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Kemp's ridley returning to the ocean after nesting. See pages 1-2. Photograph: T. Meyer

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Guest Editorial: Three 2020s Conservation Setbacks for the Critically Endangered Kemp's Ridley Sea Turtle

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In years 2020, 2023 and 2024, conservation for the critically endangered Kemp's ridley sea turtle (*Lepidochelys kempii*) population suffered three significant setbacks. The first setback began in 2020 when the National Park Service reviewed the Sea Turtle Science and Recovery Program at Padre Island National Seashore, Texas (NPS 2020), reduced its budget, sidelined Dr. Donna J. Shaver who had successfully supervised it for more than 40 years, and reduced the amount of research that was allowed to be conducted by that program (Repanshek 2024; https://parkplanning.nps.gov/documentsList.cfm?parkID=86&projectID=114475).

The second setback occurred in 2023, when the binational (Mexico-United States) annual report (Burchfield & Adams 2023), covering Kemp's ridley conservation and research on the coast of Tamaulipas, Mexico, failed to contain essential data on annual nests (clutches laid) on the two epicenter beach segments: Rancho Nuevo and Barra del Tordo (= Playa Dos). The explanation given by Burchfield & Adams (2023) was:

> "The year 2023 was an atypical nesting season for the operational aspects of the Binational Program given that of the six camps that have been monitored on the coast of Tamaulipas each year (La Pesca, Tepehuajes, Rancho Nuevo, Barra del Tordo, Altamira and Miramar), this year we, the U.S. contingent, were only permitted to work in the State of Tamaulipas-operated camps of La Pesca, Tepehuajes, Altamira and Miramar. In the case of Altamira and Miramar, we were only allowed to work part of the season due to awaiting permits from Mexico City. The other two epicenter camps of Rancho Nuevo and Barra Del Tordo were operated by CONANP. The U.S. field crew was precluded from assisting in these camps due to a misunderstanding of the fiduciary requirements for U.S. participation. Historically, Tepehuajes, Rancho Nuevo and Barra Del Tordo have been, and remain, the index beaches for monitoring the recovery of this taxon."

During preceding years 1966-2022, the annual index of Kemp's ridley population status was first represented by annual nests on the Rancho Nuevo beach segment only, then later expanded to combined beach segments Rancho Nuevo, Tepehuajes and Barra del Tordo. The annual number of females nesting in a season on this index beach is included in the binational (U.S.-Mexico) recovery plan (NMFS *et al*. 2011) as a demographic criterion for both downlisting and delisting Kemp's ridley under the U.S. Endangered Species Act of 1973 as amended. The annual number of female Kemp's ridleys nesting in a season on the Tamaulipas index beach has been calculated by dividing annual nests by 2.5, the mean number of nests per female per nesting season (NMFS *et al*. 2011; NMFS & USFWS 2015; Wibbels & Bevan 2019). Data on annual numbers of hatchlings released from Rancho Nuevo and Barra del Tordo beach segments were also missing from the 2023 annual report (Burchfield and Adams 2023). If data for Rancho Nuevo and Barra del Tordo beach segments in 2023 and subsequent years are not shared, this may have far-reaching consequences related to tracking the annual status of the Kemp's ridley population, making it impossible to assess population recovery of the species. The essential need for access to these data was recognized in the binational (U.S.-Mexico) recovery plan for Kemp's ridley (NMFS *et al*. 2011):

> "The 1992 Recovery Plan noted that nearly the entire adult female population nests along 60 km of beach on the east coast of Mexico (*i.e.*, Rancho Nuevo).

Demographic criteria for downlisting and delisting were based on annual numbers of nesting females and annual numbers of hatchlings released on beaches of Rancho Nuevo, Tepehuajes, and Playa Dos referred to as primary nesting beaches (NMFS *et al*. 2011). NMFS *et al*. (2011) also recognizes the importance of cooperative actions across various international stakeholders to ensure the protection and recovery of this species:

> "A State committee for the protection and conservation of the Kemp's ridley should be formed to ensure integrated management planning and action. This committee should include participants from proper authorities, local communities, government agencies, NGOs, fishers, and tourist industries. Participation of local communities is essential in decisions about site specific management. This might be accomplished via a memorandum of understanding or other form of agreement."

The third setback occurred in July 2024, when tropical storm Alberto made landfall on the coast of Tamaulipas. Storm surge and high winds likely caused catastrophic damage to Tamaulipas nesting beaches and conservation infrastructure there. The full impact of this damage may be impossible to assess, if the sharing of data among stakeholders continues to be blocked.

We recommend that effects of these three setbacks be investigated and evaluated further to determine their impacts on Kemp's ridley population recovery, especially since Arendt *et al*. (2023) predicted that "Kemp's ridley sea turtle nesting may not achieve 1947 levels by 2048." It now seems possible that such nesting may decrease, without anyone being able to recognize the decline.

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Fibropapillomatosis (FP) in Kemp's ridley (*Lepidochelys kempii*) Sea Turtles Nesting in Veracruz, Mexico

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Fibropapillomatosis (FP) is a disease characterized by epithelial tumors (Herbst 1994), first reported in a green turtle (*Chelonia mydas*) presenting with large, raised masses in Key West, Florida in 1938 (Smith & Coates 1938). FP has now been reported worldwide and for all species of marine turtle to varying degrees (Herbst 1994; Aguirre & Lutz 2004; Flint 2013). The disease is putatively caused by the herpesvirus, Chelonid Fibropapilloma-Associated Herpes Virus (CFPHV), along with underlying environmental or ecological conditions (Herbst *et al.* 2004). Especially high rates of FP have been observed in green turtles and are typically seen during the juvenile developmental stage (Balazs & Pooley 1991; Flint 2013; Jones *et al.* 2016; Kelley *et al.* 2022). Rates as high as 92% have been reported for juvenile green turtles at foraging sites in Kaneohe Bay, Hawaii, an area highly impacted by anthropogenic runoff from a nearby river (Balazs & Pooley 1991). Kelley *et al.* (2022) used a hierarchical disease state model to estimate that nearly all juvenile green turtles in the Indian River Lagoon, Florida, develop FP. While it is plausible that FP in neritic juveniles is acquired during pelagic developmental stages, a study of genetic data from the tumors of infected turtles in Florida suggested that viral infection occurs sometime after juvenile recruitment to neritic developmental habitats (Ene *et al.* 2005). Further, although adult turtles have lower reported incidences of FP tumors (Limpus & Miller 1990; George 1997), this may not accurately reflect viral infection rates. The CFPHV virus has been genetically detected in both visibly infected and apparently healthy turtles for five species of marine turtle (Alfaro-Núñez *et al.* 2014), indicating the potential for seemingly healthy individuals or populations to act as cryptic vectors of FP. Although FP tumors are benign, advanced stages of FP may become debilitating with enlarged, obstructive growths and are linked to inflammation, immunosuppression and bacterial infection (Norton *et al.* 1990; Work *et al.* 2000, 2003; Aguirre & Lutz 2004), highlighting the need for increased understanding of FP infection rates, patterns of infection with respect to life stage, transmission pathways, and factors underlying tumor progression.

Despite a worldwide distribution and high incidence rates for several species of marine turtle, reports of FP in Kemp's ridleys (*Lepidochelys kempii*) have been historically rare (Page-Karjian *et al.* 2021). Tumors were first documented on a Kemp's ridley nesting at Rancho Nuevo, Mexico, in 1985 (Guillen & Peña-Villalobos 2000), and R. Márquez observed a nesting female at Rancho Nuevo in 1967 that had large, FP-like tumors, suggesting an even earlier presence (Barragan & Sarti 1994). Nonetheless, until recently, only a handful of Kemp's ridley FP cases were documented (Barragan & Sarti 1994; Guillen & Peña-Villalobos 2000; Page-Karjian *et al.* 2021). The historically low occurrence of FP in this species is remarkable considering the Kemp's extensive overlap in foraging habitat with loggerhead turtles and, to a lesser extent, with green turtles, both of which are known to harbor the FP virus during various life history stages (Witzell & Schmidt 2004; Alfaro-Núñez *et al.* 2014). Within the last decade, however, reports of FP in Kemp's ridleys have notably increased. Page-Karjian *et al.* (2021) report 22 cases of FP in Kemp's from 2006-2020. Interestingly, twelve of these turtles were adults, a rarely observed life stage for FP, and five of these twelve adults were nesting females from Texas, USA.

Kemp's ridleys nest predominantly in the western Gulf of Mexico from Veracruz State, Mexico to southern Texas, with most nesting occurring at Rancho Nuevo in Tamaulipas State, Mexico (Márquez *et al.* 2001; SEMARNAT 2018). Tecolutla, Veracruz, located approximately 315 km south of Rancho Nuevo, hosts a small yet consistent number of Kemp's ridleys each nesting season (Márquez *et al.* 2001; Roberts *et al.* 2015; SEMARNAT 2018). This beach has been monitored for nesting activity since 1974 by Vida Milenaria, a local non-profit conservation organization under the direction of authors FCM and IG. Since 2014, additional monitoring efforts have been initiated by authors MAR and KEL in collaboration with Vida Milenaria that involve standard nesting beach monitoring practices (*e.g.*, tagging, morphometrics, and genetic biopsies). Despite the intensive monitoring over several decades by Vida Milenaria, no turtles with FP had been observed at Tecolutla, until recently.

Table 1. Summary of data for the four Kemp's ridleys with FP-like tumors at Tecolutla.

Turtle	Date	CCLnt (cm)	CCW (cm)	Tumors	Tumor location and size (mm)	Figure
1	14 May 2018	64.6	64.5	3	R shoulder (26 diameter); R front flipper (29 diameter); Head (26x44x5)	Fig. 1
2	18 May 2018	68.5	68.7	1	R front flipper (9 diameter)	Fig. 2
3	18 May 2018	n/a	n/a	1	R front flipper (94x92)	Fig. 3
4	15 May 2019	69.7	66.5	1	R rear flipper (50 diameter)	Fig. 4

Figure 1. Photographs of the three tumors found on Turtle 1 nesting on 14 May 2018. The raised mass on the head is indicated by the arrow and circle.

Here, we report the observation of FP-like tumors on four adult Kemp's ridley turtles nesting at Tecolutla in 2018 and 2019 (Table 1). Individuals were observed to have between one and three external tumors each, ranging in size from 9-94 mm, and occurring on the neck, shoulder, flippers and top of the head. Due to the lack of previous encounters with FP at Tecolutla, there was no protocol in place for tumor assessment, and therefore, no tissue samples were collected from the tumors. Photographs of the four turtles were obtained (Figs. 1-4). Tumor size was measured for three turtles in the field and indirectly estimated using photographs for a fourth turtle. For photograph-based estimation, a scale was created for each image by converting the length of known objects in the picture into pixels and using this relationship to establish tumor size.

The first turtle demonstrating signs of FP (Turtle 1) was encountered on 14 May 2018 and had a curved carapace length (CCLnt) of 64.6 cm, measured from the nuchal notch to the most posterior tip of the shell, and a curved carapace width (CCW) of 64.5 cm (Fig. 1; Table 1). Three tumors were present: one smooth, circular tumor on the right shoulder measuring 26 mm across with a few embedded barnacles; one smooth, circular tumor on the ventral surface of the right front flipper (*i.e.*, armpit) measuring 29 mm across, and one rough, raised mass on top of the head measuring 26 x 44 x 5 mm (Fig. 1). The second turtle presenting a tumor (Turtle 2) was encountered on the day of an arribada, 18 May 2018, with a CCLnt = 68.5 cm and a CCW = 68.7 cm. A small, circular, rough lesion with a 9 mm diameter was present on the ventral surface of the right front flipper (Fig. 2). The third turtle (Turtle 3) was also encountered during the 18 May arribada. No measurements were taken of the turtle's carapace or tumor, however, photographs of the large, rough, cauliflower-like tumor on the dorsal surface of the right front flipper were used to estimate its size as approximately 94 x 92 mm (Fig. 3). The fourth turtle with a tumor (Turtle 4) was encountered a year later, on 15 May 2019 and measured 69.7 cm long and 66.5 cm wide. The tumor was cauliflower-like, loosely attached, located on the ventral surface of the right rear flipper, and measured approximately 50 mm in diameter (Fig. 4).

Since FP tumors are typically associated with smaller, neritic, juvenile turtles (Balazs & Pooley 1991; Kelley *et al.* 2022), adult nesters with tumors are putatively first- or second-time nesters

Figure 2. Photograph of the tumor present on Turtle 2's right front flipper (18 May 2018).

Figure 3. Photograph of the tumor present on Turtle 3's right front flipper (18 May 2018).

