



FIELD STATION PROFILES

OSA BIOLOGICAL STATION: PROTECTING CENTRAL AMERICA'S GREATEST PACIFIC LOWLAND RAINFOREST

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NAME OF FIELD STATION

- Osa Biological Station (known locally as Piro Biological Station);
- Estación Biológica Osa (conocida localmente como Estación Biológica Piro)

GEOGRAPHIC LOCATION

- Puntarenas Province, Osa Peninsula, Costa Rica
- Lat 8°24'13"N (8.40376), Lon 83°20'11"W (−83.33661), 0-340 m.a.s.l

HABITAT

The Osa Peninsula (~1200 km²) in the southwest of Costa Rica, has the largest remaining tract of Pacific lowland wet forest in Mesoamerica (Holdridge 1967) and is home to ~50% of the country's biodiversity (Barrantes et al. 1999, Kohlman 2011). The peninsula serves as a bridge between North and South America for species' migrations, making it one of the most species-rich and high-endemism regions worldwide. The region has a tropical climate with high temperatures year-round ranging from 23.4°C to 28.8°C (Whitworth et al. 2018) and annual rainfall ranging from 3000 to 7000 mm yr⁻¹ with considerable seasonal variation. The rainy season is typically from June to November and the dry season from December to May (Taylor et al. 2015).

The Osa Peninsula rises from sea level to 745m asl. Ecosystems represented are mainly tropical wet forests, combined with tropical premontane wet forests, plus marine and freshwater ecosystems. It has three core protected areas, Corcovado (~424 km²) and Piedras Blancas (~140 km²) National Parks, and the Golfo Dulce Forest Reserve (~599 km²) that serves as a biological corridor

between the two national parks. These protected areas conserve old-growth and secondary rainforests within a matrix of cattle farms, oil palm and timber plantations, and other agricultural land (Flatt et al. 2022). The peninsula also harbors the country's largest mangrove forest, an important habitat for migratory birds and which is protected by the Terraba-Sierpe National Wetland (~270 km²) and designated as a Ramsar site. The coastline offers nesting habitat for sea turtles and harbors the Golfo Dulce (~750 km²), a tropical fjord that provides critical habitats for marine mammals, sharks, sea birds and an endemic subspecies of sea snake (*Hydrophis platurus xanthos*).

FAUNA

One hundred and forty species of mammal, including 58 bat species and 25 cetacean species, have been recorded from the region (Soto & Jiménez 1992, Vaughn & Rodriguez 1997). The peninsula is home to many species of conservation concern, including large carnivores such as jaguar (*Panthera onca*) and puma (*Puma concolor*), and important seed dispersers such as Baird's tapir (*Tapirus bairdii*), white-lipped peccary (*Tayassu pecari*), and Geoffroy's spider monkey (*Ateles geoffroyi*). The Golfo Dulce fjord has important populations of resident species, such as the common bottlenose dolphin (*Tursiops truncatus*) and the Pantropical spotted dolphin (*Stenella attenuata*). It also hosts important migratory species, such as scalloped hammerhead shark (*Sphyrna lewini*) and humpback whale (*Megaptera novaeangliae*).

Over 460 tropical resident and Neotropical migratory bird species have been recorded in the region (Leavelle 2013). The Osa Peninsula is home to the largest population of scarlet macaws (*Ara macao*) in Central America and hosts 18 endemic bird species, including the



yellow-billed cotinga (*Carpodectes antoniae*), the black-cheeked ant-tanager (*Habia atrimaxillaris*), the mangrove hummingbird (*Amazilia boucardi*), the turquoise cotinga (*Cotinga ridgwayi*), Baird's trogon (*Trogon bairdii*), and the three-wattled bellbird (*Procnias tricarunculatus*) - all of which are considered to be threatened (IUCN 2022).

The peninsula is also home to 52 species of amphibian and 93 species of reptile (Savage 2002). The granular poison dart frog (*Dendrobates granuliferus*) and the Golfo Dulce poison dart frog (*Phyllobates vittatus*) are endangered endemic amphibians with their center of distribution in the region. Reptile species of concern include rare snakes such as the yellow sea snake (*H. platurus xanthos subsp.*), the eyelash palm pitviper (*Bothriechis schlegelii*) and the extremely rare and threatened black-headed bushmaster (*Lachesis melanocephala*). There are also four threatened and endangered sea turtle species – the Pacific green (*Chelonia mydas*), leatherback (*Dermochelys coriacea*), olive ridley (*Lepidochelys olivacea*), and hawksbill (*Eretmochelys imbricata*).

