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Research Article

An update on female sizes and body condition of nesting olive ridley turtles (*Lepidochelys olivacea*) in La Escobilla Beach Sanctuary, Mexico

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ABSTRACT. Body condition (BC) can affect the reproductive output and hatchling survival of nesting olive ridley turtles (*Lepidochelys olivacea*). However, little is known about the BC of nesting females during the arrival event at nesting sites. Therefore, this study aimed to evaluate the BC of females nesting in La Escobilla Beach Sanctuary (La Escobilla) during the 2021 nesting season. Nesting females were measured and weighed. The mean size for nesting *L. olivacea* was 60.41 ± 2.98 cm for straight carapace length, 52.69 ± 2.57 cm for straight carapace width, and 34.35 ± 3.94 kg for weight (n = 483). The mean (± standard deviation, SD) Fulton′s/Bjorndal BC index estimated for nesting females was 1.54 ± 0.15, while the mean (± SD) of body mass index was 2.18 ± 0.23. Based on these indexes, 28 individuals were classified as in bad condition, 315 in good condition, and 19 in excellent condition. This first estimation of the olive ridley turtle body condition in a nesting colony showed that BC is a good body condition for most nesting females in La Escobilla. This study is a valuable baseline for nesting *L.olivacea's* health condition.

Keywords: *Lepidochelys olivacea*; arribada; health assessment; body mass; length; reproductive output

INTRODUCTION

The olive ridley turtle *Lepidochelys olivacea* is a pantropical marine species distributed worldwide in tropical and subtropical oceanic regions (Abreu-Grobois & Plotkin 2008). This species is currently listed as "Vulnerable" according to the International Union for Conservation of Nature Red List (Abreu-Grobois & Plotkin 2008) and classified as "Endangered" by Mexican laws (DOF 2010). Like most sea turtles, the olive ridley turtle has been severely affected by human activities, such as direct take and illegal trade and harvesting of eggs for local consumption, both considered to be one of the species's major threats (Fonseca et al. 2009, Valverde et al. 2012, Bézy et al. 2016, Pheasey et al. 2020).

This species exhibits two nesting strategies, one associated with nesting in a solitary fashion and the other, a unique nesting behavior where hundreds to thousands of turtles emerge on nesting beaches in a synchronous event called "arribadas" (Cornelius et al. 1991, Bernardon & Plotkin 2007). In the Americas, the most notable arribadas nesting beaches are in Costa Rica (Cornelius et al. 1991, Plotkin et al. 1997, Campbell 1998, Hornarvar et al. 2008, Fonseca et al. 2009), Nicaragua (Steward 2001, Hope 2002), Panamá (Cornelius et al. 2007), and Mexico (Peñaflores et al. 2000, Campbell 2007).

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Mexico has one of the most important nesting areas of the *L. olivacea* on La Escobilla Beach Sanctuary (La Escobilla) in Oaxaca, on the eastern Pacific coast (Márquez et al. 1996, Ocaña et al. 2012). This site was designated in 1986 as a protected natural area under the category of sanctuary to protect the olive ridley turtles. The area is under the management of the Comisión Nacional de Área Naturales Protegidas (CONANP, Márquez et al. 1996). Generally, the arribadas occur at a particular time of the year, between June and December, commonly once a month. Occasionally, an arribada can last a single day or up to 30 days (Ocana et al. 2012). In the eastern Pacific, the arribadas coincide annually with the rainy season (June-October, Cornelius 1986), as for La Escobilla.

Most sea turtle monitoring programs are focused on assessing population trends (Nel et al. 2013), or the protection of nesting sites (García et al. 2003, Gaona & Barragán 2016, Mazaris et al. 2017). However, there is little information on the health condition of the nesting females (e.g. individual size has decreased over time, Tuček et al. 2014). For example, in India, a declining trend in female sizes has been detected for olive ridleys (Shanker et al. 2003). Similar patterns had been shown for hawksbill turtles (*Eretmochelys imbricata*) in Mexico (Perez-Castaneda et al. 2007), loggerhead turtles (*Caretta caretta*) in Turkey (Ilgaz et al. 2007), and green turtles (*Chelonia mydas*) in Hawaii (Piacenza et al. 2016). While information shows that the olive ridley nesting population in Mexico is growing (Seminoff et al. 2008, Márquez et al. 2014), the condition of nesting females remains in a gap. Moreover, evaluation of female sizes and individual turtles' health is rare in Mexico despite their importance for improving conservation efforts (Nolte et al. 2020). Particularly, the knowledge of female body size will enable us to establish the relationship between reproductive output and body size (Hays & Speakman 1991, LeBlanc et al. 2014, LeGouvello et al. 2020a,b). Furthermore, body condition (BC) knowledge of nesting females is important because it can affect the reproductive output and hatchling's survival (Perrault et al. 2012); however, BC is considered a poor predictor to assess the adipose tissue (Kophamel et al. 2023).