Figure 3. Photograph of the tumor present on Turtle 4's right rear flipper (15 May 2019).

overcoming an infection acquired during the juvenile stage. In this case, nesters with FP would be expected to be smaller in size. However, when comparing the average size of all turtles encountered in Tecolutla from 2014-2019 with that of the three measured turtles with FP, no apparent pattern was detectable between turtle size and FP presence (Table 2). The average CCLnt and CCW of turtles measured in Tecolutla from 2014-2019 was 66.9 cm (±2.4 SD, n = 165) and 68.2 cm (±2.7 SD, n = 166), respectively. In comparison, the average CCLnt and CCW for turtles with FP was 67.6 cm (±2.6 SD, n = 3) and 66.6 cm (±1.2 SD, n = 3), respectively. There was no significant difference between CCLnt of non-FP and FP turtles (t-test, p = 0.65). Furthermore, the CCLnt of two of the measured turtles with FP (Turtles 2 and 4, Table 1) were larger than the CCLnt mean for nesting turtles at this beach (67.0 cm). This suggests that the turtles with FP tumors on Tecolutla's beaches are mature nesting females, not first-time nesters who may be in the process of overcoming a juvenile FP infection. However, we note that small carapace size may not necessarily indicate a young reproductive Kemp's ridley female as some studies suggest that the size at sexual maturity of Kemp's varies (Bjorndal *et al.* 2014; Avens *et al.* 2017).

The recent increase in reports of FP and FP-like tumors in a non-traditional species and a non-traditional age class is concerning, especially considering the relatively recent population fluctuations of this species after a period of exponential growth and potential delisting (Heppell 2014; Caillouet *et al.* 2016). In Veracruz, three out of 96 nesting individuals (3.1%) identified in 2018, and one out of 76 nesting individuals (1.3%) identified in 2019 exhibited FP-like tumors, after decades of no observations of tumors. In a previous study in Texas, FP was confirmed in one nesting individual in 2012, one in 2019, and three in 2020 (Page-Karjian *et al.* 2021). Taken together, these data indicate a noteworthy increase in FP in Kemp's ridley turtles during the 2018-2020 period. We note that while Vida Milenaria has continued its conservation efforts since these encounters, including counting and relocating nests, and releasing hatchlings, there has been no systematic program for encountering nesting females since the onset of the global COVID-19 pandemic. Therefore, we have no data on the continued presence of nesting females with FP-like tumors between the encounters reported here and the publication of this manuscript. Additional research efforts are needed, especially the continued monitoring of nesting females along with tumor and blood biopsies, to fully understand the impact FP is having on the Kemp's ridleys nesting in Tecolutla and importantly, if the disease is present in nesting individuals without symptoms. Further, it is worth considering that transmission between nesting Kemp's ridleys might be elevated compared to other species as they often nest in arribadas, where many individuals synchronize the timing of their nesting. Arribada turtles aggregate in the near-shore waters of nesting beaches before an arribada (Bonka 2020), potentially presenting opportunities for high rates of viral transmission.

Given FP's association with anthropogenic factors like pollution (Balazs *et al.* 2000; Aguirre & Lutz 2004; dos Santos *et al.* 2010; Tristan *et al.* 2010), the new appearance of tumor-bearing turtles on Tecolutla's nesting beaches could be a sign of anthropogenic factors affecting in-water habitats in the region. A recent study from the proximate Veracruz Reef System National Park reports a 12.2% incidence rate of FP in green turtles (all juveniles) and notes that this area is affected by organic pollution from rivers and a new Port of Veracruz expansion project (Suárez-Domínguez *et al.* 2020). Similarly, Shaver et al. (2019) report an increase in the prevalence of FP in green turtles (predominantly juveniles) of Texas waters, from less than 4% in 2010-2015 to 35.2% in 2018. To better understand disease transmission in the area, we recommend future studies examining the range overlap of juvenile green turtles and adult nesting Kemp's ridleys in the Western Gulf of Mexico and a genetic comparison of the herpesvirus associated with each group. In addition, determining the rate of viral infection in seemingly healthy turtles across age classes will be an important next step to provide insight into the true prevalence of the virus; perhaps the virus is widespread, and FP only occurs when turtles are substantially immunocompromised. Increased genetic studies of the underlying herpesvirus will be valuable for determining which turtle populations or regions are at higher risk of FP, and if FP prevalence is correlated with metrics associated with pollution or other anthropogenic impacts (Aguirre & Lutz 2004; Alfaro-Núñez *et al.* 2014; Alfaro-Núñez & Gilbert 2014).

Table 2. Curved carapce length (notch to tip) in cm. for all turtles encountered between 2014 and 2019, compared to the three turtles reported in 2018 and 2019 with tumors. A fourth turtle with a tumor was encountered, but carapace measurement was not taken.

	N	Average	Std. Dev.	Maximum	Minimum
All Turtles (2014-2019)	165	66.9	±24	75.6	60.9
Tumor Turtles	3	67.6	±26	69.7	64.6

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Validation of the iPhone Measure Application to Determine Straight Carapace Measurements of Sea Turtles

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Sea turtles play critical roles in marine ecosystems by maintaining coral reefs, limiting seagrass overgrowth, serving as a substrate for numerous epibiota, and providing nutrients to nesting beaches; yet human activities and subsequent environmental changes continue to threaten their populations (Bjorndal & Jackson 2003). One strategy used to better understand basic biology, population assessments, and conservation efforts in sea turtles is to monitor size, allowing for an improved interpretation of growth rates, health status, body condition, reproductive output, and habitat quality (Bolten 1999; Bjorndal *et al*. 2000). Standardized carapace measurements in sea turtles are collected using both flexible tapes for curved measurements and calipers for straight-line measurements (Bolten 1999; Wyneken 2001). Both methods have high precision (Bjorndal & Bolten 1989). Due to variability in curved measurements (Shoop & Ruckdeschel 1986), straight-line measurements are considered a gold standard in sea turtles, freshwater turtles, and tortoises (Carr 1952; Pritchard *et al.* 1983) and are a standardized metric for the U.S. Sea Turtle Stranding and Salvage Network Stranding Report (https://www.seaturtlestranding.com/stssn/stateData/STSSN_form_FL.pdf). Despite this, straight-line measurements are less frequently collected (Foley *et al*. 2019) due to logistical challenges of transporting large calipers and cost restrictions (some larger calipers cost >$300 USD) (Lagor *et al*. 2024).

With the rapid advancement of technology, smartphone applications have emerged as potential alternatives to conventional measurement tools, particularly with the forestry industry (Balenović *et al.* 2020; Borz *et al.* 2022, 2024) and in archaeological studies (Lagor *et al*. 2024). The iPhone's Measure application (app) employs light detection and ranging (LiDAR) technology to simplify the measurement process, allowing users to record size and other morphological attributes with greater efficiency (https://support.apple.com/en-us/102468). Despite the increasing use of smartphone technology in ecological research, there remains a gap in the literature regarding the comparative accuracy and reliability of these methods (Andrachuk *et al*. 2019). The objective of this study was to compare straight-line carapace measurements in sea turtles using calipers and iPhone's Measure app. By examining accuracy and practicality, this research seeks to provide insight into the potential of modern technology to complement traditional methodologies, both reducing costs in the field and improving logistics.

The study was conducted from 30 March 2023 to 01 October 2024. Sea turtles nesting on Juno and Jupiter Beaches, Florida USA were encountered during routine nighttime monitoring surveys conducted by Loggerhead Marinelife Center (LMC), under Florida Fish and Wildlife Commission Marine Turtle Permit [FWC MTP] #205. Nesting turtles were illuminated with red LED headlamps to take the measurements (Fig. 1) after ~75% of the clutch had been deposited. Additionally, sea turtle patients entering LMC's rehabilitation hospital (FWC MTP #086) and mounted specimens housed in the LMC collection (FWC MTP #252) were also used for this study. Measurements from the calipers and the Measure app were taken independently by two different individuals to eliminate bias. In total, 85 sea turtles were measured, including 31 nesting leatherbacks (*Dermochelys coriacea*), 13 nesting loggerheads (*Caretta caretta*), eight loggerheads in rehabilitation (one juvenile, three subadults, four adults), one juvenile loggerhead taxidermized specimen, 12 nesting green turtles (*Chelonia mydas*), 11 juvenile green turtles in rehabilitation, four green turtle taxidermized specimens (three juveniles, one subadult), four hawksbill (*Eretmochelys imbricata*) taxidermized specimens (three juveniles, one subadult), and one subadult olive ridley (*Lepidochelys olivacea*) taxidermized specimen. Measurements were taken using Haglöf Mantax Blue 50 cm and 127 cm calipers (Haglöf, Sweden; cost: ~$182 and $327 USD, respectively) with a precision of ±1 mm, KWK Trade 1500 mm high-precision calipers (Taizhou KWK Trade Company Limited, Taizhou, China; cost: ~$500 USD) with a precision of ±1 mm, and the iPhone Measure app with a precision of one cm.

Two carapace measurements were collected for leatherbacks including standard straight carapace length ($SCL_{standard}$) from the nuchal notch to the posterior edge of the caudal peduncle (Fig. 1e; Bolten 1999) and straight carapace width (SCW) at the widest point of the carapace (Fig. 1g). For chelonids, three measurements were collected including minimum straight carapace length (SCL_{min}) from the midpoint of the nuchal scute to the notch of the two most posterior scutes (Fig. 1a, d), $SCL_{standard}$ from the nuchal notch to the distal portion of the most posterior marginal (supracaudal) scutes (Fig. 1b), and SCW at the widest part of the carapace (Fig. 1c, f) (Bolten 1999; Wyneken 2001).

Agreement between caliper and Measure app measurements was evaluated using Passing-Bablok regression, where a slope equal to 1 and an intercept equal to 0 indicate perfect agreement between the two methods. The Bland-Altman method and paired-sample t-tests were used to evaluate biases (*i.e.*, mean difference) between measurements determined by calipers and the Measure app. All statistical analyses were run using MedCalc® (version 23.0.2; Ostend, Belgium).

Measures of central tendency and range for each species of sea turtle measured for this study are included in Table 1. Passing-

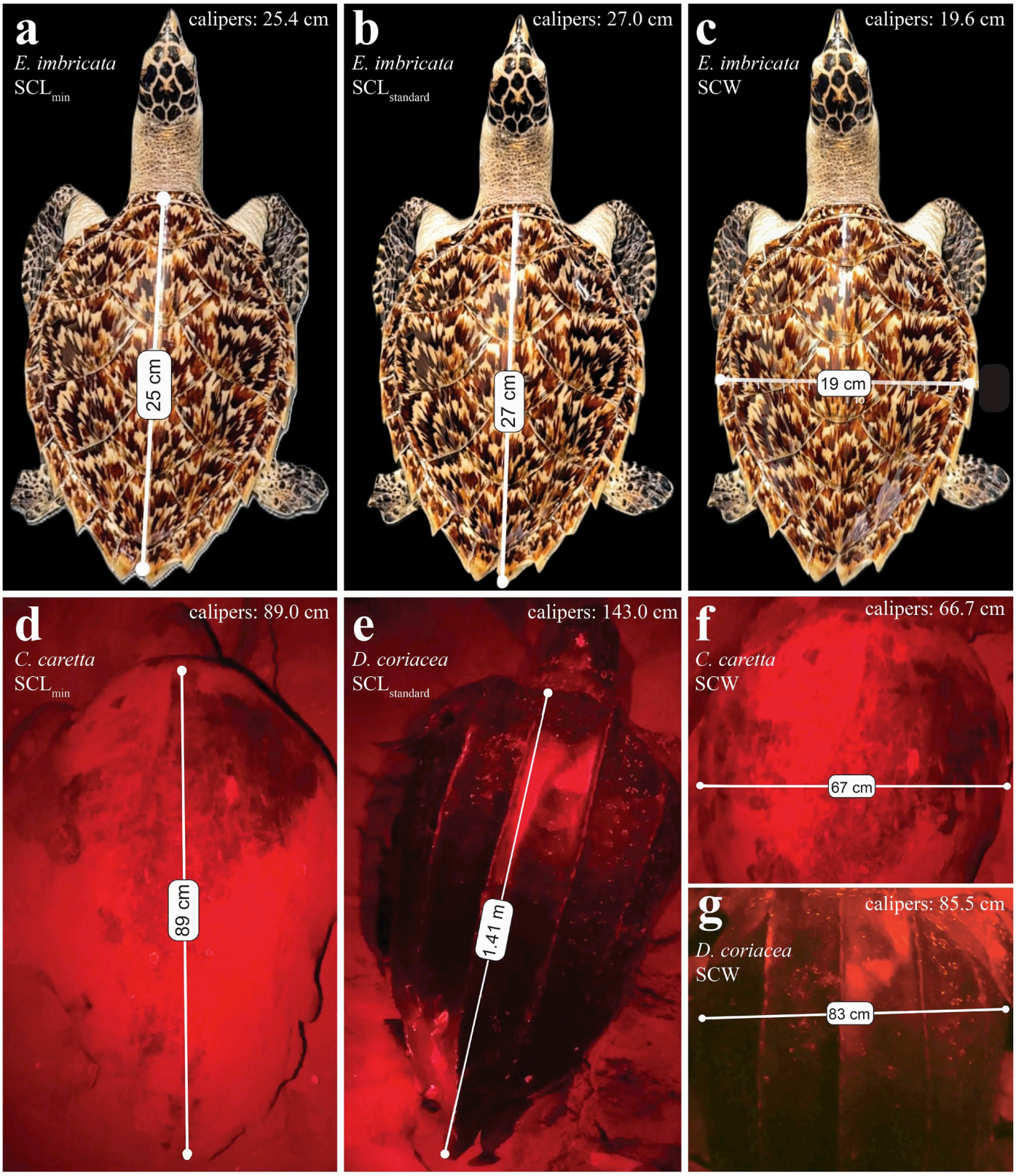

Figure 1. Measurements of (a) minimum straight carapace length (SCL_{min}), (b) standard straight carapace length ($SCL_{standard}$), and (c) straight carapace width (SCW) of a hawksbill sea turtle (*Eretmochelys imbricata*) specimen using iPhone's Measure application. Measurements of (d) SCL_{min} of a nesting loggerhead sea turtle (*Caretta caretta*), (e) $SCL_{standard}$ of a nesting leatherback sea turtle (*Dermochelys coriacea*), (f) SCW of a nesting loggerhead, and (g) SCW of a nesting leatherback using red LED headlamps on the nesting beach at night. The corresponding caliper measurements are provided on each figure panel. Anterior is at the top of each image.

