

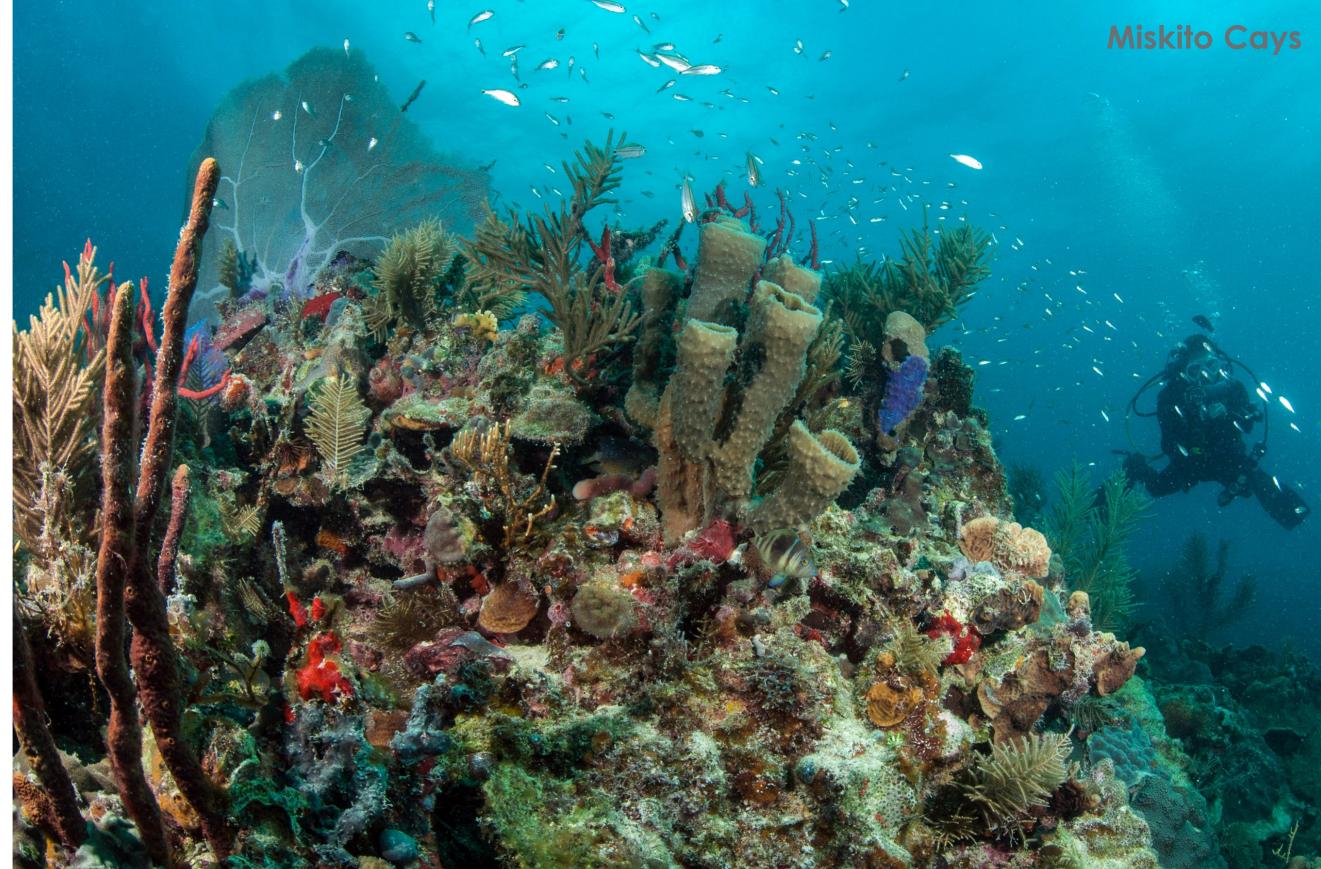
Diver swims along the edge of a reef covered in marine life, Miskito Cays, Honduras

PREVIOUS PAGE: Rope sponges cling to a boulder

Following six flights, two nights and a 30-hour boat trip, I found myself approaching a relatively uncharted group of small coral cays about 60km off the northeast coast of Honduras, not far from the Nicaraguan border. I joined a group of scientists from various institutions around the world, assigned to document their activities and photograph the habitats and associated wildlife both above and below the water.

