

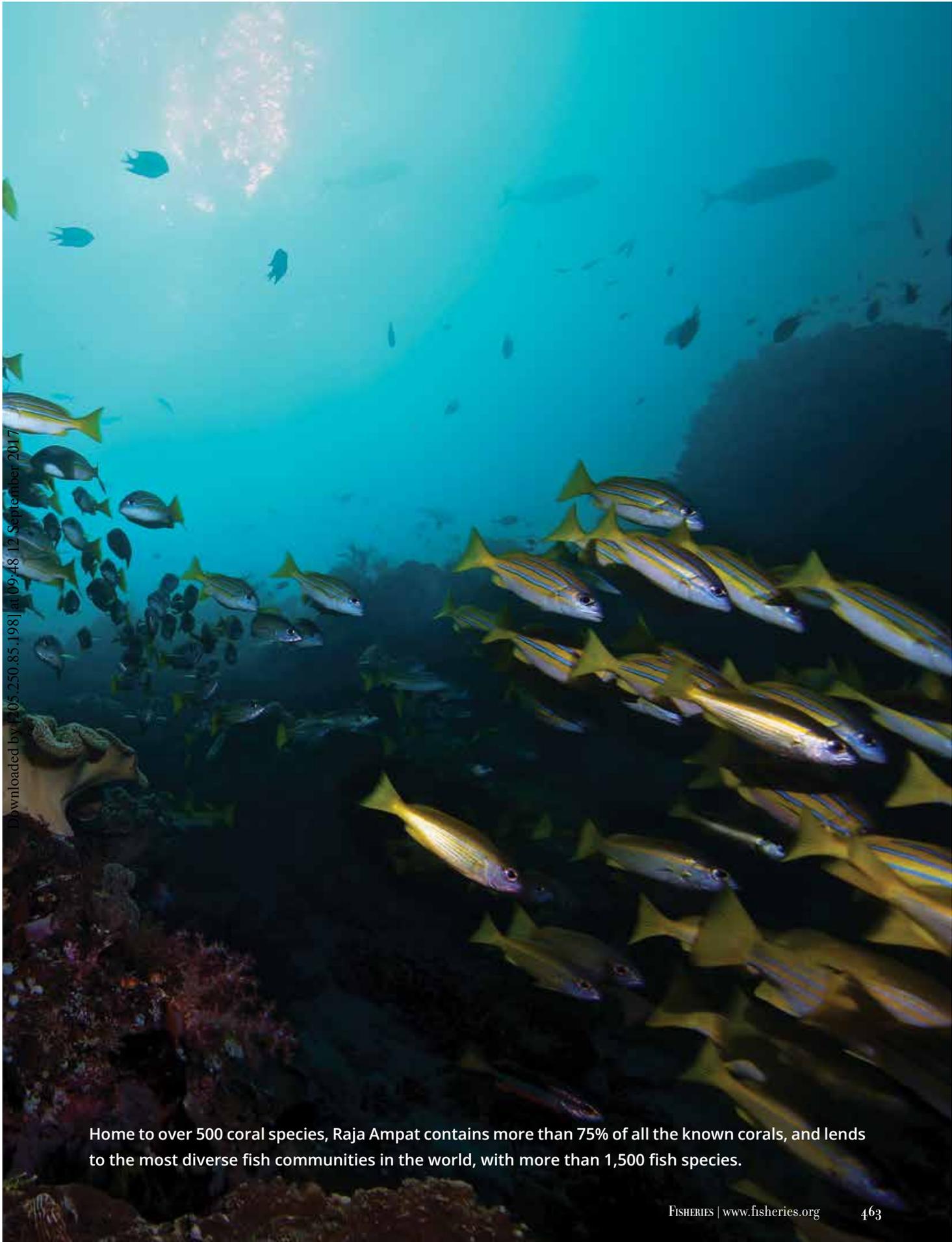
PHOTO DIARY

Raja Ampat: A Biodiversity Hot Spot and the Future of Marine Conservation

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A large school of yellow-striped snappers (Lutjanus fulvifasciatus) is swimming in a clear, blue-green underwater environment. The fish are densely packed in the lower half of the frame, moving towards the right. In the background, other smaller fish are visible, and the water is filled with light filtering from above. The bottom of the image shows a dark, textured coral reef structure.