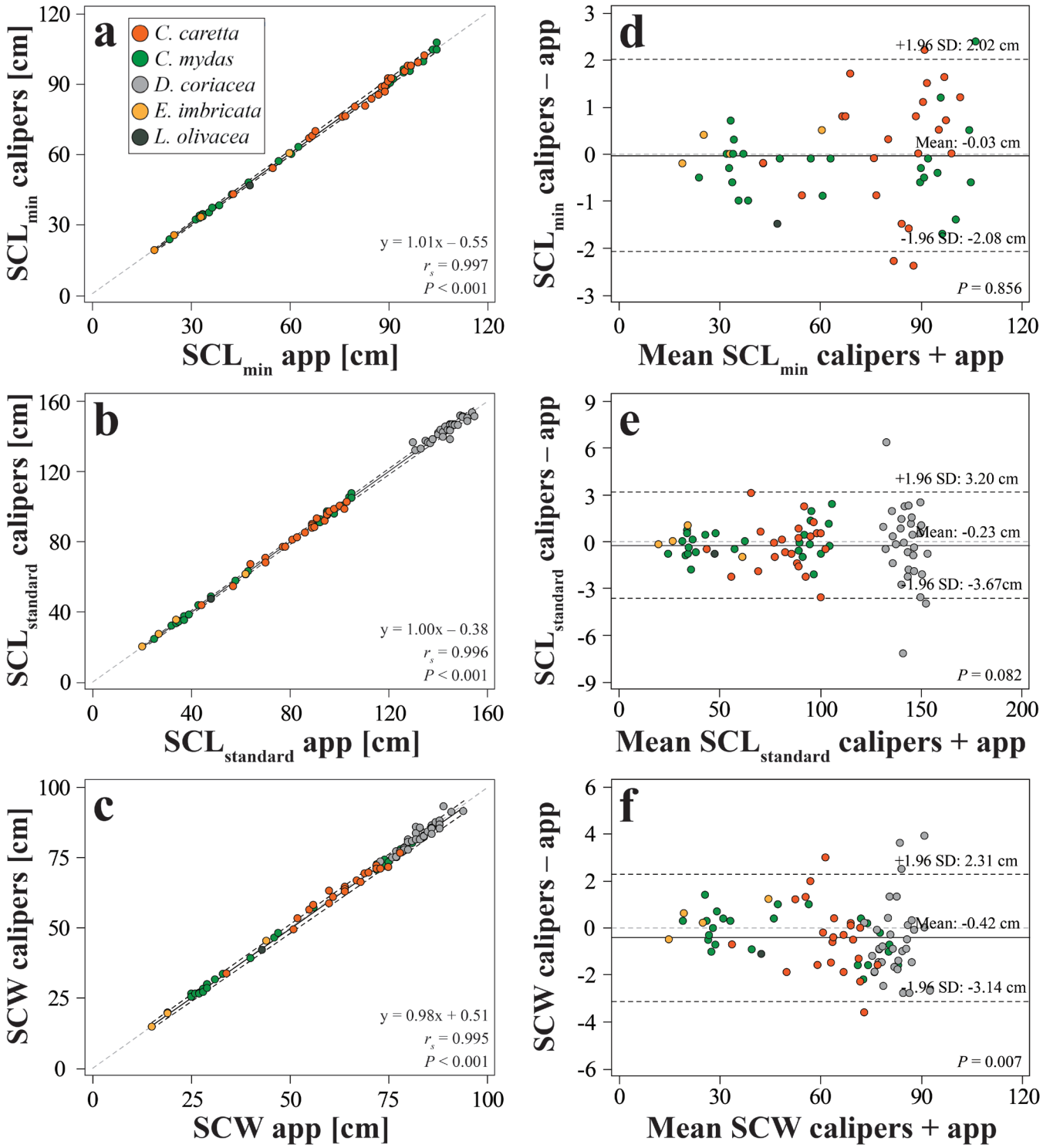

Figure 2. Passing-Bablok regression analysis comparing (a) minimum straight carapace length (SCL_{min}; not measured for leatherbacks), (b) standard straight carapace length ($SCL_{standard}$), and (c) straight carapace width (SCW) of five sea turtle species using calipers and iPhone's Measure application (in cm). Solid black lines are the lines of best fit, dashed gray lines are the lines of identity (*i.e.*, y = x), and dashed black lines are the 95% confidence intervals of the slope. No systematic or proportional error was observed between the two methods. Bland-Altman difference plots comparing (d) SCL_{min}, (e) $SCL_{standard}$, and (f) SCW. Solid black lines indicate the mean difference between the two methods (*i.e.*, calipers versus Measure app), dashed gray lines are the lines of identity, and dashed black lines are the 95% limits of agreement. *P* values correspond to results from paired-sample t-tests. No significant differences were observed between either SCL measurement; however, SCW was significantly smaller (by 0.42 cm) when using calipers compared to results produced by the Measure app.

Table 1. Minimum and standard straight carapace length (SCL_{min} and $SCL_{standard}$, respectively) and straight carapace width (SCW) for leatherback (*Dermochelys coriacea*), loggerhead (*Caretta caretta*), green (*Chelonia mydas*), hawksbill (*Eretmochelys imbricata*), and olive ridley (*Lepidochelys olivacea*) sea turtles using calipers and iPhone's Measure application (app).

		SCLmin (cm)			SCLstandard (cm)			SCW (cm)		
	Method	Mean ±SD	Median	Range	Mean ±SD	Median	Range	Mean ±SD	Median	Range
Leatherback (N = 31)	Calipers	–	–	–	141.8 ±5.7	142.7	131.9-151.5	81.8 ±5.0	81.3	73.2-92.9
	Measure app	–	–	–	142 ±6	143	130-150	82 ±4	82	73-91
Loggerhead (N = 22)	Calipers	82.5 ±15.1	86	42.8-102.2	83.5 ±15.3	87.9	43.4-102.4	63.1 ±9.4	64	33.3-76.4
	Measure app	82.0 ±15.0	88	43-101	84 ±15	89	44-103	64 ±10	64	34-78
Green turtle (N = 27)	Calipers	65.3 ±30.0	60.1	23.5-107.4	65.8 ±30.0	61	24.2-107.4	52.0 ±23.1	48	19.3-82.4
	Measure app	65.0 ±30.0	61	24-105	66 ±30	62	25-105	52 ±24	47	19-84
Hawksbill (N = 4)	Calipers	34.4 ±18.3	29.2	18.8-60.5	35.7 ±18.0	31	19.8-61.0	26.1 ±13.4	22.4	14.5-45.2
	Measure app	34.0 ±18.0	29	19-60	36 ±18	31	20-62	26 ±13	22	15-44
Olive ridley (N = 1)	Calipers	–	–	46.5	–	–	47.1	–	–	41.9
	Measure app	–	–	48	–	–	48	–	–	43

Bablok regression analysis (Fig. 2) showed significant, very strong agreement ($r_s > 0.99$) for SCL_{min}, $SCL_{standard}$, and SCW between caliper and Measure app measurements, with no proportional (*i.e.*, the confidence interval of the slope passed through 1) or systematic (*i.e.*, the confidence interval of the intercept passed through 0) error. Bland-Altman bias for SCL_{min} was -0.03 cm ($P = 0.856$) and for $SCL_{standard}$ was -0.23 cm ($P = 0.082$). Neither of these was significantly different between the two methods; however, the bias for SCW was -0.42 cm ($P = 0.007$) and was significantly different between the two methods (Fig. 2). The coefficient of variation (CV) of SCL_{min} ($N = 5$), $SCL_{standard}$ ($N = 8$), and SCW ($N = 8$) in sea turtles that were measured using calipers more than once by the same individual on different dates ranged from 0–1.2%, 0–1.5%, and 0–1.1%, respectively. The CV for the Measure app for SCL_{min}, $SCL_{standard}$, and SCW ranged from 0–1.1%, 0–3.0%, and 0–3.0%, respectively, indicating replicability with both methods. The two largest CVs were taken from leatherback turtles on the nesting beach at night; however, they are still within typical CVs for measurements of the same individual sea turtles that have been measured on more than one occasion (Bjorndal & Bolten 1988).

Our study demonstrates that the iPhone Measure app is appropriate for use with sea turtles. The high levels of agreement, minimal biases, and replicability indicate that smartphone-based LiDAR measurements serve as a reliable substitute for calipers, especially in situations where transporting large or costly equipment is impractical (Borz *et al*. 2024). Additional LiDAR-based measurement applications are available on other operating systems (*e.g.*, Android; Tomaštík *et al.* 2017), and although those were not tested in the present study, they are likely also suitable for straight carapace measurements in sea turtles, which can be easily verified using comparisons in the field. Nearly 60% of the world's global population uses smartphones, although this differs in advanced versus emerging economies (prioridata.com/data/smartphone-stats/ and pewresearch.org/global/wp-content/uploads/sites/2/2019/02/Pew-Research-Center_Global-Technology-Use-2018_2019-02-05.pdf). Given the validation of the Measure app, straight carapace measurements are now more likely to be incorporated into sea turtle studies requiring these types of measurements (*e.g.*, to calculate body condition index, life-stage class designation, etc.) and in response to sea turtle strandings that often occur unexpectedly and require rapid response times, making calipers less likely to be available, therefore reducing available data for meta-analyses (Foley *et al*. 2019).

The SCW measurements were significantly lower when using calipers in comparison to the Measure app, which could be related to differences in accuracy of the devices (*i.e.*, the Measure app only measures to the nearest cm, whereas the calipers are accurate to 0.1 cm), turtles moving during measurements (*e.g.*, during nest disguising activities), or subjectivity in where individuals measuring turtles placed their start and end points (Borz *et al.* 2024). It is worth noting that the start and end points placed in the app may be manipulated after they are selected to improve accuracy, and we suggest practicing with the Measure app prior to using it for data collection. In forestry studies, it has been shown that the Measure app was more reliable for breast height tree diameter measurements during periods of higher ambient light, which also could have affected some of our measurements that were collected at night under red LED light (Borz *et al*. 2024).

Smartphone technology is becoming more widely available and affordable, potentially expanding the capacity for straight carapace measurements of sea turtles. Ultimately, while calipers remain the gold standard for measurements as they are more precise than the Measure app, our findings suggest that smartphone-based LiDAR measurements are a promising and convenient complementary tool for morphometric analysis. With continued advancements in technology and accessibility, this approach could improve data collection efforts of these vulnerable species.

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Report from the Decolonizing Sea Turtle Conservation Workshop at the 42nd Internation Symposium on Sea Turtle Biology and Conservation, Pattaya, Thailand

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**Compilers and Writers; *Contributing Editors; +Workshop Attendees

On Sunday, 24 March 2024, the first International Sea Turtle Symposium (hereafter Symposium) workshop on the decolonization of conservation was held at the 42nd International Sea Turtle Symposium (ISTS Symposium42) in Pattaya, Thailand (Fig. 1). This session discussed two recent SWOT Report articles identifying how we participate in colonial conservation and parachute science as individuals and as a sea turtle society (Shanker *et al.* 2022, 2023). In doing so, workshop participants took time to identify their roles, express their observations, experiences, perspectives, concerns, confusions, and frustrations, and brainstorm ideas of how they would like to see the International Sea Turtle Society (hereafter Society) address these issues. What follows is an account of this meeting, including recommendations for actions that could be taken to begin addressing some of the issues raised.

What does the colonization of sea turtle conservation refer to? Within the history of sea turtle conservation, most of our own work and that of the experts we idealize reflect a theme of colonialism in which primarily English-speaking researchers from the Global North travel to remote areas in the Global South to tell local communities how to live and manage/interact with their natural resources (Rudd *et al.* 2021). These efforts to "educate and train" local populations, though often well-intentioned with respect to ecological goals, frequently overlook the local sociocultural values and economic needs (Brockington et al. 2006; Campbell 2007; Armitage *et al.* 2020; Bennett *et al.* 2021). Unfortunately, but not surprisingly, the sea turtle community is no exception, as we find sea turtle people following the same global migration routes and methods forged by centuries of colonialism (Shanker *et al.* 2023) in this case, to exploit intangible resources such as knowledge and culture. Importantly, this form of colonization is not limited to foreign scientists in local communities but also within local communities of different regions.