Embarking on the Caribbean Pearl II from Utila, one of the Bay Islands a few miles off the north coast of Honduras, we made our way along the coast to an area unknown to the region's tourist diving operations. As we got close to the cays, our crew grew increasingly nervous, perhaps justifiably so.

This part of Honduras has long been a major route for cocaine trafficking into the United States from South America, and the region through which we were sailing was well-known for its use by certain cartels who preferred moving their cargo by sea. However, the apparently efficient military presence in the area (we



were boarded ourselves by five soldiers armed to the teeth, carrying out a pre-arranged search) provided a vague form of comfort, and so we continued.

The archipelago

The Miskito Cays form an archipelago spanning both Honduran and Nicaraguan waters. On the Honduran side, 49 tiny coral

islands and sand bars are dispersed across 750 sau km of shallow seabed. The area is named after the indigenous people of the region, the Miskitos, who

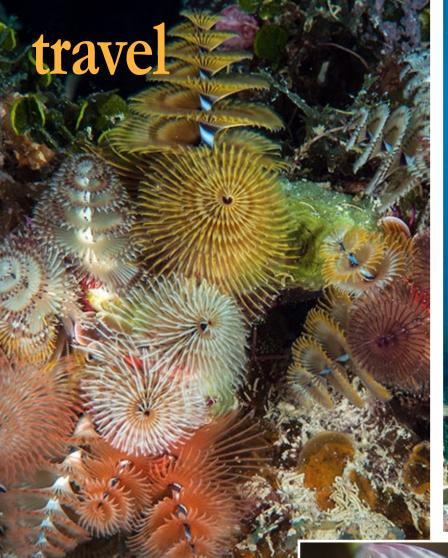
inhabit communities along the coast of both countries. The region is known as the Miskito Coast, or more accurately (the name has nothing to do with

the blood-sucking insects) La Mosauitia.

La Mosquitia is in some ways the wild west of Central America. The region is tropical rainforest



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LEFT TO RIGHT: Christmas tree worms; Social feather-duster worms; Midnight and rainbow parrotfish

wilderness forming the greatest continuous expanse of tropical forest north of the Amazon. Sparsely populated the area has an exceptionally high diversity of flora and fauna. It is only accessible by water or air and much of it remains unexplored.

Although tourism exists, the region only attracts a few hardy explorers each year, so there is no actual tourist infrastructure to speak of. The area's inhabitants include four indigenous groups (the Pech, Tawaka, Garifuna and Miskito) with the majority composed of Miskito people who live on the coast. With few available livelihoods, many of the men from these remote villages work in the industrial fisheries for lobster and conch, and more recently, sea cucumbers.

Risky fisheries

For over 40 years these fisheries have continued with exceptionally poor management resulting in unsustainable exploitation not only of the marine resources, but also of the fishermen themselves.

The primary method of fishing

is scuba divina, but this remains relatively primitive and dangerous, relying for the most part on basic, poorly maintained equipment with little regard for the safety of the diver. As the populations have been overfished, the

remaining lobster and conch have been driven into deeper waters. Human casualties from diving associated incidents have risen as a consequence, and now there are around 120 diving accidents per fishing season with around 20 being fatal. Industrial fishing vessels around

80ft in length are packed with 100 men. Divers, assisted by canoeists, who follow them from the surface, make multiple dives to depths of 120 feet or more. Incidents resulting from incorrect procedures or malfunctionina equipment have become common-place.

Many divers have lost their lives, and many more have permanent, debilitating injuries resulting from decompression related illness. More than 1,000 permanently disabled men are left scattered in remote communities of La Moskitia as a result of diving for these fisheries.

Proposed protected area

The effect this is having on many communities is now becoming apparent, and now many of the indigenous groups are calling on the Honduran government

to close the waters surrounding the Miskito Cays to industrial fishing. They are proposing an area of 1.45 million hectares to be the exclusive use of a locally managed, small-scale artisanal fishing fleet using improved fishing methods, that don't include scuba.