BC is the physical status of an animal's body (Stevenson & Woods 2006). It is used to evaluate the fitness of animals in their environment (Taylor 1979, Peig & Green 2010). It also measures individual conditions, usually related to nutritional status and energy reserves (Harder & Kirkpatrick 1996 in Copeland 2004). Ecologists have used BC indexes to estimate an animal's nutritional state and a proxy for its health condition (Ullman-Culleré & Foltz 1999). To estimate sea turtles' BC, morphometric data collection from many individuals is required (Thomson et al. 2009); hence, a BC index is a metric derived from the relationship between an animal's length and its mass (Labrada-Martagon et al. 2010). Until now, little is known about the BC of nesting females that emerge on nesting beaches in arribadas. Ramírez-Villanueva et al. (2023) documented the BC of a few females in the territorial sea off nesting beaches on the Pacific coast of Mexico off Oaxaca. Changes in the BC, resulting from changes in the biochemical composition of the tissue and mobilization of energy reserves, may be related to season, life-history traits, health status, or exposure to stressors (Barton et al. 2002). Hence, reproductive success, survival, and population dynamics depend on the BC of the organisms (Jones et al. 1999, Stevenson & Woods 2006).

Several approaches have been employed to estimate and evaluate individual or group BC in turtles (Stevenson & Woods 2006), including mass-length relationships (Bjorndal et al. 2000, Jessop et al. 2004), blood sample analysis (Stamper et al. 2005), examination of the plastron (Thomson et al. 2009), epibiotic barnacle loading (Deem et al. 2009, Flint et al. 2010, Nájera-Hillman et al. 2012), and adipose tissue estimation by bioelectrical impedance analysis (Kophamel et al. 2023). Moreover, these BC indexes have even been linked to life history traits such as mate selection, territorial extension, and mortality (Green 2001). The Fulton's condition factor is the most widely used BC index in sea turtle health-assessment studies (Ricker 1975, Bjorndal et al. 2000). This study emerges from fishery sciences and is based on the assumption that all parts of an ideal theoretical fish grow similarly (isometric growth) (LeCren 1951, Bjorndal et al. 2000). Thus, generates an index that can be related to the animal's length, dissociating both body size and BC and obtaining an abstract measurement of energy reserves (LeCren 1951, Cone 1989). Nonetheless, this assumption is rarely true (LeCren 1951). Healthy individuals are more likely to reproduce because they have high energy reserves than animals with low conditions (Schulte-Hostedde et al. 2005). Therefore, these individuals are essential for the population's health and supporting proper ecosystem functioning (Meffe 1999, Munson & Karesh 2002). This study aimed to evaluate the female sizes and BC of the nesting olive ridley turtle in La Escobilla and provide a baseline for understanding this population and future trends.

MATERIALS AND METHODS

Study area

La Escobilla Beach is within the municipality of Santa Maria Tonameca (Fig. 1) in the state of Oaxaca, on the southwest Mexican Pacific coast (15°43'37''N, 96°44'49''W). The climate is warm-subhumid, with a mean annual temperature of 28°C. The mean annual precipitation is 1000 mm, with rains falling between May and October (García 1981). The beach is approximately 25 km long, and the arribadas turtles nest along an 8-km strip at the beach's western end (Ocaña et al. 2012).

Data collection

This study was conducted from August through December 2021, during the olive ridley turtle nesting season on La Escobilla. Nesting females were approached at night approximately 5 min after nest-building behavior ceased and egg-laying activity had begun. If the female did not appear in an egg-laying trance at the time of the first approach, a 5-min wait was added to the egg-laying disturbance (Whiting et al. 2007). Each turtle was evaluated as prone and supine to determine that the selected female had no injuries, mutilations, or obvious signs of illness. One examiner held the animal to avoid excessive movement, and the other performed a detailed systematic inspection in a cranial-caudal dorsoventral orientation (Resendiz et al. 2018). All those organisms that presented evidence of fractures and injuries were excluded from this study.