Often, researchers and conservationists from the Global South are not well-connected to the network of counterparts around the globe and are, therefore, overlooked and undervalued. Possibly, this is due to language barriers, with English being the predominant language used for scientific publication, communication, and collaboration (Dahdouh-Guebas *et al.* 2003). However, this also stems from glorifying the prestige of the Global North and the Western-centric convention of how research and conservation "should be done." As such, conservationists of any background should be more aware of the difference between sharing versus imposing their ecological and social ideologies on local and indigenous cultures and be careful not to heroize researchers from the Global North or their methods to avoid further colonization within regions.

How has the International Sea Turtle Society colonized sea turtle conservation? The Society has been a registered non-profit organization since 1996. Its roots are regional sea turtle conferences held under various names since 1981, aimed at bringing together

Figure 1. Photo taken Sunday, 24 March 24 2024, at the 42nd International Sea Turtle Symposium in Pattaya Thailand of Decolonizing Sea Turtle Conservation Workshop Attendees. From left to right: Hector Barrios-Garrido, Kartik Shanker, Alex Gaos, Michael White, Andrés Ramos-Benito, Livia Tolve, Rushan Bin Abdul Rahman, Connie Kay-an Ng, Aileen Lavelle, Amanda Robbins, Bryan Wallace, Kelly Hogan, Kelly Stewart, and Jarina Mohd Jani.

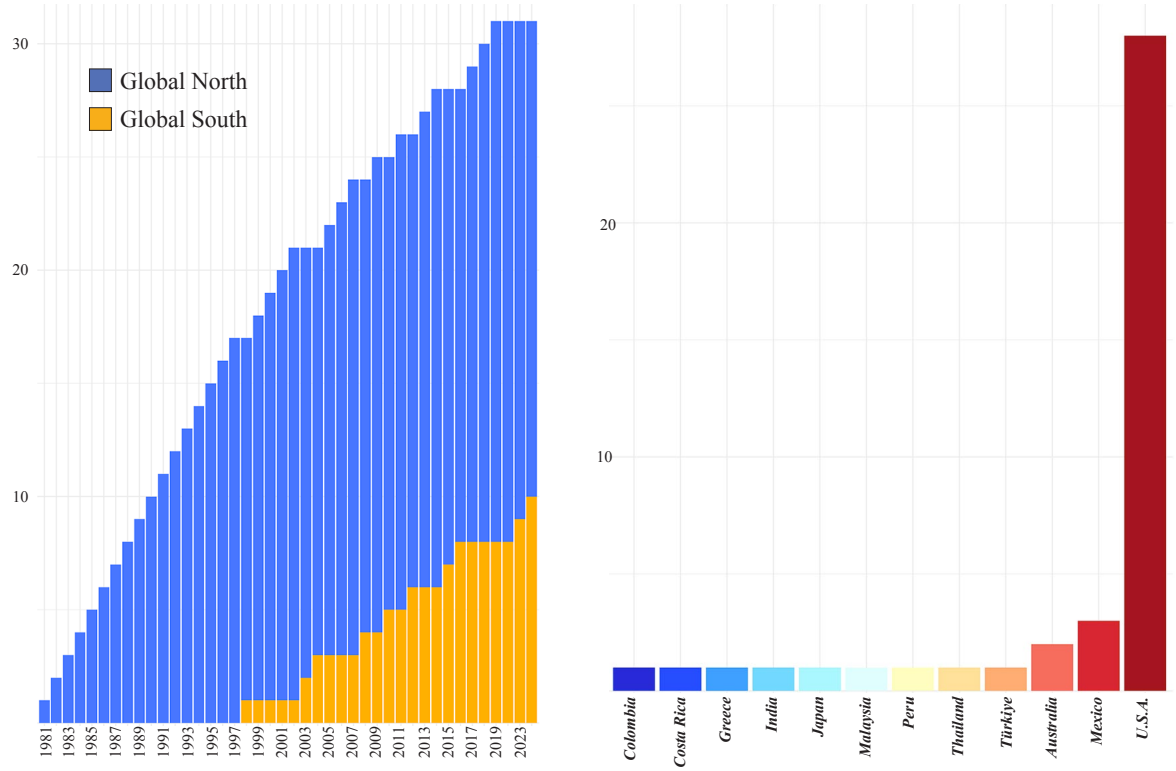

Figure 2. Cumulative Sea turtle symposia (1981-present) by global region on left and host nation on right (Past Proceedings - International Sea Turtle Society 2024). The Global North category is Europe (apart from Türkiye), North America, Japan, and Australia (UN Trade and Development 2023). The Global South category is Türkiye, South Africa, Colombia, Costa Rica, India, Malaysia, Peru, Thailand, and Mexico (UN Trade and Development 2023; UNESCO Organization for Women in Science for the Developing World 2024). Note that no symposium was held in 2020 or 2021.

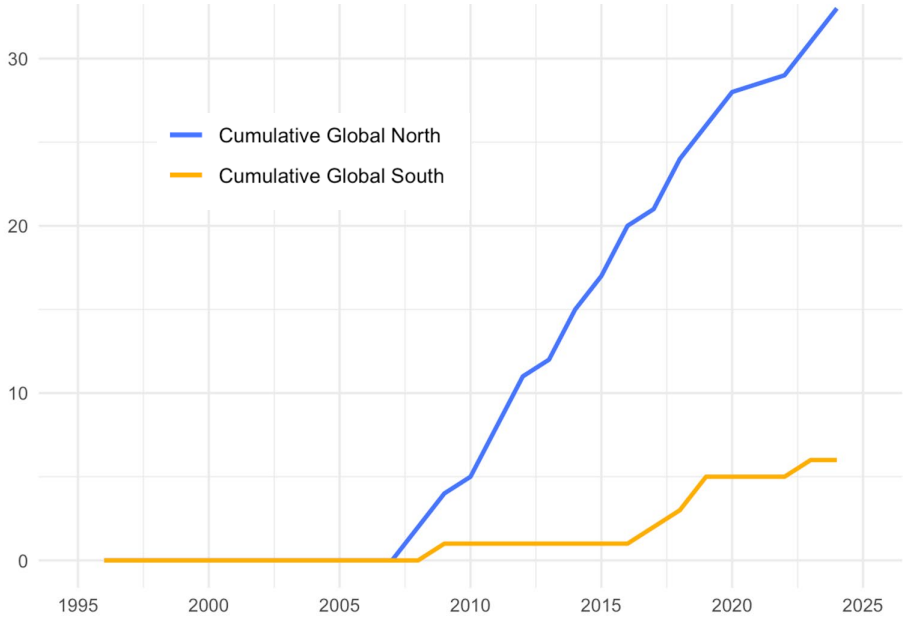

Figure 3. Cumulative ISTS Lifetime Achievement Award Winners by global region (Past Proceedings - International Sea Turtle Society 2024). The Global North category is Europe (apart from Türkiye), North America, Japan, and Australia (UN Trade and Development 2023). The Global South category is Türkiye, South Africa, Colombia, Costa Rica, India, Malaysia, Peru, Thailand, and Mexico (UN Trade and Development 2023; UNESCO Organization for Women in Science for the Developing World 2024).

volunteers and researchers from the southeast of the United States. Therefore, meetings were held predominately in the southeast United States (Fig. 2; Past Proceedings - International Sea Turtle Society 2024) until 1998 (the 18th International Sea Turtle Symposium) when the scope of these meetings expanded from a regional workshop to an international conference (Fig. 2; Past Proceedings - International Sea Turtle Society 2024). Since then, the Society has come a long way, from a few local attendees to now welcoming a diverse range of participants, including researchers, conservationists, and students. In fact, the virtual format of ISTS Symposium40 in 2022, necessitated by the COVID-19 pandemic, boasted one of the widest geographic range of attendees, attracting individuals from over eighty countries (Pendoley 2022). In doing so this Symposium also highlighted ongoing issues related to global representation.

Though the Society was created officially in its current nonprofit status in 1996, the history shows a predominance of Symposia host nations and honorees from the Global North, with growing participation from the Global South in recent decades (Fig. 2; Past Proceedings - International Sea Turtle Society 2024). This imbalance is further evident in participants' geographic and professional backgrounds, the distribution of awards (Lifetime Achievement Award has gone to someone from the Global North 84.5% (n = 38) of the time), and the locations of symposium events, which have frequently favored individuals from and countries in the Global North (14 symposia or 58% (n = 24) since 1998; cumulatively 31 symposia or 73% (n = 42)) (Fig. 2 and 3; Shanker *et al.* 2023; Past Proceedings – International Sea Turtle Society 2024). In fact, the only award of which all recipients have been from the Global South is the Grassroots Awards (Past Award Recipients - International Sea Turtle Society 2024).

Another important indicator of global differences is the ISTS Student Awards, which have been given for the best talks and posters since 1990. Student Awards are a highlight of the event with many students vying for this distinction and a dozen or more judges giving considerable time to evaluating the presentations and posters. Without a doubt, this plays a great role in incentivizing and inspiring the next generation of sea turtle biologists and conservationists. However, as a result of epistemic differences in what is considered "good science" and likely asymmetries in regional representation, material resources, and training available, a vast majority of these awards have also gone to students from North America, 89.75% (mainly the United States). Only 10.23% (21 of 205) of student winners were from an institution in the Global South (Fig. 3).

We suggest these disparities are indicative of the larger issue of unequal access and influence within the field of sea turtle conservation, often described as a form of "colonization" and there is a pressing need for the Society to ensure a more equitable global representation in future symposia.

How does the International Sea Turtle Society decolonize sea turtle conservation? As a collective sea turtle society, we should learn from the mistakes of the past to move forward, as ultimately, the responsibility of reforming how we collaborate and communicate conservation should be equally shared by all identities in the Global North and Global South (Dahdouh-Guebas *et al.* 2003). We outline a few ways in how this can be achieved:

1) Recognize that local communities are the guardians of their ecosystems.
2) Listening respectfully to local community members about their ancestral knowledge and cultural practices within the ecosystems we seek to conserve. As Western-trained researchers, we can learn more from communities besides gathering data for statistical analysis.
3) Recognizing non-English speaking researchers/conservationists and ensuring their work is shared in global forums.
4) Adapting and integrating commonly accepted scientific techniques to be compatible with local cultural practices.
5) Recognizing that all forms of use, including consumption, deserve meaningful consideration and that sustainable management decisions can be guided through a collaborative integration of Indigenous community knowledge and scientific research.

What has the International Sea Turtle Society done so far to encourage decolonization?

1) In 1998, the Symposium was hosted at its first international

location in Mazatlán, Mexico. Since 2003 the Symposium has been regularly hosted at international locations including Global South venues (Fig. 2; Past Proceedings - International Sea Turtle Society 2024). Therefore, of 24 symposia since 1998, 14 have been hosted in Global North countries, 10 of which occurred in southeast United States and 10 have been hosted in Global South countries.

2) The ISTS travel grants started around 1985 through the vision of Karen Eckert, Scott Eckert, and Tony Tucker, with support from Jim Richardson, to increase the participation of students and individuals who are from an underrepresented region and face financial barriers. This long-standing grant is a shining example of prioritizing diverse backgrounds within our community.

3) The Symposium Grassroots Award was created in 2011 to recognize participation and contributions by Indigenous and local community members (Past Awards Recipients - International Sea Turtle Society 2024).

4) In 2021, the Symposia began awarding the Community Grant, which helps "build[] capacity for local leadership and community-based conservation[]." (Community Grant Program - International Sea Turtle Society 2024). The majority (89%; n = 9) of these grants have gone to Global South communities (Community Grant Program - International Sea Turtle Society 2024).

5) Early in ISTS history, the nominating committee proposed new members of the Board of Directors, and then the general membership voted on these proposed individuals. Attempts have been made to diversify the Board of Directors since the early 1990s. In 2006, direct voting for the Board of Directors was established. While this process has clear advantages, there are limitations as only Society members (*i.e.*, those who can afford to purchase and renew annual memberships) can run for these positions and vote for candidates. As such there is an inherent structural barrier in Board of Directors membership and representation that needs to be addressed (Shanker pers. comm. 2024).

What can the International Sea Turtle Society do? Although the Society cannot decide how its members conduct their work or if Symposium attendees should decolonize sea turtle conservation in their region, it can contribute to the cause by setting examples and creating new norms. Therefore, during the Decolonization Workshop of ISTS Symposium42, participants discussed concrete steps that could be taken to make Symposium, and thus the Society, more inclusive and less "colonial" in form and function. Some practices that the Society can adopt include:

1) Implementing Satellite Meetings

2) Apart from the issue of the Symposium's carbon footprint, our opportunity to truly learn from and network with one another is minimized if research and persons from the Global South or students and early career researchers, who are often on the frontlines of novel science, continue to be underrepresented. One potential way to address this systemic inequity could be to host regional satellite meetings in conjunction with the Symposium. Regional satellite meetings would create an opportunity for collaboration with neighboring researchers and conservationists while still contributing remotely to the annual symposium. These satellite meetings can be further accommodated for time zone differences by saving and sharing recorded presentations with global participants via a symposium archive.

3) Improving Access and Collaboration
As our society grows, so do our sessions, and even those who can afford to attend the Symposium annually cannot participate in each session and workshop. Pre-recording and archiving talks, meetings, discussions, workshops, and digitized posters would allow broader, more equitable access to the symposium's educational wealth. Archived sessions would allow for access to content after the symposium has ended, accessible to a larger audience, including future researchers, conservationists, and students not yet in the sea turtle world.