In order to realise this ambitious proposal, the relevant Miskito communities will not only require retraining in new fishing methods but also a solid management strategy that combines fishing regulations with marine spatial plans. Community leaders have specified these plans must identify and protect critical habitats, nursery grounds and other ecologically important areas.

As with many remote locations, the environmental impact of sustained exploitation of industrial fisheries around the Miskito Cays have,



September 21 & 22, 2013 (Saturday & Sunday) PhoenixDiveShow.com



October 5 & 6, 2013 (Saturday & Sunday) StlouisDiveShow.com



October 11 & 12, 2013 (Friday & Saturday) CarolinaDiveShow.com



January 25 & 26, 2014 (Saturday & Sunday) BaltimoreDiveShow.com



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Deepwater sea fans; Yellowline arrowcrab (below)

to date, largely been ignored. Due to the relative isolation of the area, the past and current condition of the ecosystem and its regional significance is essentially unknown. This lack of information is one of the largest hurdles preventing these communities from developing their plans further.

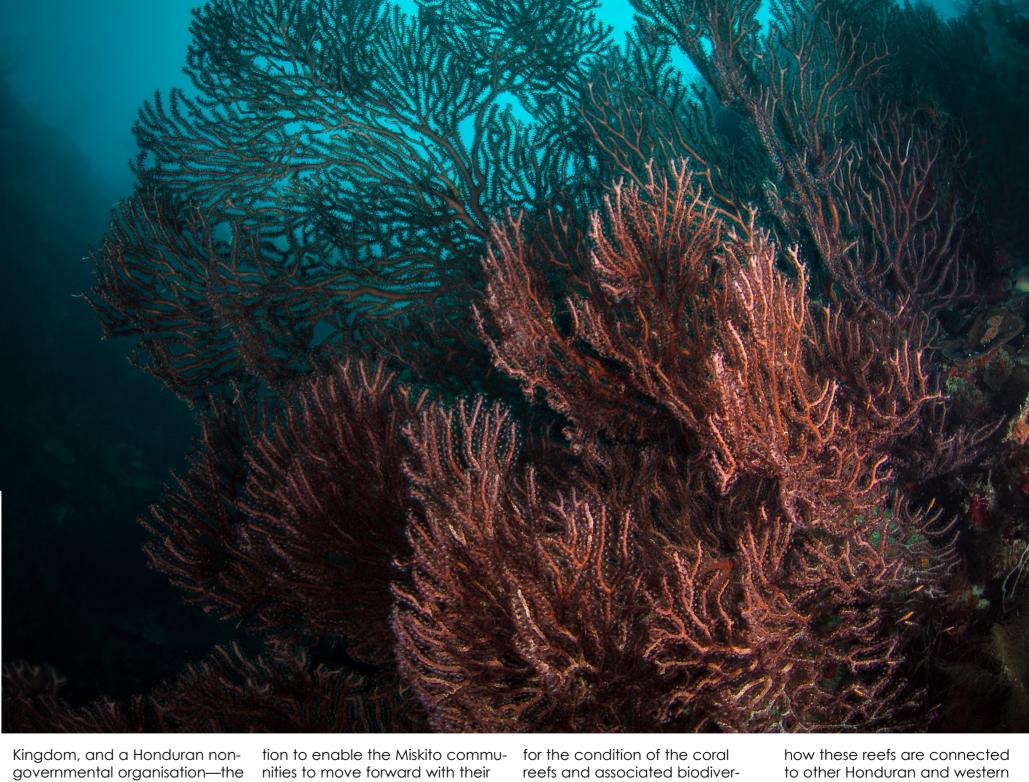
Research program

In collaboration with a team of international researchers from the Smithsonian Institution, Harbor Branch Oceanographic Institute, University of Queensland in Australia, University of Manchester in the United





Yellowline goby peering out from a great star coral colony



Kingdom, and a Honduran nongovernmental organisation—the Centre for Marine Studies—Dr Steve Box, a marine biologist from the Smithsonian Institution has developed a multi-disciplinary research program in order to provide the missing information to enable the Miskito communities to move forward with their sustainable fisheries and marine management proposal.