Turtles were examined using two methodologies: 1) straight carapace length (SCL), straight carapace width (SCW), and thickness of carapace (TC) were measured using a 950 mm long Haglöf tree caliper (Model Mantax Blue; estimated measurement error ± 0.5 cm) (Le Gouvello et al. 2020a, Lamont & Johnson 2021). The SCL was measured from the nuchal notch to the most posterior portion of the rear marginals. The SCW was measured from the widest part of the carapace, and the TC was measured from the middle of the plastron to the highest part of the carapace; 2) the curved carapace length (CCL), curved carapace width (CCW), and diameter of body (circumference, Cir), in the same carapace locations for straight measures. All measurements were taken with a flexible tape (measurement error ± 0.5 cm; Le Gouvello et al. 2020a, Lamont & Johnson 2021). Finally, the weight (W) was taken in kilograms for each turtle by suspending the turtle by ropes and a portable stretcher attached to a digital scale (instrument error ± 0.5 kg), anchored to a metallic tripod (Lamont & Johnson 2021).

Body condition estimates

The BC of nesting females was estimated using three different BC index: 1) Fulton index (K), 2) BC index modified by Bjorndal et al. (2000) (Bjorndal index, hereafter), and 3) body mass index (BMI). Fulton's index has been estimated for several sea turtle species and is calculated from the length-weight relationship (Beverton & Holt 1957). Bjorndal et al. (2000) proposed an index to determine the BC for green turtles (*C. mydas*) in the Bahamas National Park system, which was then taken as a reference to determine BC. Additionally, we implemented a new approximation to the BMI, commonly used in veterinary sciences and cattle ranching (Salazar-Cuytún et al. 2020).

The K was calculated as:

$$K = \frac{W}{L^b} \times 10^n$$

where b is the scaling exponent (isometric and therefore equal to three), the result is multiplied by 10 and raised to n to achieve a unit.

The Bjorndal index was calculated as BC = [body mass (W) × SCL^{-3}] × 10,000, where body mass is the animal's W in kilograms, SCL is the straight carapace length, and 3 is the scaling exponent, which is isometric and therefore, equal to three.

The BMI was calculated as

BMI = [W (kg) / TC (mm)] / SCL (mm)] / 10

where W is the animal's W in kilograms, thickness of the carapace (TC) is the measure from the middle of the plastron to the highest part of the carapace in mm, and SCL is the straight carapace length. Traditionally, this formula is applied to measure BMI in sheep, horses, swine, and other farm animals (Salazar-Cuytún et al. 2020), using the height of the withers; here, we replaced this for TC.

The BC of nesting turtles, based on the three BC indexes, was characterized by Castro et al. (2001) as a) bad condition, individuals whose BC is less than the arithmetic mean of the sample minus a standard deviation; b) good condition, individuals whose BC is equal to or greater than the previous value and less than or equal to the sum of the mean plus a standard deviation; and c) excellent condition, representing individuals whose BC is greater than the sum of the average and a standard deviation.

Data analysis

Simple linear regression was used to analyze the relationship between W and each measurement variable (SCL, SCW, CCL, CCW, Cir). Mann-Whitney tests