The use of remote technology would have the additional benefit of facilitating more time and space for workshops, discussions, and networking. By inverting the current time and space allotted between the oral sessions and workshops, the ISTS program will allow for more opportunities to interact and collaborate with new and former colleagues.

4) Sourcing Translators
Presenting an oral, poster, or even a discussion point during a workshop can be intimidating; doing so in another language amplifies the sentiment. Language barriers could be a deterrent for some researchers as they may not have the speaking or writing skills to share their work, or they have limited skills. They are, therefore, presenting their work under strained capacity, and they may be unable to garner the attention their work deserves. Including translators via multilingual volunteers or even allocating funds for translators allows for more work to be displayed and shared, more conversations and collaboration among attendees to take place, and nurture recognition of their work.

Additionally, including a written translation service that allows participants to write, translate, and submit questions during live sessions, which moderators can read on their behalf.

5) Ensuring a Diverse Board of Directors
The Board of Directors that helps guide, manage, and represent the Society should be a reflection of its members. Having minimum regional representation within the Board of Directors, promotes diversity within an already existing international society, encourage inclusion and collaboration by leading as an example, allow for a more immediate recognition of global perspectives; and further identifies and celebrates counterparts from regions or backgrounds that may have been overlooked in previous years.

6) Elevating and Celebrating Diverse Conservation Practices
As sea turtles occur globally, so do the conservation efforts to protect them and their habitats. As a society working to conserve these animals and their ecosystems, we have the unique privilege of being privy to various communities and cultures. However, as this workshop group has noted, we often promote uniform conservation practices, usually within the realm of Western-approved strategies. As we enlighten ourselves about the colonialism of this mentality and how to decolonize our practices, we should investigate, share,

and celebrate the varied sea turtle conservation practices occurring at global nesting shores and within international coastal communities. In doing so, we provide ourselves with an opportunity to learn from one another, inviting new methods and strategies that have the potential to increase the success of conservation interventions.

We suggest formally celebrating these diverse conservation practices and successes as

a. part of our annual Decolonizing Conservation workshop; and/or
b. as a discussion point within the annual regional or board meetings.

Alongside celebrating diverse conservation practices, we recognize a need to promote the Symposium Grassroots Award further, which is an initial effort to recognize the efforts and successes of Indigenous and local communities.

7) Creating an Equity Committee

To enact the above suggestions and proactively propose further accommodations, the society could establish an Equity Committee to support the ISTS, particularly the President and their organizing team. The Equity Committee could

a. support the Society Board of Directors and Symposia organizers with the aforementioned suggestions, *e.g.*,
    i. implementing satellite meetings,
    ii. instilling remote technology, and
    iii. providing and managing translation services.
b. perform an audit of the Society and Symposium to identify opportunities to implement further inclusivity measures (*e.g.*, review membership and Terms of Reference for the Symposium Program Committee, Student Award Committee, Travel Grant Committee, *etc*.);
c. organize an annual Symposium meeting or workshop focused on topics of equity, inclusivity, and decolonizing sea turtle conservation; and
d. assist with improving social media accounts, ensuring posts are frequent, informative, inclusive, and relatable.

This committee would raise awareness, suggest improvements, and address inequalities, including those outside of decolonization, like providing childcare for symposium attendees.

Moving Forward

The decolonization of conservation is a necessary movement being discussed globally (Dahdouh-Guebas *et al*. 2003; Rudd *et al.* 2021; Tan 2021). By adopting the above suggested practices within sea turtle conservation, the Society has an opportunity to help facilitate the forward movement and spread of decolonizing conservation. Doing so will set an example, not only for our society of sea turtle conservationists, researchers, students, and enthusiasts, but for other conservation societies as well. Furthermore, participating in the decolonization of conservation aligns with our International Sea Turtle Society mission statement, "to promote understanding, appreciation, and value of sea turtles and their habitats through the exchange and sharing of information, techniques, ideas, and inspiration that will promote actions from local to global levels, for the advancement of sea turtle biology and conservation" (Who Are We? - International Sea Turtle Society 2024).

Disclaimer: In this workshop report, we use the terms "Global North" and "Global South" to discuss issues related to global inequality in sea turtle research and conservation. We have chosen these terms for specific reasons:

Avoiding Economic Labels: We avoid terms like "high income," "low income," and "developed" or "undeveloped," as these terms often overlook the historical and structural reasons behind countries' current status, including the impact of colonialism.

Understanding Privilege: We recognize that "privilege" can have different interpretations, and there is still debate on its usage within our group – some argue that privilege is conferred by colonial powers while others see it as a result of colonial history where countries that have managed to rise from less privileged circumstances have done so despite systemic challenges. The term "more privileged" in this context denotes countries that have historically benefited from global systems and structures, often at the expense of others. The term "less privileged" is used for countries that have faced challenges due to these same systems.

Global North and Global South Usage: The term "Global North" refers to the countries in the Northern Hemisphere, most of which participated in the colonization of countries in the "Global South," which refers to countries in the Southern Hemisphere, many of which have been colonized (Patrick & Huggins 2023). There remains to be global debate about these terms as they originated in the 1970s and are not a consistent geographic reflection of colonization (Patrick & Huggins 2023). However, they are used in this context for their simplicity in reflecting colonization and their recognition as widely used terms.

We acknowledge that these terms may not adequately capture the complexities of global inequalities but use them to frame the discussion in a way that emphasizes historical context and systemic issues.

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President's Report for the 42nd International Sea Turtle Symposium Pattaya, Thailand, 24-29 March 2024

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The 42nd International Sea Turtle Symposium (ISTS42) took place from 24-29 March 2024 at Dusit Thani Hotel, in Pattaya, Thailand. Planning for the symposium began in 2022 shortly after the election of Stephen Dunbar to the position of President-elect, with initial meetings between Dunbar and his Thai organizing team, and the Mayor of Pattaya, Mr. Poramese Ngampiches and his team (Fig. 1). With a welcoming spirit, Mayor Ngampiches encouraged the organizing committee to pursue holding the ISTS in Pattaya and began to offer services and ongoing support for the symposium. "It will be a great honor and pleasure to have the ISTS in Pattaya," Ngampiches said. It was decided early by the President and Thai Organizing Committee that Pattaya would serve as an ideal host city due to its location on one of the largest beach areas in the country, as well as the many features on offer to visiting attendees to the symposium. These include scores of international restaurants, street food stalls, craft markets, and opportunities to explore the many cultural treasures of the surrounding province. The city is an eclectic mix of cultural heritage, art, crafts, tradition, and exciting events. Additionally, it was the only coastal location with hotels large enough to host the international event, with more than 500 attendees expected to attend.

Over the ensuing 23 months after deciding the host city, a huge coalition of committee members and organizers pulled together to discuss ideas for the symposium. These ideas included a wide range of workshops, regional meetings, and special sessions. For the ISTS42, we also planned some new initiatives, including having three concurrent oral sessions, a student-only social event, and introducing an 'Origin Stories and Stories from the Field' special session. In total, the organizing group included no less than 23 committees, with each working in concert with other committees to ensure plans avoided overlap, conflicts, and redundancies.

This was only the second time the ISTS was held in Southeast Asia, the first being the 23rd ISTS, with president Nicholas Pilcher in Kuala Lumpur, Malaysia in 2003. For the first time in the symposium's history, the meetings were hosted in Thailand, making the ISTS more accessible to communities, researchers, government agencies, and students from throughout the SE Asia and Indian Ocean regions. To facilitate a sense of integration of both the East and West, as well as the Global North and Global South, the theme of the symposium was "***All In - All Together; Inspiring the Next Generations of Global of Sea Turtle Conservationists***." This theme set the inclusive tone of the meetings, with the warm and welcoming staff of the Dusit Thani Pattaya Hotel, and the international inclusiveness of the city providing the perfect backdrop for all attendees to feel they were part of a truly historic and memorable ISTS gathering.

Figure 1. A planning meeting of the ISTS42 team and the Office of the Mayor of Pattaya, Mr. Poramese Ngampiches.

Of the 590 pre-symposium registrants, 558 attended the meeting (94.6%) (Fig. 2) representing 66 countries from around the world, with especially high attendance from the Asia and Southeast Asia regions, fulfilling one of the main purposes of holding the meetings in Thailand.

Logo: To commemorate the 42nd ISTS, the symposium logo (Fig. 3) was thoughtfully designed by Sirawich Srisiri (a member of the Thai Organizing Committee for the symposium) with input from President Dunbar, and the use of turtle images originally painted by Dawn Witherington. The logo incorporated elements of the Thai culture, including a city scape of historic cultural icons throughout Thailand, and the Thai art style of the traditional golden leaves, called Kranok. The Kranok is a classical, fundamental Thai pattern widely used for the ornamentation of Thai architecture and art. In the logo, the Kranok cradles a water body rendered in the distinctive Thai artistic style, along with the cityscape, and the three species of sea turtles (green, hawksbill, and leatherback) most commonly found in Thai waters, all symbolizing Thailand's rich historic heritage connected to its waters. Overall, this logo demonstrated the harmonization of Thai tradition, culture, and arts, with the conservation of precious sea turtles.

Symposium Website: The website for the 42nd ISTS was expertly managed by Paul Whittock. This included the use of the general format developed for the 40th ISTS in which key tabs and links were already in place on the website. New tabs and pages were added to the ISTS42 website as desired, and Paul was also able to provide a map of countries represented by attendees for the symposium. The integration of ConfTool also made changes to registration details, abstracts, payments, communications to specific attendees, and the symposium program development much

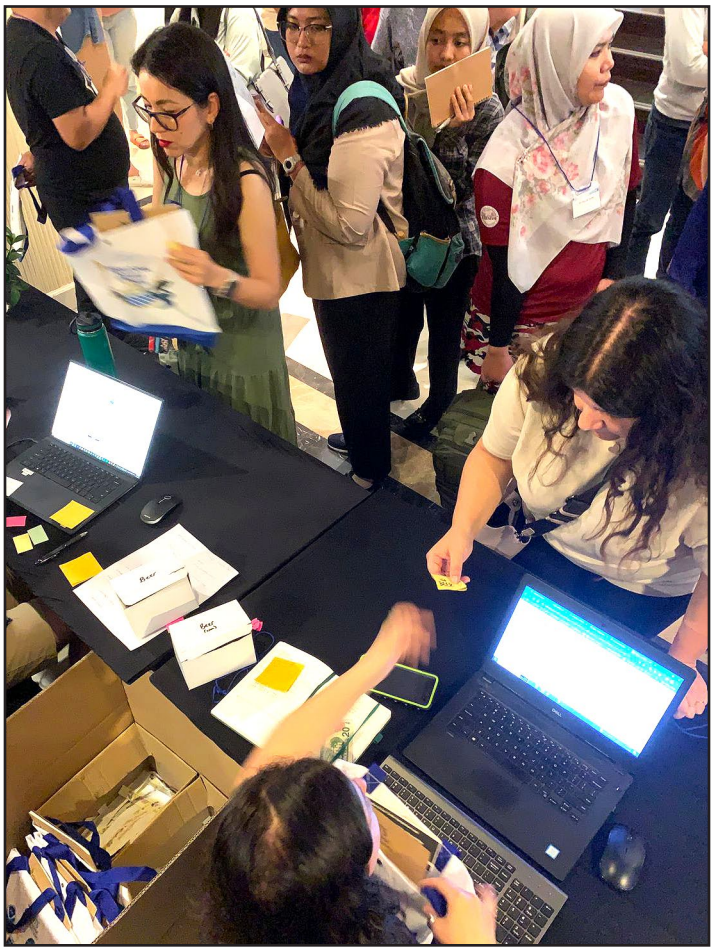

Figure 2. The on-site registration desk activities at the ISTS42.

Workshop	Time of Day	Hours	Attendees
Bycatch assessment and mitigation in developing world fisheries	8:00 AM – 12:00 PM	4	47
Career paths in sea turtle conservation	1:00 PM – 5:00 PM	4	19
Decolonizing sea turtle conservation: walking the talk	8:00 AM – 12:00 PM	4	10
Drones and Turtles	8:00 AM – 12:00 PM	4	28
Developing behavior change campaigns for sea turtle conservation	8:00 AM – 5:00 PM	8	36
Environmental education art as an environmental education tool for children in sea turtle projects	8:00 AM – 12:00 PM	4	18
GIS	8:00 AM – 5:00 PM	8	35
Global perspectives on sea turtle and marine conservation education	1:00 PM – 5:00 PM	4	31
Overcoming barriers to knowledge: sea turtle movement and habitat connectivity in Southeast Asia	8:00 AM – 12:00 PM	4	25
Photo-based sea turtle citizen science projects: from opportunistic data collection to creating impact	1:00 PM – 5:00 PM	4	22
Photo ID – applications, challenges and technical solutions	8:00 AM – 5:00 PM	8	19
Sea turtle rehabilitation and medicine	8:00 AM – 5:00 PM	8	54
Temperature-dependent sex determination	8:00 AM – 5:00 PM	8	20
Total		72	364

Table 1. Details of the 14 workshops presented on the Sunday prior to the start of the Symposium.

Figure 3. The Symposium logo with information highlights.