A central part of this program is to gather essential ecological data of the Miskito Cays region in order to establish a baseline for the condition of the coral reefs and associated biodiversity. Ultimately, the objectives are to assist both local groups and the government of Honduras move towards the sustainable use of their marine resources and improve understanding of

how these reefs are connected to other Honduran and western Caribbean marine ecosystems. The study will also be used as part of ongoing comparative research programs across the entire Caribbean.

Miskito Cays



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Research activities

The schedule was rigorous, involving both underwater and terrestrial surveys. A small team took the tender vessel and landed on as many of the cays as possible to ground-truth various satellite imagery and bathymetric charts.

A team of divers conducted surveys to assess the abundance of corals, algae and fishes using a standardised reef monitoring protocal, while individual divers were responsible for collecting various samples for later lab analyses. These were used to assess the severity and prevalence of coral diseases along with the diversity and abundance of sponges and algal communities. Genetic analyses was used to uncover patterns of dispersal for three commercial fisheries species and an endangered coral species among the reefs of the northern and southern areas.

Combined, this research will greatly improve understanding of the physical, environmental and ecological context of the proposed Honduran Miskito Cays marine area.

Diving

Following our slightly un-nerving run-in with the Honduran Navy, we approached the first of the northern group of cays. Some were no more than slightly elevated patches of sand, only just visible above the water, while others were well-established small islands with



Chain moray eel; Solitary gorgonian hydroid (right)





dense vegetation providing habitat for large numbers of breeding seabirds. Ringed by thin strips of white sand gently sloping into vivid turquoise lagoons, the cays were almost stereotypically beautiful—exactly what one would expect from remote coral islands in the Caribbean.

An air of excitement and anticipation filled the boat as we prepared for our first dive. Due to its relative inaccessibility, this region was largely unknown to divers, and reports describing the

area were scarce. Although not thought to be vastly different from other coral reefs in the Western Caribbean, nobody really knew what to expect.

Many reefs throughout the entire Caribbean have suffered significant declines over the last 30 years. This decline, however, is mostly described on reefs close to areas of human population and thought to be caused partly by a combination of human-induced pressures such as overdevelopment, pollution and overfishing.

Although the Miskito Cays are known for fishing, they are far away from the mainland, which limits direct land-based human impacts. These reefs therefore have the potential to be comparatively healthier than their counterparts in other locations.

Secretly hoping for crystal clear water, whale sharks, manta rays and pristine coral reefs like no living soul has seen before, my descent onto the first reef was one of mixed emotions. While still excited to be diving this unex-



Diver examines life on cliff face; Knobby sea rod (below)

Miskito Cays

als die, faster growing species such as algae quickly become established leaving little room for new corals to settle. Although a major problem now affecting all the world's coral reefs, the lack of species diversity, in comparison to reefs of the Indo Pacific, means some parts of the Caribbean have been particularly badly affected.

Massive boulder coral forma-

last dive of the second day was particularly memorable, not so much for marine life encountered but rather the ancient towering coral colonies, formed from layer upon layer of growth, where the upper surface is alive built on top of previously deposited rock skeleton. The pinnacles formed cathedral-like structures creat-

tions were a common feature

on many of the dives, some in

better condition than others. The

structures creating a labyrinth of pillars, caves and tunnels almost eerie in the fading daylight.

Gliding underneath some of these imposing coral masses, I frequently noticed impressive bushes of black coral, a



plored region, my initial reaction was one of slight disappointment. A storm from a few days earlier had stirred up the water, and the visibility was not as good as expected. The main purpose of my visit here was to provide habitat images of the coral reefs, so my intention was to shoot almost exclusively wide-angle. The amount of suspended sediment in the water column was going to make this task slightly more challenging than anticipated!

Impressive reef structures, at first silhouetted in the gloom, came into view, covered in myriad forms of life. The intricate shapes of black coral bushes and delicate wire corals hung from the sides of massive colonies of *Montastraea*, large reef-building corals that provide a foothold for numerous smaller coral species. Sea whips, sea fans, sponges, tunicates, macroalgae, encrusting algae and fire corals also competed for any available space.