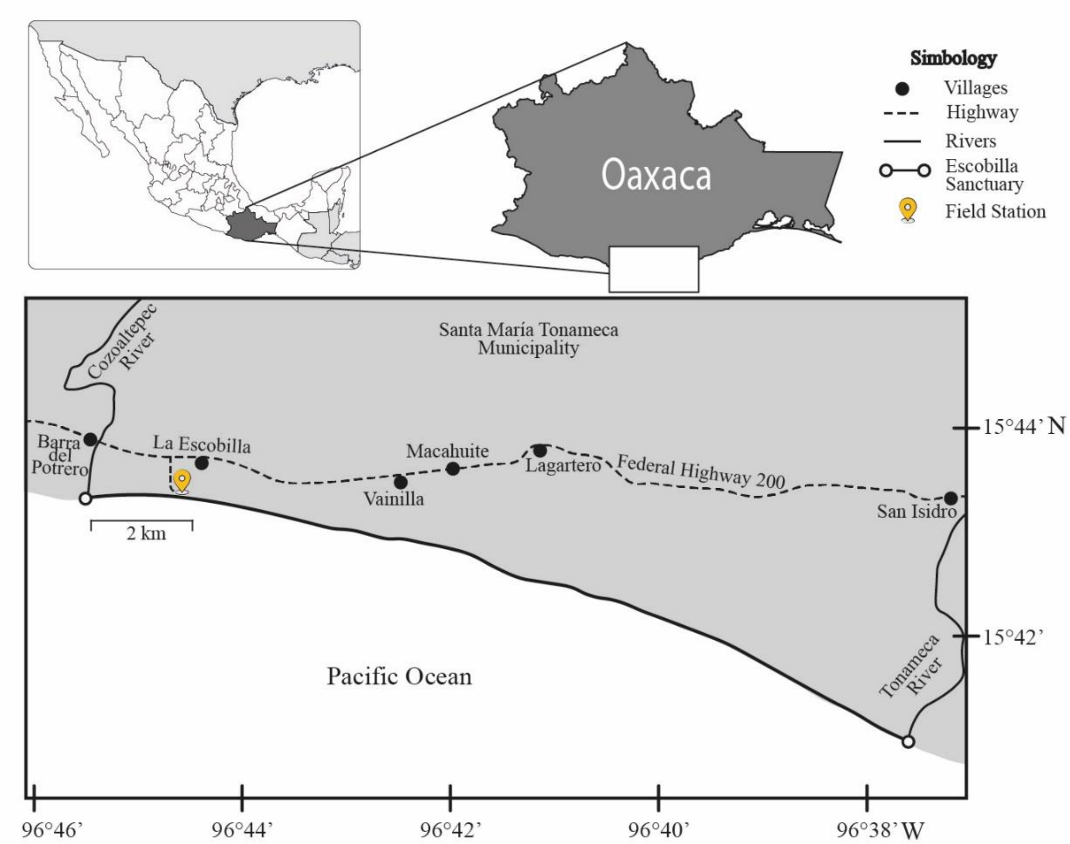

Figure 1. Location of La Escobilla Beach Sanctuary, Oaxaca, Mexico.

were used to identify differences between BC estimates. As a product of applying the formulas of the different indexes used, we noted that Fulton's and Bjorndal's indexes were similar in their values; therefore, we considered these as one (Fulton's/ Bjorndal index, hereafter). Additionally, simple linear regressions were used to analyze the relationship between the BC indexes and SCL, as well as between the BC indexes and W. Finally, a within-group sum of squares (WGSS) test was used to evaluate the BC classification of the specimens evaluated. Results were considered significant when $P < 0.05$. Mean and standard deviation (SD) are presented in the following notation: mean ± SD. Analyses were performed using Past 4.08 statistical software (Hammer et al. 2001).

RESULTS

A total of 447 nesting olive ridley female turtles were sampled during the nesting season. The mean, minimum, and maximum values of the variables (SCL, SCW, TC, CCL, CCW, W) are presented in Table 1. The size (SCL, SCW) and W of nesting turtles was not significantly different from a normal distribution (Shapiro Wilks test $_{SCL}$= 0.906, $P = 0.0643$; Shapiro Wilks test $_{CCL}$ = 0.858, $P = 0.0003$; Shapiro Wilks test $_{Wgt}$ = 0.995, $P = 0.0003$; Fig. 2). A mean of 60.41 ± 2.98 cm was found for SCL (range = 32.7-71.1, n = 450), 52.69 ± 2.57 cm for SCW (range = 36-65.9, n = 450), and 34.35 ± 3.94 kg (range = 23.7-46.3, n = 483) for W. There was a positive relationship between W, and all measurements (Table 2), and particularly, a positive relationship was found between W and Cir (Fig. 3).

Thirty-three females were discarded from the BC analysis due to a failure in the digital scale during its sampling. The other 52 females were discarded from the BMI analysis due to the absence of thickness of carapace measures. The mean ± SD Fulton′s/Bjorndal body condition index estimated for the nesting olive ridley was 1.54 ± 0.15, whereas the mean ± SD of BMI was 2.18 ± 0.23 (Table 3). There was a significant difference between Fulton′s/Bjorndal index and BMI (Mann-Whitney test = 0.0014, $P < 0.000001$). Moreover, there was a negative relationship between Fulton′s/Bjorndal index and SCL ($r = -0.47$, $P < 0.000000783$; Fig. 4a), although there was a positive relationship between BMI and SCL ($r = 0.130$, $P < 0.004$; Fig. 4b). On the other hand, there was a positive

Table 1. Morphometric measurements of nesting female *L. olivacea* in La Escobilla, Oaxaca. SD: standard deviation, n: sample size.

Measurement	Abbreviation	Mean	SD	Range	n
Straight carapace length (cm)	SCL	60.41	2.98	32.7-71.1	450
Straight carapace width (cm)	SCW	52.69	2.57	36-65.9	450
Thickness of carapace (cm)	TC	25.65	2.07	13-43.9	399
Curved carapace length (cm)	CCL	65.11	3.33	57.4-93.7	483
Curved carapace width (cm)	CCW	69.17	3.43	60.4-98.2	483
Circumference (cm)	Cir	125.13	4.95	112.3-141.1	483
Weight (kg)	W	34.35	3.94	23.7-43.3	483

