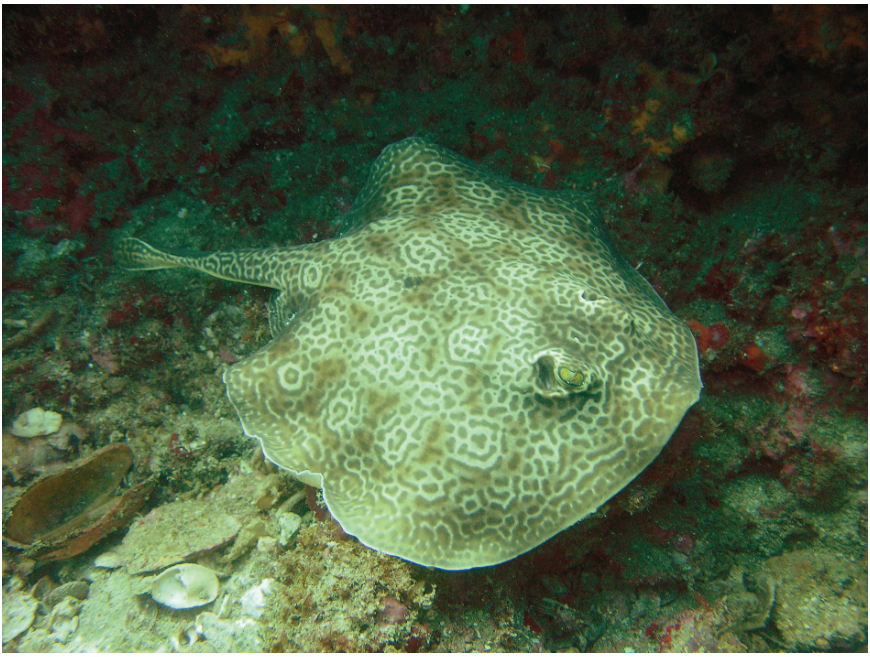
Part 39
Marine Fish

William A. Bussing and Myrna López



Urobatis halleri from Bahía Salinas, Pacific Costa Rica (Photo: Jorge Cortés)

W.A. Bussing and M. López
Museo de Zoología and Centro de Investigación de Ciencias Marinas y Limnología (CIMAR), Universidad de Costa Rica, 11501-2060 San José, Costa Rica.
e-mail: wbussing@biologia.ucr.ac.cr; myrnal@biologia-ucr.ac.cr

I.S. Wehrtmann, J. Cortés (eds.) *Marine Biodiversity of Costa Rica, Central America*,

Abstract The expected diversity of Pacific marine fishes found in waters between 0 and 200 m depth off the mainland of Costa Rica and the oceanic island Isla del Coco is greater than 800 species. The Costa Rican Caribbean ichthyofauna totals somewhat more than 600 species. Fishes new to science or new to the region are constantly being found in Central American waters wherever intensive collecting takes place. Habitats are diverse and some species apparently have spotty or limited geographic distributions. The broad outlines of lower Central American fish biodiversity are presented, although additions to this fauna are continually being made.

Introduction

The present lists of species include all material in the Museo de Zoología of the Universidad de Costa Rica (UCR) collections plus species whose geographic ranges, as are reported in the scientific literature (principally Fischer *et al.* 1995; Carpenter 2002), include Costa Rica and adjacent countries. Numerous species discovered on the exceptional Atlantic coral reefs and islands found off Belize, but not expected to occur in lower Central America, are not included. Likewise, the San Blas archipelago on the Caribbean coast of Panama presumably harbors additional reef species not expected in Costa Rican waters. The totals to date of expected species (based on the literature) for each coast of Costa Rica and the actual number of species deposited in the University of Costa Rica collections are shown in Table 39.1.

The UCR Atlantic fish holdings include about 50% of the total estimated number of species present along the Caribbean coast of Costa Rica (Species List 39.1 is included on the CD-Rom). Thus the UCR Pacific fish collections represent 85% of the estimated total number of species found between the surface and 200 m depth (Species List 39.2 is included on the CD-Rom). One representative of the Caribbean fish fauna of Costa Rica is shown in Fig. 39.1.