Reef health

These highly competitive interactions are what make coral reefs among the most biodiverse ecosystems on the planet. Conversely, they are also responsible for a fundamental, and relatively recent problem. Maybe no more than 50 years ago, coral mortality on well-established reefs was not a major issue. Indeed, mass mortality as a result of coral bleaching or disease is a comparatively new phenomenon. For mil-

lions of years, coral communities have been highly resilient, able to recover from most major environmental disturbances.

Nowadays, however, much of that resilience has been lost, most probably due to increasingly frequent and persistent human-induced disturbances. As cor-



Elkhorn coral



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Juvenile parrotfish on staghorn coral reef

Miskito Cays

natural stressors. Due to their dramatic decline, *Acropora* corals have become something of a rarity, so it's always a pleasure to find areas where they still thrive.

Although not as dense a thicket of elkhorn as I

was expecting, there were some massive formations here, some with branches a metre or so in diameter, perhaps the largest I've ever seen. Amazingly, many of the colonies here, as I've seen in other areas, were growing just beneath the surface. Because





species known as Antipatharia which, despite their name actually look like giant red sea fans. Unlike other areas I've dived in the Western Caribbean, these striking black coral bushes were a regular sight on many of the dives here and were reminiscent of some of the dense gorgonian forests I've encountered in the Pacific.

Although we encountered a fair share of reefs in less than favourable condition, either besieged by algae, soft corals and sponges, or deteriorating as a result of disease or bleaching, we also noted some encouraging signs of resilience providing a little optimism that the reefs here could have potential to sustain themselves. In many parts of the Caribbean, indications of

significant growth or recovery are becoming all too scarce.

Elkhorn and staghorn coral

A number of fine stands of staghorn coral (Acropora cervicornis), intricate branching corals that were almost completely wiped out by white band disease in the early 1980s, were seen on a number of dives. Prior to the 1980s, these corals were responsible for much of the structural complexity of Caribbean reefs providing numerous species with shelter from predation. Loss of this complexity has profoundly altered the biodiversity of many reefs so to see even small, healthy patches of Acropora anywhere in the Caribbean is reassuring indeed.

a snorkel in shallow water close to a cay called Caratasca. A small team had gone ashore earlier that day and reported a number of elkhorn coral colonies in the shallows. Elkhorn coral (Acropora palmata), like its close relative staghorn, was once an abundant reef-building species common throughout Caribbean reefs providing much of the foundation and structure. Suffering the same fate as staghorn, elkhorn coral also died off at an alarming rate and before long 95 percent of both species had declined. White band disease, which only affects these two Acropora species, is still something of a mystery although almost certainly has some connection to increased human and



Elkhorn coral (above); Detail of staghorn coral branch (top right)

of the depth, or rather lack of it, I relied on natural light for photography. Hampered once again by fairly poor visibility and struggling to compose shots due to being underweighted, and possibly not as proficient at breathholding as I used to be, I managed one or two acceptable images.

Heading south
After two days divi

After two days diving the northern group of cays, we made our way to the group in the south closer to the Nicaraguan border, much to the consterna-

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at ease after we were assured that the Honduran Navy was still on exercises in the area and were nearby should we need them.

here was to assess whether the reefs around the northern and southern Miskito Cays are connected, not only to each other but also to the Mesoamerican

> Barrier Reef System (MBRS). The MBRS stretches all the way from the Yucatán Peninsula in Mexico apparently ending at the Bay Islands in Honduras. If data collected during the survey could show that the Miskito Reefs were connected to the MBRS. this boundary could effectively be extended by about 400km. Interestingly, casual observations during the expedition suggested the northern group of cays may well be connected, whereas the southern group showed a

TOP TO BOTTOM: Shoal of blue tang; Christmas tree worms; Hermit crab

number of striking similarities with more isolated reefs found further to the south around Panama.

Some of the reefs around the southern group of cays, at least the ones we dived, were markedly different from those in the north in that they adhered more to classic 'spur and groove' formations rather than massive boulders and towering pinnacles.

Reef fish abundance also appeared slightly higher, although some species such as grouper were still noticeably absent—not surprising, as they are a valuable fisheries taraet. Another noticeable aspect of these southern reefs were the sheer number of different species crammed into relatively small areas. Although this was evident on the reefs to the north, as it generally is in any coral reef community, some of the reefs here appeared particularly muddled and chaotic.