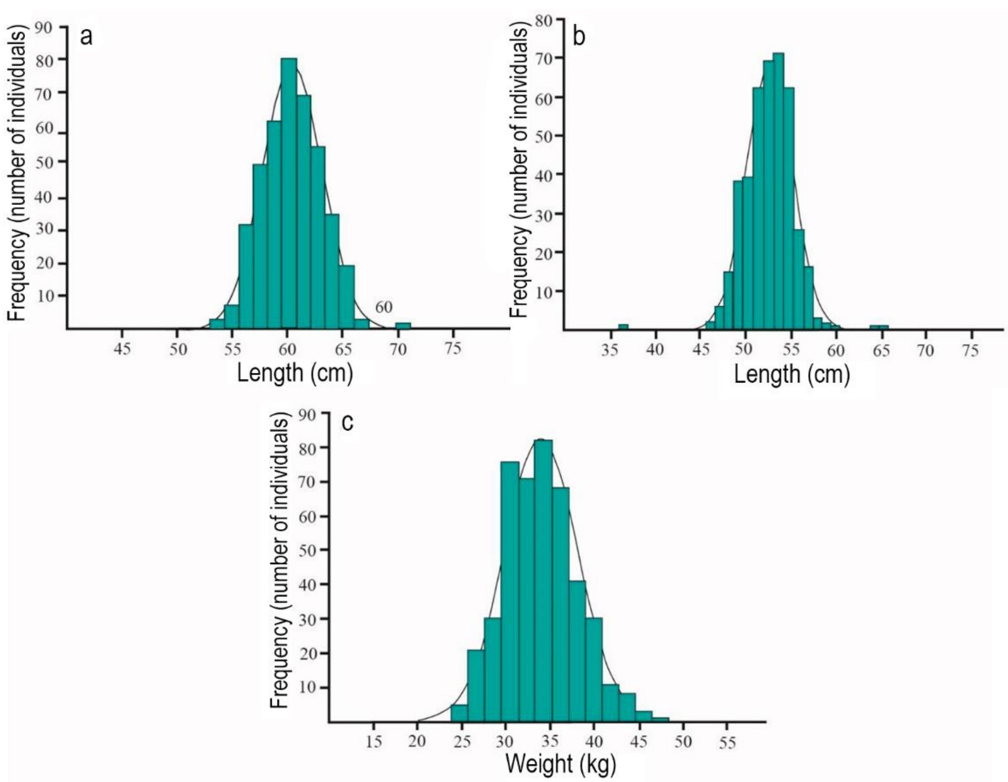

Figure 2. Size distribution for *L. olivacea* sea turtles in La Escobilla, Oaxaca. a) Straight carapace length, b) straight carapace width, c) weight. The line shows the normal distribution curve.

relationship between Fulton′s/Bjorndal index and W (r = 0.334, P < 0.000404; Fig. 5a), and a positive relationship between BMI and W (r = 0.517, P < 0.00005; Fig. 5b).

Based on the Fulton′s/Bjorndal index results, we classified 49 individuals with bad condition, 318 with good condition, and 47 with excellent condition. Using WGSS analysis, we found that 67.9% (WGSS = 41026, F = 2.11) of the individuals were correctly classified. Additionally, there were differences in the BCI index between BC groupings (Mann-Whitney test = 0.0014, P < 0.000001; Fig. 6a). On the other hand, BC characterization based on BMI resulted in 28 individuals classified as in bad condition, 315 as in good condition, and 19 in excellent BC. There were differences in the BCI scores between the groups (Mann-Whitney test = 0.00001, P < 0.0000001; Fig. 6b), and using WGSS analysis, we found that 72.8% (WGSS = 2.14) of the individuals were correctly classified.

DISCUSSION

Morphometric studies provide basic information about animal development, evolution, biomechanics, behavior,

Table 2. Simple linear regression equations (Y= ax + B) for significant correlations of length measurements of *L. olivacea* in La Escobilla, Oaxaca. SCL: straight carapace length, SCW: straight carapace width, CCL: curved carapace length, CCW: curved carapace width, Cir: circumference, W: weight, r^2: R-squared, F: F-test value, df: degrees of freedom, *P*: probability value (< 0.05).