Because of fortuitous circumstances and events, we have placed greater emphasis on the Pacific coast ichthyofauna than on the Caribbean fishes; Figs. 39.2 and 39.3 show two representatives of the Pacific fish fauna of Costa Rica. The Golfo de Nicoya on the Pacific coast is of commercial interest for the country due to its importance as a nursery and major producer of shrimp and fishes. The taxonomic status of the Pacific ichthyofauna too was lesser known and attracted several research expeditions to sample the mainland and Isla del Coco habitats using modern sampling methods. In exchange for numerous opportunities to collect materials aboard research vessels provided by the Natural History Museum of

Table 39.1 Species counts for both coasts of Costa Rica

Ocean	Families	Genera	UCR species	Lit. species
Pacific	119	436	719	838
Atlantic	116	333	332	625

Fig. 39.1 *Lutjanus apodus* from Cahuita, Caribbean coast of Costa Rica (Photo: Andrea Bernecker)

Fig. 39.2 *Diodon holocanthus* from Bahía Salinas, Pacific Costa Rica (Photo: Jaime Nivia)

Los Angeles County (LACM), duplicate specimens have been deposited in both UCR and LACM collections since 1962. Holotypes and paratypes of new species described by us are deposited at LACM; large series of paratypes are also maintained at UCR.

The tropical eastern Pacific ichthyofauna extends from the tip of the Baja California peninsula to northern Peru. Briggs (1974) reviewed the distibution of fishes, crustaceans, and mollusks and discussed the boundaries of the two major zoogeographic provinces, a northern "Mexican Province" and southern "Panamanian Province." Numerous larger schooling fishes inhabit both provinces, although many, especially

Fig. 39.3 *Hippocampus ingens* from Bahía Culebra, Pacific Costa Rica (Photo: Jaime Nivia)

smaller less vagile species, are endemic to each province. A Central American faunal gap of less species diversity forms a wide boundary (Gulf of Tehuantepec to Gulf of Fonseca) between Mexican and Panamanian provinces principally due to the paucity of species typical of rocky shorelines. Robertson & Allen (2002) provide a list of 683 fishes for the Mexican Province, 612 species in the faunal gap, and 890 species in the Panamanian Province.

We have documented over 300 species from Isla del Coco (Lavenberg & Bussing 2000; Bussing & López 2005). Most of these are also present on the Costa Rican mainland, but about 85 species are either endemic to the island (20) or found at both Isla del Coco and Islas Galápagos (the rest). Other species are vagrants from the Indo-West Pacific or from the Central American mainland and not necessarily establish resident breeding populations at Isla del Coco.

The distribution of the Caribbean fish fauna is less clearly defined (Briggs 1974). The northern boundary of the "Caribbean Province" includes the tip of Florida, excludes the northern Gulf of Mexico, and continues from Tampico, Mexico, on the continental coastline of Central and South America to eastern Venezuela. To the south vast stretches of mud bottom extend across the mouths of the Orinoco and Amazon Rivers and delimit the "Brazilian Province." The "West

Indian Province" consists entirely of islands and contains a large diversity of species isolated from the Central American mainland and even to a lesser degree from the close-by Florida Keys. Böhlke & Chaplin (1968) list 507 species from the Bahamas, many of which have never been recorded from the Caribbean mainland.

No estimates of the total species diversity of the Western Atlantic Province are available, but Smith *et al.* (2002) plotted the combined distribution of 987 fish species as well as the composite distribution of 1,172 fish, invertebrates, and tetrapods in the Western Central Atlantic. The resulting maps reveal the area of highest species richness is located in southern Florida, the eastern Bahamas, and northern Cuba. Other secondary centers of diversity in descending order of richness are northern South America, Central America, and the northern Gulf of Mexico. They consider the relatively low endemism and species diversity on the Central American shelf to reflect, in part, its relatively recent reconnection with older North and South American faunas. Abundant evidence of this is shown by the large number of geminate transisthmian species of fish and other organisms. Most fish genera are present on both coasts of the isthmus.