In comparison to their Indo Pacific counterparts, which, to me, appear neat, tidy and somewhat well-organised, many Caribbean reefs looked like they had been haphazardly thrown together by a madman. Diversity of sponges on these southern reefs was particularly striking with numerous forms and colours covering many of the Montastraea colonies in a tangled profusion of bright purple, yellow and red, often stretching out into the water column like ancient wizened fingers.

Closer inspection on these southern reefs, and most in the north, revealed the usual array of Caribbean macro species. Exquisite feather duster worms gently swaying in the current, yellowline bobies

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skimming over star corals, purple tipped tentacles of giant anemones protruding from crevices, clumps of neon blue and orange tunicates, tiny, elusive and rather alien looking solitary gorgonian hydroids,



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Following a quick call via satellite

phone to his office in the Honduran

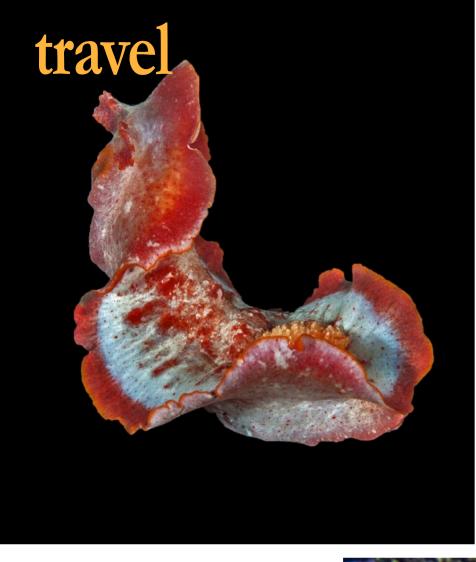
tion of our crew who were becoming

go much further due to security con-

cerns, we were fortunate that one of

our team worked for the U.S. Embassy.

more anxious by the day. Reluctant to



Spanish dancer nudibranch Stoplight parrotfish cleaned by juvenile bluehead wrasse; Sea lettuce nudibranch (lower right)

mon sight on most Caribbean reefs, but others are a little more enigmatic, and in many locations, either completely absent or just downright rare.

Two of the largest and most strikingly beautiful parrotfish species are the midniaht and the rainbow, which fall into this category. I had seen one or two midnights before, but only occasionally and only ever at one dive site on an island about 400km northwest. I had never seen a rainbow parrotfish. Imagine my surprise then as I

was suddenly faced with a roving shoal of 60-70 midnight parrotfish, with a number of juvenile rainbows amongst them, swooping over the reef like a cloak of black, iridescent blue and green.

Undeterred by my presence, the fish were feeding voraciously, scraping algae from rocks and coral heads, circling an area again and again to ensure all food was consumed. This is what makes parrotfish so crucial on coral reefs. In sufficient numbers they can keep large areas of reef clear of algae opening up crucial settlement space for new corals. Without these keystone species, many reefs quickly become overwhelmed by algae, which soon replaces corals as the dominant species—a process known as a phase shift, and one which is very difficult to reverse.

Large shoals of midnight parrotfish were seen on at least three dives.



Redband parrotfish cleaned by juvenile bluehead wrasse

them was initially fairly exhausting. I soon realised trying to chase them over the reef was futile and so attempted something a little more strategic.

On each encounter, the fish seemed to circle the area a number of times.

After watching

encounter, the fish seemed to circle the area a number of times. After watching them at a distance for a few minutes, I would choose a suitable position and lie in wait, trying

Photographing

to minimise my breathing to reduce bubbles and hoping they would swim toward me. This ambush technique worked with limited success, as the fish would invariably detect me from a distance and usually swim the other way. As ever, the visibility wasn't great, but I managed a few acceptable images.

Sea urchins

Another encouraging sign that the reefs here may have slightly higher resilience than those elsewhere in the region with potential to sustain themselves, were higher than average numbers of longspined sea urchins (*Diadema antillarum*).

With a function similar to parrotfish these urchins are, or rather were, an important herbivore throughout the Caribbean, freeing up critical settlement space for new corals by consuming algae. In 1983, however, the species declined by over 97 percent across the



Miskito Cays

entire Caribbean due to an unidentified pathogen. The consequences in some areas were devastating, as large areas of

when in large numbers.

column.