X	Y	a	b	n	r^2	F	df	*P*
W	SCL	1.13	-34.25	443	0.54	22.34	1.29	0.0001
W	SCW	0.85	-11.24	443	0.28	12.85	1.05	0.0001
W	CCL	0.82	-19.58	443	0.44	18.94	1.11	0.0001
W	CCW	0.72	-16.18	443	0.36	15.95	0.97	0.0001
W	Cir	0.72	-16.18	443	0.36	15.95	0.97	0.0001

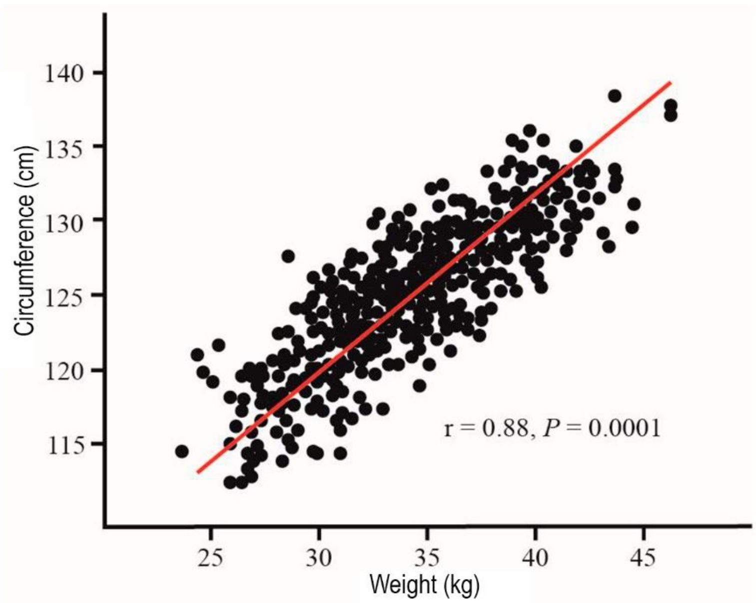

Figure 3. Relationship between circumference and weight of nesting female *L. olivacea* in La Escobilla, Oaxaca.

Table 3. Body condition index comparisons of three formulae applied in *L. olivacea* in La Escobilla, Oaxaca. SD: standard deviation, n: sample size.

	Mean	SD	Range	n
Fulton index	1.54	0.15	0.88-2.59	414
Bjorndal index	1.54	0.15	0.88-2.59	414
BM Index	2.18	0.20	1.18-4.01	362

ecology, and physiology (van Dam & Diez 1998); furthermore, they play a key role in characterizing and analyzing intra-population trends (Figueroa & Alvarado 1990, van Dam & Diez 1998). For the olive ridley turtle, knowledge about their morphometric characteristics and BC has remained limited. In this study, BC was classified using morphometric analyses, and it is the first assessment for olive ridleys nesting in La Escobilla on the Pacific coast of southern Mexico. It also shows that fewer nesting females were registered at this location a few decades later.

Body size is commonly used in field studies with sea turtles; nonetheless, one of the most common body measures is the curve measure (Sönmez 2019). Here, we report two groups of measures (straight and curved). Our mean SCL (60.41 cm) and SCW (52.69 cm) found were smaller than SCL (62.98 cm) and SCW (57.07 cm) reported by Frazier (1983) (n = 82), also on nesting olive ridley turtles in La Escobilla. More recently, Gaona & Barragán (2016) reported a range of CCL from 60 to 78 cm, a range of CCW from 63 to 78 cm, and a range of W from 33 to 52 kg. Conversely, the mean results found in this study were smaller than those of the previous studies mentioned above. Espinoza-Romo et al. (2018) reported a mean SCL of 61.7 ± 1.5 and a mean W of 34.9 ± 3.7 for adult olive ridley turtles in northern Sinaloa, Mexico. However, in this study, they evaluated turtles captured while they floated at the surface of the open sea, including data from adult males.

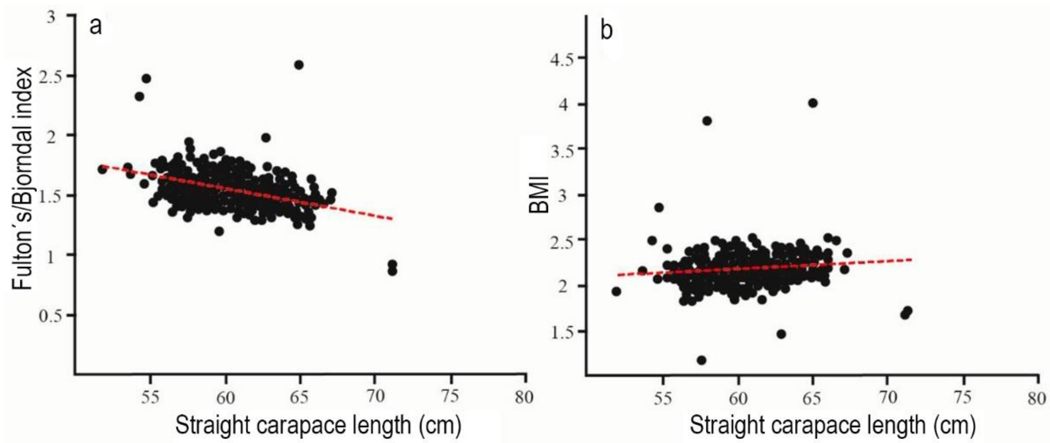

Figure 4. Relationship between a) straight caparace length (cm) and Fulton′s/Bjorndal index, and b) straight caparace length (cm) and body mass index (BMI) in La Escobilla, Oaxaca.