FLORA

The flora has representatives of about 25% of Costa Rica's overall plant diversity with about 6% endemism of tree

species (Morales-Salazar et al. 2013, Rodriguez & Moya 2011). This makes it one of the most diverse botanical regions of Central America. So far, over 2600 species of vascular plants from 187 families have been recorded - with the three largest families being Fabaceae (193 spp.), Rubiaceae (181 spp.), and Orchidaceae (126 spp.; Huber et al. 2008). The peninsula's forest, with canopies over 60 m in height, is home to over 700 tree species. At least 20 of these are endemic species, and 23 endangered. Many are rare and restricted to old-growth forest - including two species of Caryocaraceae - the 'Ajo amarillo' (*Caryocar costaricense*), and the 'Ajo negro' (*Anthodiscus chocoensis*), and one of Canellaceae - the 'Canelillo' (*Pleodendron costaricense*) (Aguilar et al. 2017, Barrantes et al. 1999, Cornejo et al. 2012, and Pillco-Huarcaya et al. 2022).

ACCESS AND INFRASTRUCTURE

Travel to the station

The Osa Biological Station is part of the Osa Conservation Campus situated at the southernmost coastal tip of the Osa Peninsula (Figure 1). The station is a 1-hour drive (~30 km) from the nearest town of Puerto Jiménez (Lat 8°31'37"N [8.52719], Lon 83°18'24"W [-83.30672]) and can be reached by taxi (~\$70 one-way), by local bus "colectivo"



Figure 1. Map of the Osa Conservation Campus, showing the location of the Osa Biological Station and other main facilities (white bubbles), trail system (dotted lines), points of interest (icons), main roads (solid brown lines), and rivers (solid light blue lines). Inlay shows the campus' location on the Osa Peninsula, situated on the southern-Pacific coast of Costa Rica.



Figure 2. Main infrastructures of Osa Biological Station: (A) Aerial photo of the station's infrastructures set up; (B) Dining hall and common area; (C) Researcher cabin rooms; (D) National Science Foundation funded laboratory, with storage, refrigeration and working spaces.

(~\$9 one-way - getting off at Conservación Osa stop from where the station is a ~10-min walk), or by car (gravel road, Route 245 towards Corcovado National Park). Puerto Jiménez can be reached from San Jose Capital city by plane (~1hour, ~\$160 one-way), by bus (~8h, ~\$17 one-way), and by car via HWY34 Coastal Road (~7h, 398 km) via Quepos or via HWY2 Pan American South Route (~9h, 362 km) over the mountains of the Cerro de la Muerte.

Infrastructure

The Osa Biological Station was established in 2003, has seven main buildings and can host a total of 54 visitors (Figure 2A). The dining hall with a large common area and fully equipped kitchen (Figure 2B) serves farm-to-table meals prepared with organic fresh food from the Osa Verde Regenerative Farm. There are three cabins with capacity for nine to 12 people each. Each cabin has three bedrooms, two restrooms, two showers (one indoor, one outdoor), a common area, clothes-line drying area, and a hammock – perfect for small research groups. There is

also a six-bedroom dormitory with capacity for 24 students. The dormitory has its own integrated bathroom and showers, and deck spaces for meetings and relaxing. A multi-purpose classroom is available with ample room for working with samples and hosting presentations. In addition there is a National Science Foundation funded laboratory (built in 2020, Figure 2D) with basic storage, refrigeration, and working spaces. The station is powered by solar and micro-hydro renewable energy systems and back-up generators for emergency power-outs. Wireless internet is available in the dining hall, classroom and laboratory. Laundry service is offered twice a week. The Osa Verde Regenerative Farm, located ~20-min walk from the station, uses sustainable and integrated farming practices and¹ houses a native tree nursery. The broader reserve hosts an *in-situ* botanic garden. The nearby Greg Gund Conservation Center, a satellite educational campus located in Cerro Osa is about a 60-min walk or 20-min drive from the station. The Osa Nature Retreat is located about a 20-min walk from the station. Both infrastructures provide



Figure 3. Habitats found within land protected by the Osa Biological Station: (A) The station's coastline, where the rainforest and mangroves meet the ocean; (B) View of an 'Ajo amarillo' (*Caryocar costaricense*) within the ancient old-growth rainforest; (C) Thirty-meter canopy access tower, the only one in Osa Peninsula.

additional housing and lecture spaces for researchers, film crews and other guests. For those who require regular direct access to the Golfo Dulce, there is also a small marine lab and facility in the office grounds in Puerto Jimenez that can host three to six marine researchers/students.