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and the highly appropriately named lettuce sea slug, to mention but a few. A number of docile nurse sharks were

also seen and, a real treat for me, were

branchs I had not seen before: a purple-

the discovery of two spectacular nudi-

spotted sea goddess and a Spanish

dancer, the latter of which provided

some great photo opportunities, as it

Caribbean parroffish

twisted and gyrated through the water

Although general reef fish diversity was

not strikingly different to reefs in other

were some unusual and encouraging

spent some time studying Caribbean

parrotfish and their role in maintaining

healthy reefs, I'm always on the lookout

Some species, such as the small and

unassuming striped parrotfish, are a com-

for this charismatic species, particularly

areas of the Western Caribbean, there

encounters on a few of the dives. Having

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CLOCKWISE FROM RIGHT: Researcher on Becerros Cay ground-truthing satellite imagery with dive boat in the background; Magnificent frigatebirds roosting on low branches and coming in to land: Extensive roots of mangroves; Forest clearing on Becerros Cay





coral reef were auickly overgrown by persistent mats of algae.

Although still not recovered to anything like their pre-1983 numbers, some recent reports have described a number of local recoveries and signs of associated regeneration of coral reefs. It is possible some of the Miskito reefs could be included.

Stinky Cay

During another brief respite from

diving. I had the opportunity to join the terrestrial team on an exploratory excursion to one of the cays. Appropriately named Stinky Cay by the locals, the tiny island was a thin strip of sand and low-level vegetation teeming with seabirds. Magnificent frigatebirds accounted for most of these but there were also a number of brown boobies and masked boobies most of which were nesting on the ground.

On the beach, the decrepit remains of an old fishermen's hut provided a perch for a few frigates while the rest sat on nests or branches among the mangroves at the wider end of the cay. It was nesting season, so the majority of birds were tending their young, which sat, dinosaur-like waiting for their next meal.

Frigates, at least when they reach adulthood (the chicks aren't the most attractive lookina creatures), are majestic birds, appearing almost spectre-like, as they circle above scouting

for suitable prey. Although commonly using their large talons and hooked beaks to catch fish by skimming the surface of the water, they are also piratical in nature, frequently harassing other birds forcing them to regurgitate their stomach contents, which



they then catch and consume as it falls. Having the opportunity to walk among this colony with my camera and experience the sights, sounds and smells was a rare treat and an absolute pleas-



This was hopefully the first in a series of expeditions to the Honduran Miskito Cays. Surveys will need to be repeated throughout the year in order to build up a solid picture of the past and current condition of the area's ecosystems as well as to identify critical habitats, nursery grounds and other ecologically important areas. This information is crucial if we are to assist the Miskito

Communities in achieving their goal of establishing a solid management strategy to protect their fisheries from continued exploitation and their fishermen from further harm.

George Stoyle is a marine ecoloaist, coral reef researcher and underwater photographer based in the United Kingdom. For more information, visit: Earthinfocus.com





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fact file

Miskito Cays, Honduras



SOURCES: U.S. CIA WORLD FACTBOOK, XE.COM,

1 WIKIPFDIA.ORG

History Named for the Miskito Indians who live in the region, the Miskito Cays are found on the Caribbean Mosquito Coast (or Miskito Coast), which historically comprised an area on the east coast of today's Honduras and Nicaraaua. Lona dominated by British interests, it wasn't until in 1894 that the Mosquito Coast was incorporated into Nicaragua. Finally, in 1960, the northern part was granted to Honduras by the International Court of Justice.1 Honduras was itself part of the vast Spanish empire in the New World, and finally gained its independence in 1821. It wasn't until 1982 that there was a freely elected aovernment following over 20 years of military rule. The country experienced conflict in the 80's, as anti-Sandinista contras fighting the Marxist government in Nicaragua used Honduras



as a safe haven. Honduras was also allied with the Salvadoran government against leftist guerrillas. In the late 90's, Hurrican Mitch hit Honduras causing vast devastation and killing 5,600 people. The Honduras economy has made a slow recovery since then. Government: Democratic constitutional republic. Capital: Teguciaalpa

Geography Honduras is located in Central America. On the east side, it borders the Caribbean Sea, between Guatemala and Nicaraaua. On the west side, it borders the Gulf of Fonseca, leading to the North Pacific Ocean, between El Salvador and Nicaragua. Terrain is comprised of narrow coastal plains, with mountains in the interior. Coastline: Caribbean Sea 669km; Gulf of Fonseca 163km. Lowest point: Caribbean Sea 0m. Highest point: Cerro Las Minas 2,870m.