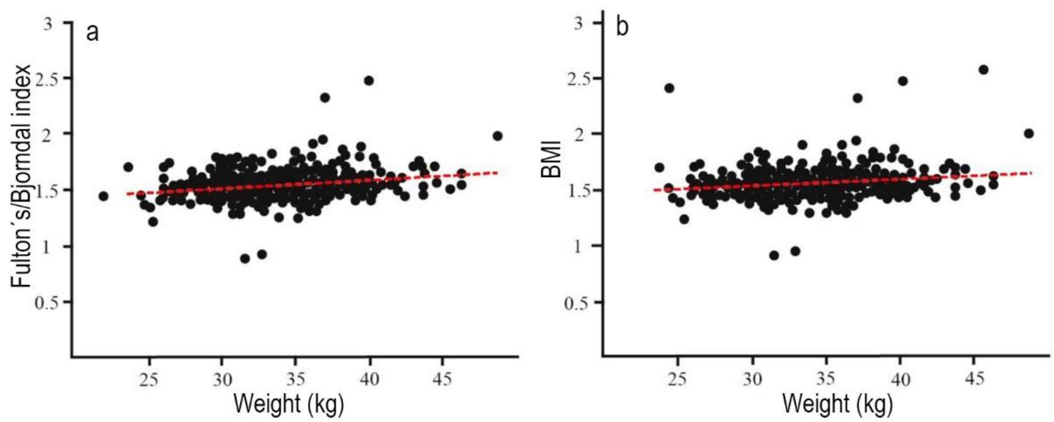

Figure 5. Relationship between a) weight and Fulton′s/Bjorndal index, and b) weight and body mass index BMI in La Escobilla, Oaxaca.

One of the advantages of getting body measurements from turtles is that regional differences or latitudinal trends can be evaluated across nesting populations (Tiwari & Bjorndal 2000). For example, the CCL and CCW (65.11 ± 3.33; 69.17 ± 3.43 cm, respectively) obtained were smaller than those reported by Kalb (1999) (CCL: 68.4 cm ± 0.2 cm) for Playa Nancite, Costa Rica, and Vera & Rosales (2012) in Tumbes, Peru (CCL: 67.8 cm ± 2.9 cm). Dornfeld et al. (2015) reported a mean CCL of 65.9 ± 3.5 cm for Playa Grande, Costa Rica, while in the western Pacific, Whiting et al. (2007) reported a mean CCL of 69.6 ± 2.3 cm. In the western Atlantic, da Silva et al. (2007) reported a mean CCL of 73.1 ± 0.2 cm for Sergipe and Bahía, Brazil. Although our results are slightly smaller than those in the literature, Bergmann's rule proposes a positive relationship between mean body size and latitude, in which smaller individuals are found at lower latitudes (Gardner et al. 2011, Angielczyk et al. 2015); however, this is only applied for endothermic animals (Ashton & Feldman 2003).

Some hypotheses proposed by Le Gouvello et al. (2020a) have been used to explain the mechanisms responsible for a decline in sea turtle mean carapace size. First, the possibility of an increase in the number of first-time nesters in the nesting population, which means an increase in food competition and consequently affects growth rates (denso-dependence processes). Second, a change in the size at maturity, with females reaching maturity at a smaller size. Third, lower rate of post-maturity growth, and fourth, decreased adult survivorship. However, a fifth hypothesis related to ecosystem variation productivity in tropical regions has been proposed as a product of large-scale ocean-atmosphere anomalies affecting primary and secondary production. In the west Atlantic,