Perhaps the relative paucity of Atlantic species is partly due to the physical nature of the Caribbean coastline of Costa Rica that is principally high-energy sand beach with only a few coral reef habitats in the south. The continental shelf drops off rapidly and provides a minimum diversity of benthic habitats. More collecting by scuba, trawls, and dredges would clearly improve our knowledge of the biodiversity and geographical distribution of the Costa Rican Caribbean ichthyofauna.

Specialists

Names of specialists of most fish families are available in the FAO volumes cited below.

Collections

The main collections of Costa Rican fishes are deposited in the Museo de Zoología, Universidad de Costa Rica, and in the Natural History Museum of Los Angeles County, California, USA.

References

Allen GR, Robertson DR (1994) Fishes of the Tropical Eastern Pacific. Crawford House Press, Bathhurst, Australia, 332 p

Allen GR, Robertson DR (1999) Shorefishes of the Tropical Eastern Pacific. Version 1.0 compact disk. Smithsonian Tropical Research Institute, Panamá

Böhlke JE, Chaplin CCG (1968) Fishes of the Bahamas and adjacent tropical waters. Livingston, Pennsylvania, 771 p

Briggs JC (1974) Marine Zoogeography. McGraw-Hill, New York, 475 p

Bussing WA, López MI S. (1993) Demersal and pelagic inshore fishes of the Pacific coast of lower Central America. An illustrated guide. (Spanish & English). Spec Publ Rev Biol Trop, 164 p

Bussing WA, López MI S (2005) Fishes of Cocos Island and reef fishes of the Pacific coast of lower Central America. An illustrated guide (Spanish & English). Rev Biol Trop 52(Suppl 2):192

Carpenter KE (ed) (2002) The living marine resources of the Western Central Atlantic. FAO species identification guide for fishery purposes and American Society of Ichthyologists and Herpetologists Special Publication No. 5. Vols 1–3. FAO, Rome, 2127 p

Cervigón MF (1966). Los peces marinos de Venezuela. Fundación La Salle, Caracas, 951 p

Cervigón F, Cipriani R, Fischer W, Garibaldi L, Hendrickx M, Lemus AJ, Márquez R, Poutiers JM, Robaina G, Rodríguez B (1993) Field guide to the commercial marine and brackish-water resources of the northern coast of South America. FAO, Rome, 513 p

Fischer, W. (1978) FAO species identification sheets for fishery purposes. Western Central Atlantic (Fishing Area 31). FAO, Rome, Vols 1–6 (no pagination)

Fischer W, Krupp F, Schneider W, Sommer C, Carpenter KE, Niem VH (1995) Guía FAO para la identificación de especies para los fines de la pesca. Pacífico Centro-oriental. FAO, Rome, Vols 1–3, 1813 p

Lavenberg RJ, Bussing WA (2000) Lista de especies del Parque Nacional Isla del Coco. Peces. Appendix. *In*: Garrison G (ed) Peces de la Isla del Coco/Fishes of Cocos Island. INBio, Santo Domingo, Heredia, Costa Rica, pp 334–353

Grove JS, Lavenberg RJ (1997) The Fishes of the Galápagos Islands. Stanford University Press, California, 863 p

Robertson DR, Allen GR (2002) Shorefishes of the Tropical Eastern Pacific. Compact Disk, Version 1.0. ISBN 9962-614-02-3. www.biobase.org/sftep; Smithsonian Tropical Research Institute, Panama

Smith ML, Carpenter KE, Waller RW (2002) An Introduction to the Oceanography, Geology, Biogeography and Fisheries of the Tropical and Subtropical Western Central Atlantic. *In*: K.E. Carpenter (ed) The Living Marine Resources of the Western Central Atlantic. Vol. 1: Introduction, Mollusks, Crustaceans, Hagfishes, Sharks, Batoid Fishes and Chimaeras. FAO Species Identification Guide for Fishery Purposes and American Society of Ichthyologists and Herpetologists Special Publication No. 5, Rome, pp 1–599

Thomson DA, Findley LT, Kerstitch AN (2000) Reef Fishes of the Sea of Cortéz. University of Texas Press, Austin, TX, 353 p