Figure 4. One of several Pattaya street billboards advertising the Symposium.

easier from a management perspective. ConfTool has also helped to automate several aspects of the development and organization of the proceedings booklet for publication.

Communications and Social Media: From the start of the planning for the ISTS42, the Organizing Committee was committed to providing regular and informative e-mails and social media posts to the ISTS Membership, the CTurtle listserv, and regional e-mail lists. Although social media posts were initially slow, the onboarding of Stephanie Molina to direct the symposium social media campaign, along with assistance from Ingrid Yañez and Laura Prosdocimi greatly improved both the coordination and the output of the campaign, resulting in 164 social media posts, increasing the number of followers in all symposium social media platforms, reaching 5,200 for the ISTS Facebook account, 5,400 for the ISTS Symposium42 Facebook account, 1,803 for the ISTS Instagram account, and 614 for the ISTS Twitter account. Over the period from 08 November 2023 through 20 March 2024, engagements in Facebook increased 306.8%, while engagements through Instagram increased by a staggering 4,500%! Social media was a vitally important means of outreach and engagement to the sea turtle community, as many members who were unable to attend the symposium were able to keep updated with the many ongoing activities of the meetings. Part of our city-wide awareness campaign were several billboards arranged by the Mayor's Office, advertising the symposium around the city (Fig. 4). These were expertly designed by Stephanie Molina, as well.

Travel Grants: Between 02 November 2023 and 01 December 2023, the Travel Grants Committee, made up of nine regions, received 144 travel grant applications. Travel grants provided lodging in shared accommodations for the entire duration of the symposium. Out of 144 applications, 114 (79.2%) were approved, with 47 (41.2% of total) allocated to South Asia, 19 (16.7%) to North America, 10 (8.8%) to Europe, 10 (8.8%) to Mexico and Central America, 10 (8.8%) to South America, 7 (6.1%) to Africa, 5 (4.4%) to Oceania and Polynesia, 3 (2.6%) to the Caribbean, and 3 (2.6%) to the Middle East and North Africa. We were especially pleased to see a large number of Asia constituent applications submitted, and the funding of a large number of these facilitated significant representation from the host region.

Pre-, Post- Symposium Transportation: As a result of the substantial investment of Pattaya City and the Thai Convention and Exhibition Bureau (TCEB) into the symposium, they provided free shuttle buses that facilitated a safe, care-free way for attendees to easily transfer from Suvarnabhumi International Airport in Bangkok to the Dusit Thani Hotel in Pattaya without additional expense, or having to organize transportation once reaching Thailand. Return transportation from the Hotel back to Bangkok Airport was also arranged for attendees who took advantage of signing up prior to the symposium. The ad-hoc Transportation Committee was overwhelmed with the immediate responses of attendees when the initial sign-up lists were posted to the symposium webpage and announced through social media. The positive responses required that we planned for additional buses, especially for the day prior to the start of pre-symposium workshops and regional meetings.

In consultation with the Pattaya City Mayor's office and the Thai Organizing Committee, we were able to reschedule and rearrange buses so that essentially all attendees in need of transportation to and from the symposium were accommodated, despite some unexpected challenges in locating meeting spots within the arrival area of the airport. Nevertheless, this contribution by Pattaya City was greatly appreciated by all attendees who took advantage of the service.

Volunteers: The Volunteer Committee was directed by Itzel Sifuentes and Adriana Cortes. On the first day of registration, the ISTS President thanked the volunteers for their service and acknowledged the enormous value of their contribution to the smooth running of the symposium (Fig. 5). The Volunteer team included 129 attendees, of whom 117 were Travel Grant recipients. Volunteers assisted with

Figure 5. Prior to the start of the Symposium, President Dunbar met with the volunteers to let them know how much their service would be appreciated throughout the week of activities.

Figure 6. At the Opening Social, attendees enjoyed traditional Thai dances by the Pattaya local student dancers.

room set-ups and changes, ensuring that presentations were uploaded, and attending to any situations that needed extra help. A unique and useful experiment at ISTS42 was to have an 'on-call' group of volunteers who were accessible by WhatsApp messaging. Their willingness to deal with immediate situations was very helpful, and we again express our thankfulness to all the volunteers who dedicated their personal time to assisting with the work of the symposium.

Pre-Symposium Workshops and Regional Meetings: Attendees who arrived prior to the official start of the symposium took part in workshops and regional meetings. All 14 workshops were facilitated on Sunday, 24 March, and covered topics as varied as GIS, sea turtle rehabilitation and medicine, drones and turtles, photo-based citizen science, and a workshop organized by the Student Committee (Table 1). Workshops provided a total of 72 hours of instruction and interactions, with 364 in attendance. Seven regional meetings were carried out on Monday, 25 March, and included African, Indian Ocean, Southeast Asia, Latin American, and a special Thailand meeting, among others (Table 2). These meetings provided a total of 36 hours of reporting, discussion, and planning time involving 350 registered participants. In all, both workshops and regional meetings were well organized, efficiently conducted, and highly successful.

Meeting Region	Time of Day	Hours	Attendees
Africa	08:00 - 12:00	4	48
East Asia	08:00 - 12:00	4	32
IOSEA	13:00 - 17:00	4	99
Mediterranean Reunion	13:00 - 17:00	4	35
Oceania	13:00 - 17:00	4	45
RETOMALA: Latin America	08:00 - 17:00	8	39
Thai National Meeting	08:00 - 17:00	4	19
Western Pacific Leatherback	08:00 - 17:00	4	33
Total		36	350

Table 2. Information of the seven regional meetings presented on 25 March, prior to the opening of the Symposium

Opening Events: For the ISTS42, the Student Committee, headed by Janie Reavis and Gabriela Arango, organized a special Student Mixer event on Monday, 25 March for a student's-only opportunity to meet and greet each other without the presence of supervisors and other attendees. This was designed to facilitate opportunities for students to meet students as peers, and to have opportunities to relax and enjoy social connections among former friends, and to meet new student friends in a relaxed and purely social atmosphere.

At the completion of the Student Mixer, all other symposium participants who had pre-purchased Opening Social tickets were permitted to enter the open beach area for the first symposium-wide social event. During this event, attendees enjoyed special Thai traditional dances performed by the Pattaya local students dance group (Fig. 6), an abundance of different food stalls, available drinks, and the Master of Ceremonies talents of Jesse Senko. The event, originally planned for approximately 300 participants, well exceeded that number, reaching 412. This evening event was a fitting preparation for the much-anticipated Symposium Opening Ceremonies on the morning of 26 March.

The official start to ISTS42 began when the International Sea Turtle Society President, Stephen Dunbar, and Thai Organizing Team met the special honored guests at the entry of the Hotel. These guests included Mr. Poramese Ngampiches, Mayor of Pattaya City; Mr. Pinsak Surasawadee,

Figure 7. Permanent Secretary of the Ministry of Natural Resources and the Environment, Mr. Jatuporn Buruspat, and President Dunbar meet among other dignitaries prior to the Symposium Opening Ceremonies.

Figure 8. Dunbar providing the President's opening remarks.

Figure 9. ISTS42 attendees at the Opening Ceremonies.

Director General of the Department of Marine and Coastal Resources (DMCR), Mr. Autthaphon Chatroenchansa, Director General of the Department of National Parks (DNP); the representative of Mr. Bancha Sukkaew, Director General of the Department of Fisheries; Ms. Preeyaporn Suwannakes, Director General of the Department of Pollution; Admiral Suwin Jaengyodsuk, Deputy Commander of the Royal Thai Navy; and very special guest, Mr. Jatuporn Buruspat, Permanent Secretary of the Ministry of Natural Resources and the Environment, and Representative for Her Highness, Princess Sirivannavari. After a brief assembly and introductions of the dignitaries in the hotel entryway (Fig. 7), the Special Guest's Party filed into the Napalai Convention Hall to the cheering crowd of symposium attendees. Official welcome speeches were given by Mayor Ngampiches and Permanent Secretary Jatuporn Buruspat, who each welcomed the attendees and placed the symposium as a highlight of the sea turtle conservation efforts of the country. An ISTS President's Award was presented by Stephen Dunbar to the Permanent Secretary on behalf of the Princess Sirivannavari Thai Coral Reef and Marine Life Conservation Foundation, for the work toward sea turtle conservation in Thailand and support of many of the national organizations attending the symposium.

For the first time in symposium history, a video entitled "International Sea Turtle Society - Who We Are," was premiered. The video, compiled by Michael Dunbar, presented short video clips and photos from more than 40 organizations, projects, and communities that are part of the International Sea Turtle Society undertaking projects and programs around the world. The beautiful video (available on the ISTS42 website: www.ists42thailand.org) received a hall-wide standing ovation. Finally, Dunbar addressed the entire assembly (Fig. 8) and encouraged all of those present to reach out to one another, providing support and a sense of community, especially to the young among the group, and those who will become the international conservation leaders and decision makers of the future (Fig. 9).

Once finished, Dunbar invited representatives of each organizing committee on stage with all the dignitaries, to receive recognition from everyone in attendance for their tireless work in organizing the ISTS42 (Fig. 10), then together with Permanent Secretary Buruspat, led the President's Party through the poster hall, then to each of the hallway displays, and finally out to the entrance of the hotel.

Opening events concluded with excellent Plenary presentations by Jeffrey Seminoff ("Reflections from a sea turtle lifer"), and Jarina Mohd Jani ("Sea turtle conservation

Figure 10. The Chairs of the many organizing committees involved in the preparation of the symposium were much appreciated for all their work.

Figure 11. Plenary speakers, Jeff Seminoff (A), and Jarina Mohd Jani (B), set the tone and context for the entire Symposium.

in Southeast Asia: A tale of two beaches, and some of those in between") (Fig. 11). These plenary presentations fully set the stage for the remainder of the symposium in providing a historical context to the growth of the society, and also the importance of communities in sea turtle conservation in the Southeast Asia region.

Oral and Poster Sessions: During the ISTS42, we elected to run three concurrent oral sessions. This resulted in more opportunities for oral presentations, and the highest number of orals presented in sea turtle symposium history. After abstract submissions ended in November 2023, the Program Committee, led by Kelly Stewart, undertook the task of reviewing all 331 submissions. In the end, 328 abstracts were accepted, and the symposium hosted 173 oral presentations (Fig. 12) and 155 poster presentations (Fig. 13). Of these, 114 (combined orals and posters) were presented by students. Poster presentations were available for viewing for three full days, and symposium attendees were able to interact with poster presenters at the "Meet the Authors" sessions, providing time for viewers to ask questions and discuss the presentations.

Video Night: Once again, the symposium Video Night was another successful opportunity for projects and organizations to present their work in a unique way. The Video Night was advertised and organized by Seh Ling Long and her team. Twenty-nine videos were received from various countries and organizations, such as Bahari Hai Conservation, City University of Hong Kong, Flora & Fauna International

Figure 12. An example of the many oral presentations given by attendees to ISTS42.

Figure 13. Over 150 posters were displayed throughout the poster and vendor hall, providing opportunities to showcase and discuss the work of symposium attendees.

Figure 14. The infamous 'Jail' fundraiser is always a fun highlight of the live auction.

Figure 15. Students enjoyed insights from experienced researchers and conservation experts during the "Career Paths in Sea Turtle Conservation" student workshop.

Cambodia, Lampedusa Turtle Rescue, Marine Conservation and Research Organization Malaysia (PULIHARA), Sri Lankan Turtle Conservation Project, State University of Papua (UNIPA), WWF, and several others.

Videos were screened on Tuesday night, 26 March and ranged in purpose and presentation style, promoting conservation efforts, showcasing volunteer programs, highlighting scientific research, celebrating individual contributions, and raising awareness about the threats faced by sea turtles and their habitats. Some videos used engaging narratives and local cultural ties to conservation, while others focused on scientific data, volunteer training, and research techniques. Each one provided the audience with opportunities to see different perspectives on sea turtle conservation programs around the world.

Trading Post: Once again, the Trading Post raffle program, overseen by Kate Mansfield, was highly successful. This event provides an opportunity for researchers and organizations to donate unused, functional equipment and supplies, to be raffled off to students and organizations who may not have the opportunities or means to purchase these types of supplies first-hand. At ISTS42, individuals were provided raffle tickets and met at the Trading Post table on Thursday, 28 March. As in prior years, the event benefitted students, community organizations, and NGOs who are interested in obtaining used, but useful equipment and project materials, from tag applicators to satellite transmitters. This mechanism for the distribution of equipment and materials to student and community projects is an invaluable way to 'recycle' supplies from prior projects and laboratories and represents one way the sea turtle community continues to support students, projects, and communities that may not be able to purchase these kinds of materials.

Silent and Live Auctions: Our Silent Auction was facilitated by veteran host, Marina Zucchini who expertly arranged the auction items in the hotel meeting room specifically reserved for this purpose. Symposium attendees were able to view the items and write down their bids for two full days, then see if they won their items at the closing of the Silent Auction on Wednesday afternoon, 27 March. Later that same evening, our host for the Live Auction, expert auctioneer Rod Mast, assisted by Adriana Cortes conducted a fun-filled evening of games, challenges, the election of the symposium King and Queen, and the infamous jail fundraiser (Fig. 14). Thanks to the tireless efforts of the entire Auction Committee, the silent and live auctions raised more than US$23,000 to fund travel grants for the 2025 ISTS Symposium and did so in a way that highlighted the joy of being part of the global ISTS family.