Climate Lowlands are subtropical while mountainous areas have a temperate climate. Natural hazards include earthquakes that are frequent but mild, for the most part, as well as hurricanes and floods on the Caribbean coast.

Environmental issues Challenges stem from the expansion of urban population; logging and

RIGHT: Location of Honduras on global map. BELOW: Location of Miskito Cays on map of Honduras

clearing of land for agriculture result in deforestation; uncontrolled development and farming of marginal lands further degrade the land and erode the soil; mining operations are polluting the country's largest freshwater source, Lago de Yojoa, and many rivers and streams, with heavy metals

Economy With 65% of its population living in poverty, Honduras is one of the poorest countries in Latin America. It also has the highest murder rate in the world. Rural and indigenous people in the south, west, and along the eastern border suffer higher poverty rates than those in the north and central areas, where the majority of the country's infrastructure and industries are based. Education, while enjoying nearly 100 percent enrollment, is poor in quality, and hence, slow to improve the situation for the poor. Unequal distribution of income is extreme, and there is high underemployment. Honduras has diversified its export base beyond coffee and bananas to include automobile wire harnessing and apparel. Almost half of the country's economic activity is tied directly to the United States. In 2006, the U.S.-Central America-Dominican Republic Free Trade Agreement (CAFTA-DR) came into effect helping to foster

foreign direct investment. However, political and physical insecurity, crime and the perception of corruption, may scare off potential investors. Modest economic growth from 2010 to 2012 was not enough to improve living standards of a majority of the country's poor. A growing budget deficit, weak current account performance, unpaid salaries of public sector workers, and

several hundred million in unpaid contracts to suppliers continue to plague the government.

Currency Honduran lempiras (HNL). Exchange rates: 1EUR=27.25HNL, 1USD=20HNL, 1GBP=32.80HNL, 1AUD=17.87HNL, 1SGD=15.74HNL

Population 8,448,465 (July 2013 est.) Ethnic groups: Tmestizo (Amerindian and European mix)

in the nest (right and bottom left), Miskito Cays, Honduras

Frigatebird chicks

90%, Amerindian 7%, black 2%, white 1%. Religions: Roman Catholic 97%, Protestant 3%. Internet users: 731,700 (2009)

Language Spanish is the official language, plus there are Amerindian diaects

SWAN ISLANDS Caribbean Sea ISLAS DE LA BAHIA **₽**Guanaja Puerto Roatán Cortes Utila Puerto San Tela La GUAT. Castilla Ceiba Santa Rosa Pedro de Copán Sula Comayagua MISKITO CAYS Cerro Las • TEGUCIGALPA 0 San Danlí EL SALVADOR Lorenzo Choluteca **NICARAGUA** Golfo de 🔥 Fonseca **NORTH PACIFIC OCEAN**

Decompression chamber

Roatán has the closest chamber at Anthony's Cay Resort. There are also chambers at the main hospitals in La Ceiba, San Pedro Sula and Tegucigalpa.

Travel/Visa

Free tourist visa granted on entry for 90 days. Renewable for a further 90 days in country. There is a US\$40 departure tax paid in cash on exit.

Health

Travellers should talk with a doctor for latest inoculation recommendations and anti-malaria advice.

Miskito Cays area

At the moment, the area has not established any tourism diving, so no stated limits are in place. In the Miskitia itself, there are no dive facilities, so

guests go by liveabord from the Bay Islands. When the area is zoned for Miskitu use, authorities may charge a user fee for divers, as a way of generating revenue, and then specify dive sites and other things as part of their marine spatial plan, but that is a way off.

Websites

Honduras Tourism

www.letsgohonduras.com

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