western Atlantic turtle symposium. NOAA Tech Memo NMFS-SEFSC 226:351–352
- Xavier R, Barata A, Cortez PL, Queiroz N, Cuevas E (2006) Hawksbill turtle (*Eretmochelys imbricata* Linnaeus, 1766) and green turtle (*Chelonia mydas* Linnaeus, 1754) nesting activity (2002–2004) at El Cuyo Beach, Mexico. *Amphib-reptil* 27:539–547
- Yalçın-Özdilek S (2007) Status of sea turtles (*Chelonia mydas* and *Caretta caretta*) on Samandag Beach, Turkey: a five year monitoring study. *Ann Zool Fenn* 44:333–347