Student Committee Activities: At the ISTS42, the Student Committee completed its 12th year of activities dedicated to welcoming and encouraging student attendees. This year, the Student Committee, expertly led by Janie Reavis and B. Gabriela Arango, organized four core activities for student attendees: a Student Workshop ("Career Paths in Sea Turtle Conservation") attended by 27 students (Fig. 15); student presentation feedback; speed-chatting with experts, in which 35 students participated; student mixer in which there were games, music, and socializing opportunities. This event was held outdoors and just prior to the general Opening Social. The Committee received very positive feedback from students who were engaged in student activities during the symposium.

Closing Banquet and Awards Ceremony: The ISTS42 Closing Banquet was a special event hosted by Dave Owens, who recalled humorous experiences of his many years in sea turtle conservation and research work. At the banquet, long-time sea turtle research and conservation leaders, Kellie Pendoley and Anders Rhodin were honored with Lifetime Achievement awards (Fig. 16), while Scott Eanes and Turtle

Figure 16. A surprised and delighted Kellie Pendoley receives a Lifetime Achievement Award.

Figure 17. Closing Keynote Speaker Kartik Shanker encouraged attendees to grapple with non-colonial perspectives when engaging in our sea turtle conservation work, providing thoughtful and humorous insights from his own experiences.

Watch Egypt 2.0 each took home Champions Awards. The Ed Drane Volunteerism Award was presented to Laura Bruce for her role as a dedicated volunteer with the Loggerhead Marinelife Center in Florida. Grassroots Conservation Awards were presented to Campamento Tortuguero Ayotlcalli A.C. and Warriors of the Rainbow for their important roles in sea turtle conservation through educating future leaders and decision-makers. Finally, Dunbar presented nine President's Awards to individuals who especially contributed to the organization of this year's Symposium.

A panel of judges evaluated student oral and poster presentations nominated for the Archie Carr Student Awards. The seven students awarded for their outstanding presentations were: Tiffany Dawson (University of Central Florida, USA), Megumi Kawai (University of Tokyo, Japan), Emily Turla (Florida Atlantic University, USA), and Taylor Brunson (University of the Virgin Islands, USA) in the Biology category; and Gustavo Stahelin (University of Central Florida, USA), Anna Ortega (University of Western Australia, Australia), and Cindy Vargas (Arizona State University, USA) in the Conservation category.

Attendees enjoyed traditional Thai music and dancing from a professional dance group, while feasting from a buffet banquet that exceeded the daily bounty provided by the Dusit Thani Hotel Chefs and Kitchen staff.

Symposium Images and Videos: Symposium images and video were captured by Michael Dunbar, Hammed Mallat, and Stephanie Molina. Video shorts and images were presented at the start of sessions throughout the days of the symposium, and a folder of images has been made available to be viewed and downloaded at: https://drive.google.com/drive/folders/1_3tEyM3iq7A_l8RyF29noQCOBkomQH4x?usp=sharing. Attendees especially appreciated the "Memorial" and "Who We Are" videos produced by Michael and Stephen Dunbar, and the "Closing Remarks" video produced by Michael Dunbar. These videos are available to view at: https://www.ists42thailand.org/

Closing Ceremonies: At the closing ceremony, the Keynote Speaker, Kartik Shanker, presented a thought-provoking, encouraging, and humorous overview of the global approach to sea turtle conservation entitled, "The brighter horizon: balancing human needs and ecosystem health in marine conservation" (Fig. 17). The address challenged us all to beware of our prejudices and how these biases can impact our attitudes toward indigenous knowledge and approaches to the science and work of conservation.

At the completion of the final Keynote address, Dunbar addressed the attendees (Fig. 18) with a message that reviewed the symposium week, emphasizing,

> *"The challenges before us have never been so great as they are now, and those challenges are certain to increase in the near future. Still, we can meet the future with hope. Hope that our efforts can and will make a difference, not only for the creatures we study and work to conserve, but for the marine habitats, and the coastal community members who rely on those habitats for their daily existence. These efforts are less about saving the world, and more about recognizing that we, all of us, are a community of people who are seeking to care for the people around us, and for the creatures who share the planet with us."*

He concluded his closing remarks with the encouraging thoughts,

> *"My hope is that as we close this 42nd ISTS, that we've all been inspired to inspire others, not just others from this sea turtle community, but all those around us; to take courage, to move forward in faith that our efforts are making a difference. To be courageous enough to continue the work of sea turtle research, conservation, community outreach and education, and influencing policies that will better the lives of sea turtles and people around the world. Only now, I hope that part of those efforts will be to support each other, hug each other, and love each other more than we have before. Because that's what turtle people do! This is who we are!*"

As attendees applauded in a standing ovation, Dunbar could be heard saying to the crowd, "*I love you guys*!"

ISTS Business Meeting: The business meeting began after the formal addresses of the closing ceremony, and reviewed society business for the 2023-2024 year. Essentially all business-related items, including the Treasurer's,

Figure 18. Dunbar presenting the final remarks before officially closing the ISTS42.

Figure 19. The Presidential handover, and gifts presented from Dunbar to new President, Andrews Agyekumhene (A), and the gift from Ghana to Dunbar as outgoing ISTS President (B).

Secretary's, Awards Committee, Travel Grant Committee, and Student Awards reports were adopted by Society members without extensive discussion. However, the proposal for the restructuring of the Society's administration initiated much discussion among the members present, with members being reassured that the proposal for restructuring was in the discussion phase with a request for members to provide their feedback on the proposal over the coming year. The Nominations Committee Chair presented the 2024 Elections results: Alexander Gaos was elected President-Elect; Seh Ling Long and Richard Reina were elected to the Board of Directors; Connie Ka Yan and Kellie Pendoley were elected Nominations Committee members; and Ryan Welsh, Rod Mast, Earl Possardt, and Jacques Fretey were elected Awards Committee members. The business meeting was adjourned within the scheduled meeting timeframe.

Presidential Handover: The transition of the Presidency occurred at the conclusion of the Closing Ceremonies with the exchange of gifts from outgoing President, Stephen Dunbar, to incoming President, Andrews 'Andy' Agyekumhene. Dunbar presented Agyekumhene with some traditional representations of Thailand (Fig. 19A), while Agyekumhene presented Dunbar with a traditional Ghanaian Chief's coat (Fig. 19B). After the exchange, Agyekumhene provided a preview of the ISTS43 meetings to be held in Accra, Ghana in March 2025.

Hotel Hospitality: Our organizing teams worked closely on a regular basis with Dusit Thani Hotel in Pattaya. This included detailed planning sessions for room block arrangements, workshop and regional meeting rooms and media assistance, poster and vendor rooms, session rooms, meals, coffee breaks, and both main social events. As many details as possible were worked out well ahead of the symposium, although plans required updating and finalizing for some aspects of the symposium up to the week of the start of the meetings. This included meeting room changes, special dietary meal preparations and delivery, adjusting social event numbers, and the move of the Opening Social from the original venue (due to a rapid increase in attendance numbers during ISTS registration, beyond the capacity of the original venue) to the grounds of the Dusit Thani Hotel. In all of these and other on-the-ground adjustments, the management and staff of the hotel provided excellent service for the ISTS meetings in accommodating all our organizational and attendee needs.

The hotel itself was situated in a beautiful setting on Pattaya Beach, where attendees were able to walk the beach, swim in either of the hotel's three pools, or enjoy the warm ocean waters just a few meters from the hotel grounds. Inside the hotel, rooms were nicely decorated in touches of traditional Thai style, and were comfortable for single, double, or triple occupancy.

Perhaps the service for which we received the most comments was the incredible food that was available to attendees for breakfast and lunch, with a full buffet that included plenty of options for main courses and desserts for all dietary needs (Fig. 20). Additionally, the hotel provided food and beverages for both morning and afternoon coffee breaks that showcased many traditional Thai delicacies, introducing attendees to new and delightful flavors and tastes.

Overall, the 42nd International Sea Turtle Society Symposium was a huge success that reminded everyone who attended, that if we are to be effective at the global conservation of sea turtles and the habitats they rely on, we must continue to work in intimate collaboration with coastal communities and be committed to being 'all in – all together!'

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Figure 20. One of the many highlights of the Symposium was the food provided and presented in delightful ways by the Dusit Thani Hotel.

Michael Dunbar, Lidia Salinas, Natalia Teryda, Ray Carthy, Roldan Valverde, Sabrina Mashburn, Sean Richards, Sophie Mills, Stephanie Molina, Andrea Phillott, Emily Hyatt, Joseph Pfaller, Daniela Freggi, Amanda Southwood-Williard, Manjula Tiwari, Nicholas Blume, Terry Meyer, Michael Jensen, Makayla Kelso, Katrina Phillips, Sittikorn Kamalas, Paul Whittock, Mustapha Aksissou, Ryan Welsh, Imed Jribi, Nicholas Pilcher, Jeanette Wyneken, Yonat Swimmer, Kara Dodge, Mariluz Parga, Michael Salmon, Ana Liria Loza, Jesús Tomás, Natalie Wildermann, Marina Zucchini, Roderic Mast, Itzel Sifuentes-Romero, Adriana Cortes, Ormmy Parinda Awpituk, Janie Reavis, Aileen Lavelle, Retno Kusuma Ningrum, Adela Hemelikova, Martina Bartolini, Chandana Pusapati, Derek Aoki, Merope, Holly Stokes, Sophia Coveney, Nupur Kale, Jenna Contuchio, Melissa Staines, Riko Kimura, Rushan bin Abdul Rahman, Kayla Burgher, Syamsyahidah Samsol, Rangsima Sujittsakul, Seh-Ling Long, Lynn Massey, Suzie Graham, Angela Formia, Karen Eckert, Jose Urteaga, Alan Rees, Alejandro Fallabrino, Mark Hamann, Lalith Ekanayake, Jimena Gutiérrez-Lince, Daniela Rojas-Cañizales, Gabriela Vélez-Rubio, Georgina Zamora-Quilez, Aliki Panagopoulou, Irene Kelly, Connie Ka-yan NG, Takashi Ishihara, Paolo Casale, Kate Mansfield, Chayanis Daochai, Chandana Pusapati, Shanthasiri Jayaweera, Mohd Uzair Rusali, Betty Delali Dordzi, Laura Prosdocimi, Pablo Antonnio Trujillo Susunaga, Amalia María Cano-Castaño, Diana del Pilar Ramírez Acosta, Anjelika Abou Issa, Nerine Constant, Thane Wibbels, Andrew DiMatteo, Laura Sparks, Brendan Hurley, Zachary Posnik, Antonio di Bello, Gabriela Arango, Marco García Cruz, Renato Bruno, Stephanie Köhnk, Jane Lloyd, Mtalii Ochieng, Christine Hof, Michel Nalovic, John Wang, Harris Wei-Khang Heng, Jaime Restrepo, Jarina Mohd Jani, Hector Barrios-Garrido, Michelle Maria Early Capistran, Cathi Campbell, Jack Frazier, Bryan Wallace, Rachel Smith, Brian Hutchinson, Ashleigh Bandimere, Kelley Anderson, Lindsay Mosher, Marc Girondot, Aiyana Reissman, Kostas Papafitsoros, Daphne Hoh, Chialing Fong, Sea Williamson, Hiltrud Crodes, Summer L. Martin, Matthew David Ramirez, Michael G. White, Sarah Milton, Dave Owens, Justin Randall Perrault, Heidrun Frisch-Nwakanma, Stacy Hargrove, Michael Joseph Liles, Mario Jorge Mota, Kirah Ishelle Forman-Castillo, Tomoko Hamabata, Hie Lim Kim, Robin LeRoux, Erin McMichael, Claudio Quesada-Rodríguez, Kathy Zagzebski, Thushan Kapurusinghe, Deasy Natalia Lontoh, Isabel Marques Silva, Christina Fahy, Liyana Izwin Khalid, Juan Manuel Rguez-Baron, Brad Nahill, Matthew Godfrey, Shaleyla Kelez, Jeanne A Mortimer, Rita Patrício, Annie Page-Karjian, Maximillian Polyak, Sandra Hochscheid, Nathan Jack Robinson, Kellie Pendoley, Chandara Tak, Fitry Pakiding, Cali Turner, Christopher Long, Connie Ng, Gabriela Velez-Rubio, Mariela Pajuelo, Matthew Ramirez, Matthew Ware, Samir Patel, and Seh Ling Long, and Joseph Amoako for all their help in organizing and efficiently running the symposium. He would also like to thank Video Night Contributors: Chandra Tak, Kelly Howlett, Armando J. B. Santos, Amanda Robbins, Ochieng Odhiambo, Olivier Bousquet, Gavin Jolis, Katia Ballorain, Cécile Gaspar, Juanita Joseph, Monica Francesca Blasi, Supraja Dharini, Brian Chin Wing Kot, Tabris Yik To Chung, Henry Chun Lok Tsui, Gilberto Borges Guzman, Clemente Balladares,

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Report of the 26th RETOMALA: Regional Meeting of Latin American Sea Turtle Specialists (Perth, Australia 2022)

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iThe RETOMALA "*Reunión de Especialistas Latinoamericanos en Tortugas Marinas*" (in English: Latin American Sea Turtle Specialist Meeting) is a regional meeting that takes place during the Annual Symposium of Sea Turtle Biology and Conservation (Barrios-Garrido *et al.* 2018). This one-day event gathers researchers, students, volunteers, and advocates who focus their conservation efforts in Latin America (Barrios-Garrido *et al.* 2019). The 26th RETOMALA was originally scheduled to take place in March 2020 at Cartagena de Indias, Colombia. However, the Sea Turtle Symposium was cancelled due to the COVID-19 global health crisis. After two years without celebrating the annual symposium, the board of directors of the International Sea Turtle Society (ISTS) and the current president, Kellie Pendoley, proposed to hold the 40th annual symposium online for the first time in the history of the event.