Home to over 500 coral species, Raja Ampat contains more than 75% of all the known corals, and lends to the most diverse fish communities in the world, with more than 1,500 fish species.

Raja Ampat is a series of archipelagos that occupies 4.6 million hectares in northern West Papua, Indonesia, and lies at the eastern edge of the coral triangle within the Indo-Pacific region. With more than 600 islands, including the “four kings”—Waigeo, Misool, Salawait, and Batanta—Raja Ampat is home to the world’s most diverse coral reefs. The vast majority of these islands consist of steep limestone mounds emerging from the crystal blue water. The surrounding oceanic conditions are a mixture of the Pacific and Indian Oceans and range from low nutrient water to mangrove marshes and seagrass bays, providing contrasting nutrient environments. This unique oceanic setting favors larval dispersal and allows species from each ocean to be supported.

The combination of ideal oceanographic conditions, a mosaic of microhabitats created by hundreds of varying-sized islands, and relative isolation from anthropogenic activity has allowed for the persistence of 537 coral species, accounting for 75% of corals globally. These diverse coral reefs form the foundation necessary to support 1,500 fish species residing within Raja Ampat. Similarly, to the coral diversity, this is highest within the coral triangle, and therefore in the world. In addition, nearly 700 species of mollusks, 15 marine mammal species, and many migratory shark species inhabit these waters. This impressive list includes an array of endemic species, such as Raja Ampat “walking” sharks, and a striking number of species, especially marine invertebrates, have yet to be formally described.

Unfortunately, Raja Ampat’s abundant resources enlist extraction interest and economic development alike. Tourism, mining, and logging along with commercial, artisanal, and illegal fisheries have all developed within this biodiversity hot spot. Depleting fish stocks in neighboring Indonesian provinces and surrounding countries have drastically increased both legal and illegal fishing pressure within the region, and fisheries now target at least 200 species, with all stocks showing general declines. Furthermore, the tourism industry is growing exponentially following recent efforts to promote foreign entry. The truly incredible marine diversity, however, has made Raja Ampat a priority for national and global conservation efforts. In 2002, a political unit called the Raja Ampat Regency was formed and aided in creating the Raja Ampat Marine Protected Area, a network of seven protected areas spanning 1,185,940 hectares. In addition to establishing these

marine protected areas, recognition for protection against the consequences of high-traffic tourism prompted a decision in 2015 to introduce marine park permits. A pass costs visitors around US\$100 and goes toward supporting operational and servicing costs. While noteworthy, these endeavors are not without a continued need for support, resources, and enforcement, especially if they are to keep pace with the ever-changing social-economic landscape.

Despite these conscientious efforts, the future of Raja Ampat remains uncertain. As the tourism industry expands, surrounding fisheries collapse, and impending environmental stressors are experienced, Indonesia and the global community need to expand on existing measures to preserve this unique biodiversity hot spot. The Indonesian government is tasked with finding a balance that serves local economic interest, allowing for appropriate development, while conserving marine diversity—a fine line that few have historically walked well. Interested outside parties, particularly those with the capacity for research, have the potential to positively contribute to these measures by means of long-term environmental monitoring programs, especially programs that focus on assessing species interactions within the world’s most diverse coral reefs, in addition to monitoring how the vast majority of the world’s corals respond to changing social-economic and industrial pressures. Combined governmental and nongovernmental cooperation will also likely play a major role in supporting local education and outreach campaigns. Offering incentive and alternative measures to curb illegal fishing practices, as well as absentminded resource management, in favor of sustainable practices, continued park permitting enforcement, and park monitoring will ensure the future of Raja Ampat remain what it is today—in a word, exquisite.

Raja Ampat is a picturesque region that undoubtedly faces uncertainty, while the unique ecology of the area presents an authentic opportunity to establish forward-thinking marine conservation practices. The wonders of Raja Ampat guarantee it will be explored, and if taken for granted, the known consequences are truly dire. Successful preservation of Raja Ampat, however, has the potential to set Indonesia apart as a global leader in marine stewardship, ensuring preservation of the most diverse coral reef ecosystem the world has ever known.