Facilities in the field

The Osa Biological Station and its 3000+ ha of privately protected land present an elevational gradient extending from sea level to ~340 m.a.s.l. The network of over 30 km of trails allows visitors to explore old-growth primary forest (Figure 3B), naturally regenerating secondary-growth forest (>50 yrs old), secondary plantation forest (enriched with trees of 50 native species), recently abandoned

cattle pastures, and remnant forest strips (Whitworth et al. 2021). Forty 0.5-ha experimental plots were established in abandoned pastures in 2016 and 2017 (all cattle were removed in 2014-2015). The plots were divided into four restoration treatments: three planting regimes and a natural regeneration control (Haave-Audet et al. 2021). There is also access to a 30-m canopy tower (Figure 3C), the only one in the Osa Peninsula. The Osa Arboretum's interpretive panels spread along 11 km of the trail network highlighting the variety of habitats and programs of the organization. The arboretum, a member of Botanic Gardens Conservation International (BGCI), protects over 300 native, endemic, rare, and threatened tree species. The trail network also provides access to critical sea turtle

nesting habitats, with trail access to both Piro (2 km) and Pejeperro (4.5 km) beaches (Figure 3A).

Administration and staff

The station is managed by the U.S. non-profit organization, Osa Conservation, led by tropical wildlife ecologist, Dr. Andrew Whitworth, and Costa Rican Director, Melissa Aubert. The campus is operated by the Campus Director, Gabriela Vinueza, and Campus Coordinator, Rocio Llamas. Support to visiting students and researchers is also provided by the organization's Conservation Program, led by the Conservation Director, Dr. Carolina Soto-Navarro, and wildlife ecologist, Dr. Carolina Pinto.

STATION FEES

The stay at the station includes three fresh meals daily made with organic ingredients from the Osa Verde Regenerative Farm, workspace and access to the 30+ km trail network and the mosaic of habitats surrounding the station. Dormitory and shared (up to four persons) cabin fee per person per day is US\$60 for senior researchers (already with a PhD) and US\$45 for junior researchers (private cabins can be arranged at a different rate). Please note, these are subsidized rates to support professional researchers - tourism rates are different and can be accessed through the website or through direct contact via the reservation's email. Short-term student courses are charged at US\$75 per student per day. There is a fellowship program available to provide reduced rates to researchers and students who might not have the financial means available to conduct their research—although funds are limited and competitive (<https://osaconservation.org>). Current rates are kept up to date on the website.

LEGAL REQUIREMENTS

To do research in Costa Rica a research permit issued by the National System of Conservation Areas (Sistema Nacional de Áreas de Conservación, SINAC) is required. A permit is required for research inside or outside protected areas with temporary or permanent collection of wildlife or habitat manipulation. A permit is also required for courses or training inside or outside protected areas with temporary or permanent handling of wildlife or their habitat. To access genetic resources and biochemicals an additional permit is required from the National Commission for Biodiversity Management (Comisión Nacional para la Gestión de la Biodiversidad, CONAGEBIO) and an informed consent agreement signed with Osa Conservation. The minimum time to approve a permit is 30 days from submission,

but we recommend starting the process well in advance from your planned starting day. Our on-site campus and research staff can assist and guide applicants through the process (although we cannot handle the process completely on your behalf).

KEY RESEARCH

Osa Biological Station has acted as a scientific hub for numerous research groups and students from around the world. The broad array of investigations in thematic areas include studies related to animal behavior and cognition (Krieger et al. 2020, Laidre 2021), developmental and breeding biology (Güell & Warkentin 2023) and tropical ecology, botanical compositional studies and carbon stock estimations (Taylor et al. 2015 - see <https://osaconservation.org/media-room/science-publications/> for a comprehensive list).

Most recently Osa Biological Station has operated as a technological hub with an on-site field and programs team who deploy and test cutting-edge applications of technology and approaches to wildlife monitoring. These ongoing efforts aim to answer species- and community-level questions related to biodiversity and have been addressed using camera traps (Vargas Soto et al. 2021, 2023, Whitworth et al. 2018, 2019), acoustic recorders (Vega-Hidalgo et al. 2021; Lawson et al. 2023), and most recently, with GSM transmitters, satellite collars, and drones mounted with thermal cameras (Sellés-Ríos et al. 2022; Whitworth et al. 2022).

Many of the data sets being collected by the organization's field team are open access and available to collaborators, students and visiting researchers based upon reasonable requests. A list of these can be found on the organization's web page under the 'resources' link.

SELECTED PUBLICATIONS

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LINKS

Osa Conservation (www.osaconservation.org)
 Open Science Framework (<https://osf.io/bs4nt/>)
 Osa Arboretum (www.osa-arboretum.org)

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