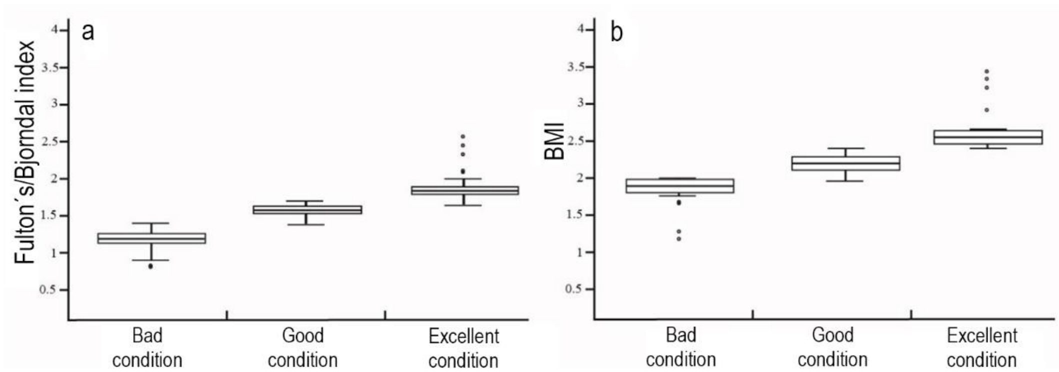

Figure 6. Body condition scores of nesting females of *L. olivacea* in La Escobilla, Oaxaca. a) Fulton's/Bjorndal index, b) body mass index (BMI).

Bjorndal et al. (2017) showed that ecological regime shifts due to the synergistic effect of a strong El Niño-Southern Oscillation and the intensification of the warming rate over the last two to three decades resulted in decreased growth rates of green turtles. As a consequence of any of these hypotheses, smaller females may produce smaller hatchlings of lower fitness (Le Gouvello et al. 2020b). In addition, smaller females may produce fewer eggs, affecting overall population growth (Le Gouvello et al. 2020a).

Regarding the relationships between body measurements and W, positive correlations were found in most cases, the strongest being between Cir and W. In this sense, Cir explains 61% of the increment in W or vice-versa. Although this is an interesting result, there are no similar studies, perhaps because mass measurements may be difficult to obtain, particularly for large animals in challenging field situations (Thomson et al. 2009). Weighing large sea turtles along nesting beaches in remote field sites is logistically difficult, and it often involves transportation of the animals to weighing facilities and holding them for prolonged periods (Thomson et al. 2009), which may affect mass measurements.

BC is a proxy for a turtle's health condition. It can be quantified by assessing an animal's external parameters (morphometrics measures) (Bjorndal et al. 2000, Labrada-Martagon et al. 2010), which is a reference to its energetic condition since an individual in good condition is assumed to have higher energy reserves than one in poor condition (Labrada-Martagon et al. 2010). Page-Karjian & Perrault (2021) explained that the first step to assessing the health of sea turtle populations is to generate population-specific baseline health data to establish a health database representative for that population. Our study assessed the BC for olive ridley nesting at La Escobilla. BC is correlated with fecundity because energetic reserves limit the amount of energy that can be distributed for reproduction and can supply valuable information about overall fitness and health (Perrault et al. 2012). This information can be especially relevant for threatened populations to prioritize conservation actions (Schulte-Hostedde et al. 2005). Sea turtles can be sensitive to the decrease in their BC because of their migratory behavior and the fact that they do not reproduce annually (Bjorndal et al. 2003). Moreover, females concentrate their reproductive efforts in specific years, followed by non-nesting years, reducing the number of breeding migrations between their distant nesting and feeding grounds (Bjorndal et al. 2000, Marco et al. 2011).

Health indicators, including BC and physical examination, have been used to determine the general health status of multiple free-living species (Thomson et al. 2009). Our study found similar BC values - using Fulton's/Bjorndal index as a reference - to those reported in healthy populations of olive ridley turtles (*L. olivacea*) in northern Sinaloa, Mexico (Espinoza-Romo et al. 2018), and was greater than those reported in Brazil (de Deus et al. 2015) and Venezuela (Barrios et al. 2015) where most turtles had a poor BC and included individuals with signs of physical illness and disease.

This study compared two ways to estimate the BC and another index (BMI) commonly implemented in veterinary sciences and cattle ranching. The BMI presented here allowed us to include the accumulation of a large fat area in the turtles' internal cavities. Therefore, BMI can be an alternative tool to predict BC in sea turtles because fat plays an important role in several functions (e.g. source of energy, buoyancy, thermal insulator) (Young 1976).

Although visual assessment techniques of the physical condition have been proposed in field studies for wildlife health assessments (Thomson et al. 2009), they are inadequate in identifying BC scores; hence, using the BC index is adequate. The BC index and the categories established (i.e. bad, good, and excellent condition) represent a viable alternative to assign each sea turtle with a BC class, and based on the percentages of the WGSS test, this classification is straightforward. Thus, similar to Stevenson & Woods (2006), we suggest that using different indexes to evaluate BC in the same population will reflect the status of the population.

In a changing ocean environment, it is important to provide baseline observations on ecosystems and organisms' health (Nolte et al. 2020). This study is the first to report the smallest female size of nesting olive ridleys for the southwest Mexican Pacific coast and is the first estimation of BC showing that most of the nesting females in La Escobilla have good body condition; however further research is required to understand if smaller female sizes can affect the reproductive output and overall population growth.

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