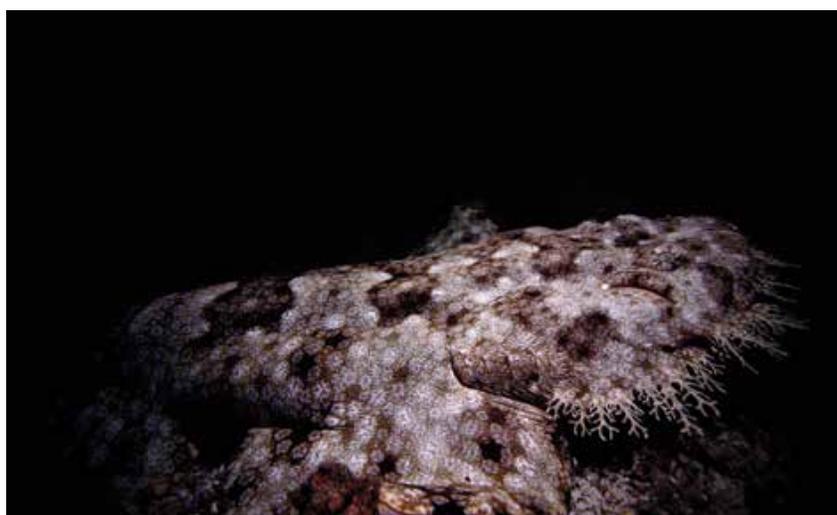
A picture-perfect view from atop Fam Island illustrates how hundreds of islands composing the Raja Ampat region are remains of ancient corals that rose from the ocean surface through changing sea levels to form a mosaic of microhabitats beneath the crystal waters.



(Top) The underwater realm within the region of Raja Ampat is incredibly rich; a visitor among these pristine reefs seems a surreal sight. A diver delights in the colorful, numerous, and expansive plateau of coral.



(Center) A hawksbill turtle *Eretmochelys imbricata* grazes on algae. Raja Ampat is home to nesting populations of green and hawksbill turtles; even leatherback turtles are known to forage in the area.



(Bottom) Tasselled wobbegong's scientific name *Eucrossorhinus dasypogon* translates to "well-fringed nose with shaggy beard," and it was named for the branching skin flaps that run continuously along its jaw. It is thought that these disruptive structures make its outline more difficult for prey to detect. As soon as this shark has lulled its catch into a false sense of security, it snaps the unsuspecting fish out of the water column in a blink of an eye.



(Top) As the name suggests, Wire Coral Goby *Bryaninops yongei*, have adapted to live primarily on wire coral. A mating pair occupied this *Cirrhopathes* sp., and both individuals (partner not shown in this image) had coloration matching that of the coral they inhabited, a common phenomenon with this species.

(Center) A Bigfin Reef Squid *Sepioteuthis lessoniana* during a successful night hunt. Witnessed in the light of our torches, this squid pulled a schooling reef fish out of the darkness, proceeded to consume it within a matter of minutes, then disappeared again into the opaque abyss.

(Bottom) Pink Anemonefish *Amphiprion perideraion* inhabiting a magnificent, bulging sea anemone *Heteractis magnifica*. *H. magnifica* is one of four host anemones that *A. perideraion* is known to reside within.

(Top) The endemic walking shark of Raja Ampat *Hemiscyllium halmahera* discovered by Gerald Allen, Mark Erdmann, and Christine Dudgeon in 2013. This specimen was a resident at the house reef of Raja Ampat Biodiversity Eco Resort.



(Center) The pristine nature of Raja Ampat is evident even to the untrained eye. The dynamic ecosystems offer glimpses into what coral reefs can and should amount to. As extreme bleaching events, ocean acidification, and overfishing become more common, the need to protect such a uniquely rich hot spot becomes increasingly pressing.



Kieran Cox is a Ph.D. student and Hakai Scholar at the University of Victoria, cosupervised by Francis Juanes and Sarah Dudas. His graduate research is a collaborative effort between the Hakai Institute, the Juanes Lab, and Ecological Interactions Research Program and seeks to investigate how marine biodiversity varies across different habitats and the processes driving this variation.

Jenna Bright holds a B.Sc. from the University of Victoria in Biology and Earth and Ocean Sciences. Employed at Archipelago Marine Research, within British Columbia's commercial fisheries Electronic Monitoring Program, she continues to develop her knowledge and passion for marine species and their management. [AFS](#)