The 26th RETOMALA was held on 25 March 2022, during the 40th International Sea Turtle Symposium in Perth, Australia (online). The online symposium was presented through a novel interactive platform, allowing participants from any location worldwide to attend presentations, meetings, workshops, and discussion groups. The aim of this RETOMALA meeting was to share the experiences and expertise of outstanding conservationists, working from different perspectives in the Latin America region. Four distinguished guest speakers were interviewed for 20 minutes each. The event ended with a discussion panel where all participants could interact and pose questions to the guests. This RETOMALA event included 66 participants from 18 different countries: Argentina, Colombia, Costa Rica, Venezuela, Italy, Spain, Mexico, Uruguay, Brazil, United States, Guatemala, Cuba, Ecuador, Panama, Cape Verde, Nicaragua, El Salvador and Peru (Fig. 1), which exceeded the expectations of the organizers for this first online RETOMALA meeting.

Ingrid Yañez was the first guest chosen to talk about 'networking.' She is a Peruvian biologist with extensive experience in sea turtle conservation as well as being a co-founder of the Eastern Pacific Hawksbill Initiative (ICAPO). Through this initiative, Ingrid established the hawksbill turtle (*Eretmochelys imbricata)* baseline data system, combining different programs with the implementation of new technologies and creation of networks working toward the conservation of this species in the Eastern Pacific and other regions (Gaos *et al.* 2010). During the event, she shared some of her experiences in the sea turtle conservation field. She talked about her beginnings as a conservationist, the limitations in leading a small new project under a reduced budget, and the merit of seeing how it grew over the years. Ingrid pointed out also the importance of ICAPO's networking, its collaborators and supporters during all the years of the initiative. Her take-home message highlighted the value of creating strong networks with sea turtle peers, communities and co-workers, and how essential it is to share the project findings with the scientific community and stakeholders to maintain these strong bonds.

The second guest was Renato Bruno, talking about 'novel initiatives.' He is a biologist from Sao Pablo, Brazil. Renato has worked in sea turtle conservation projects in Cape Verde, Costa Rica, Nicaragua and Venezuela (Saragoca Bruno *et al.* 2020; Bruno *et al.* 2021). He is currently pursuing a PhD degree at the Archie Carr Center for Sea Turtle Conservation at the University of Florida. Furthermore, he is the founder, president and scientific director of the novel non-profit conservation organization in Costa Rica "Turtle Love." Renato shared his experiences as a young researcher working on different projects and discussed the benefits and challenges to starting a grassroots conservation project. He also mentioned how important guidance and tutorage are in the academic field in the early stages of this process, and how academia may be the platform to improve conservation management projects. As a final remark, Renato sent an encouraging message for everyone with the intention of pursuing an academic degree or starting a conservation organization.

Felipe Baker was the third guest, invited to talk about 'community-based projects.' He is a member of the autonomous indigenous

Figure 1. A screenshot of some of the 66 participants from 18 countries in the 26th RETOMALA meeting in 2022. .

community Ngäbe-Bugléin Panama. Felipe is a biologist and an environmental activist working toward the conservation of natural resources within his native region. He grew up in a community that shifted from a traditional consumptive use of sea turtles to actively protecting them. For the Ngäbe Buglé community, sea turtles are part of their cultural heritage. Nowadays the Ngäbe Buglé people are an excellent example of a community-based project, supporting conservation efforts of nesting habitats for sea turtles in Bocas del Toro, Panama (Meylan *et al.* 2013). Felipe shared his experience as a conservationist within an indigenous community. He mentioned the importance of his community's relationship with nature, which made him understand the natural value of sea turtles. This encouraged him to pursue a career as a biologist and proudly become a community leader for the conservation of these species in his region. In recent years Felipe has been working as an environmental educator for the Sea Turtle Conservancy, encouraging and instructing new generations in sea turtle conservation. Traditional knowledge, scientific research and environmental education have provided Felipe valuable tools to improve and guarantee the protection of sea turtle populations in the Bocas del Toro province.

Dr Jack Frazier was the final guest, who talked from the perspective of a 'long career conservationist.' He is an American researcher with extensive worldwide experience in sea turtle conservation. His dedication and accomplishments working in this field are remarkable. He has been a resource for students, researchers, and stakeholders in the conservation of sea turtles for generations. Dr. Frazier spent most of his career in the tropics, developing environmental education programs, as well as conducting social and scientific research across Africa, Asia and Latin America (Frazier 2003; 2005; Frazier *et al.* 2007). His recent efforts are focused on articulating conservation actions from multidisciplinary approaches, and the collaborative work between different stakeholders. Dr Frazier reminisced about the beginnings of RETOMALA and how this meeting originated as a result of a collective need to share experiences with colleagues from the Latin American region. All these years he has been working under the premise that everyone has something to teach or something to learn in this field.

After the interviews, the event proceeded with a discussion panel, where all the attendants had the opportunity to ask questions to the guests, and/or share their own experiences/updates as sea turtle conservationists in Latin America. Some of the attendants' most remarkable contributions were:

A. Felix Moncada (Cuba), from the Fisheries Research Center in La Habana, Cuba, shared an important announcement about the final decision of the Cuban Government, after long legal litigations, to incinerate eight tons of hawksbill carapaces that had been confiscated and kept stored for decades in the country (Heppell & Crowder 1996; Meylan 1998; Moncada *et al.* 2012). This decision represents a relevant step for Cuba against the trafficking and commercialization of turtle shell products on the black market. And a great contribution to the regional initiatives in the Caribbean aided by the CITES international convention towards the conservation of the critically endangered hawksbill turtle.

B. Dr. Adriana Cortez (Mexico), director of Latin American Programs for the organization SEE Turtles, shared

the announcement about three new 'Inclusivity Grants' funded by her organization for supporting novel researchers in Latin America in 2022. These grants aim to support members of local communities, natives and social minorities involved in sea turtle conservation efforts, by funding job opportunities in sea turtle conservation projects in Latin America, and/or providing financial support for field research to students from these social sectors pursuing a degree in biology, veterinary or environmental sciences.

C. Carlos Calagua Yon (Perú), associated investigator of the NGO ConservAccion invited the attendants to reflect on the inclusion and role of the LGBTIQ+ community in sea turtle conservation projects in Latin America.

D. Participants also remarked on the importance of including community members in the RETOMALA meetings. They could enrich the meeting from their cosmovision and cultural background regarding their ancient relationship with sea turtles.

The event ended with the attendees expressing gratitude and joy for resuming this meeting, highlighting the importance of RETOMALA as an inclusive space to create connections between researchers, projects, students and organizations involved in the conservation of sea turtles in Latin America. Attendants also suggested contacting the organizers of previous RETOMALA meetings to select new topics for future meetings, which might include other disciplines such as social sciences, oceanography, and genetics, among others.

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44th International Sea Turtle Society Symposium
Kailua-Kona, Hawai‘i, USA, 28 February to 06 March 2026

Alexander R. Gaos

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Join Us for the 44th International Sea Turtle Society Symposium in Hawai‘i!

Aloha kākou! On behalf of the International Sea Turtle Society (ISTS), we extend a warm and heartfelt invitation to the 44th International Sea Turtle Society Symposium (44th ISTS Symposium) - a global gathering of sea turtle biologists, conservationists, researchers, practitioners, and advocates from over 80 countries. For the first time ever, this premier event will take place in Hawai‘i, from 28 February to 06 March 2026, in the stunning coastal town of Kailua-Kona (Hawai‘i Island).

Why Hawai‘i? Hawai‘i holds a deep and unique connection to sea turtles - known locally as *honu* - that are not only an iconic part of the islands’ marine ecosystems but are also deeply revered in Hawaiian culture. Despite this strong connection, the ISTS Symposium has never been hosted in Hawai‘i - until now! This event presents an exciting opportunity to highlight *honu* and their cultural significance across the Pacific and Oceania.

With the Pacific Islands at the epicenter of global conservation challenges, this symposium arrives at a crucial time to foster meaningful discussions and inspire action for sea turtle research and conservation worldwide.

Symposium Theme: “Kaiāulu” - Community. The theme of the 44th ISTS Symposium is “Kaiāulu,” a Hawaiian word meaning community, neighborhood, and village. This theme reflects the close-knit, collaborative nature of the sea turtle research and conservation community—honoring our shared commitment to understanding and protecting these incredible animals and their habitats through knowledge exchange, capacity building, and global cooperation.

A Breathtaking Venue. The symposium will take place at the stunning Outrigger Kona Resort and Spa, perched atop the cliffs of Keauhou Bay on Hawai‘i Island’s west coast. This breathtaking venue provides an ideal setting for insightful and engaging symposium sessions, fostering collaboration and knowledge exchange. It also offers the perfect backdrop for reconnecting with ‘turtler’ friends and colleagues from around the world.

Kailua-Kona, often simply called Kona, is a charming seaside town located approximately 20km from the airport that is known for its stunning sunsets, world-famous Kona coffee, historic sites, and incredible snorkeling spots. The relaxed island atmosphere, combined with the wealth of cultural and natural experiences, makes it an ideal destination for both professional engagement and personal adventure.

Extend Your Journey. If time allows, we highly encourage you to explore beyond Hawai‘i Island. Each of the main Hawaiian Islands boasts its own unique personality, landscapes, and cultural heritage, offering an unforgettable experience that will deepen your appreciation of this extraordinary region.

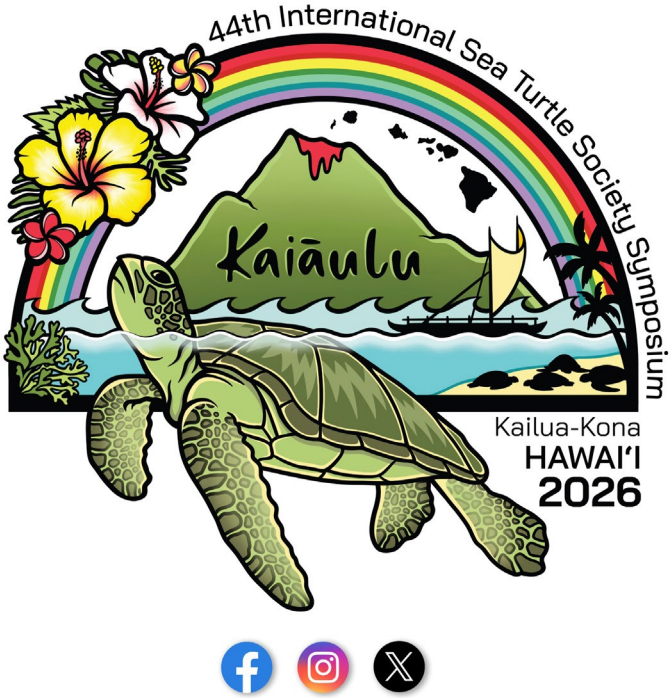
Start Planning for the Meeting. Registration and abstract submission for the 44th ISTS Symposium is currently slated to open on October 1st, 2025, so start thinking about the impactful research and conservation efforts you want to share during the conferences oral and poster presentation sessions. Prior to those presentations we will hold two days of workshops, so if you’re considering organizing one, keep an eye out for the *request for workshop proposals* scheduled to be released in late 2025. We will also host a full day of regional meetings, so start planning your meetings now. You can also prepare your videos to share during *video-night*, hone your stories for our *Origin-stories session*, and collect unique items to donate to the symposium *silent and live auctions* to support travel grants.

Save the Dates and Begin Arranging Your Trip. The 44th ISTS Symposium in Kailua-Kona, Hawai‘i, will occur between February 28th and March 6th, 2026, and promises to be an unforgettable experience, where science, culture, and conservation come together in one of the most breathtaking settings on Earth.

Mark your calendars, book your flights, and don’t forget your swimsuit, reef-safe sunscreen, and “slippahs” (local name for flip-flops or sandals)!

We can’t wait to welcome you to Hawai‘i in 2026!!!

Stay tuned for updates and learn more details by visiting the 44th ISTS Symposium website: https://www.ists-symposium44.org



RECENT PUBLICATIONS

This section consists of publications, books, reports, and academic theses that feature subject material relevant to marine turtles. Most references come from major search engines, and the editors encourage authors to submit their publications directly by email to the Recent Publications editor: mtnrecentpubs@gmail.com.

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Hand-painted sign on incubating leatherback nest in Puerto Rico. Photo by M. Godfrey

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