

Regional Profile: Indonesia

Bird's Head Seascape

2001 – 2009



Summary of Bird's Head Seascape, Indonesia MarineRAP results

Over the past decade, CI conducted a series of three ground-breaking MarineRAP surveys in the Bird's Head Seascape (BHS) of Indonesia, including the Raja Ampat MarineRAP (March-April 2001; McKenna and Rylands 2001; McKenna et al. 2002), Teluk Cenderawasih MarineRAP (February 2006), and the Fakfak-Kaimana Coastline MarineRAP (April-May 2006). These surveys, augmented by a Raja Ampat rapid ecological assessment by partner The Nature Conservancy in November 2002 and five follow-up reef fish surveys across the BHS between 2007-2009, have shown conclusively that this area ranks as a top global priority for marine conservation and served as a catalyst to initiate one of CI's largest marine investments to date.

Biodiversity Results

Taken together, the results of these surveys clearly indicate that the Bird's Head Seascape sits at the global epicenter of known shallow-water marine biodiversity. In synthesizing the survey results, Allen and Erdmann (2009) record a total of 1,511 species of BHS coral reef fish from 451 genera and 111 families (that total has now risen to over 1,600 species!) – easily the highest diversity ever recorded for an area of this size. Similarly, in their comprehensive delineation of the Coral Triangle region, Veron et al. (2009) highlight the BHS as the only coral ecoregion in the world to reach nearly 600 hard coral species – approximately 75% of the global coral species complement.

These MarineRAP surveys also revealed an area of incredible endemism – otherwise considered rare in the marine realm. Approximately 40 new coral species were discovered on the BHS RAP surveys, most of which appear endemic to the seascape. Of the world record 57 species of stomatopod crustaceans recorded during the RAP surveys, 11 are new and eight of these appear endemic to the BHS. Among reef fishes, the BHS is home to at least 31 endemic species, 29 of which were discovered during these surveys and have now been described (Table 1).

The walking shark “Kalabia” (*Hemiscyllium galei*),
an international media celebrity!



Endemic goby (*Calumia papuensis*)



Endemic jawfish (*Opistognathus rufolineatus*)





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Endemic tilefish (*Hoplolatilus erdmanni*)

Table 1: New Reef Fish Species described from CI's Bird's Head MarineRAP and related surveys

Raja Ampat	<i>Apogon leptofasciatus</i> Allen, 2001
	<i>Apogon oxygrammus</i> Allen, 2001
	<i>Chromis athena</i> Allen & Erdmann, 2008
	<i>Chrysiptera arnaza</i> Allen, Erdmann & Barber, 2010
	<i>Diancistrus niger</i> Schwarzhans, Moller & Nielsen, 2005
	<i>Eviota raja</i> Allen, 2001
	<i>Pentapodus numberii</i> Allen & Erdmann, 2009
	<i>Pseudochromis</i> sp.n. Gill, Allen & Erdmann, in press
	<i>Pseudochromis matahari</i> Gill, Allen & Erdmann, 2009
Teluk Cenderawasih	<i>Calumia eilperini</i> Allen & Erdmann, 2010
	<i>Calumia papuensis</i> Allen & Erdmann, 2010
	<i>Chromis unipa</i> Allen & Erdmann, 2009
	<i>Cirrhilabrus cenderawasih</i> Allen & Erdmann, 2006
	<i>Hemiscyllium galei</i> Allen & Erdmann, 2008
	<i>Paracheilinus walton</i> Allen & Erdmann, 2006
	<i>Pictichromis caitinae</i> Allen, Gill & Erdmann, 2008
	<i>Pseudanthias charlenae</i> Allen & Erdmann, 2008
	<i>Pterocaesio monikae</i> Allen & Erdmann, 2008
	<i>Pterois andover</i> Allen & Erdmann, 2008
Fak Fak – Kaimana Coastline	<i>Chrysiptera giti</i> Allen & Erdmann, 2008
	<i>Corythoichthys benedetto</i> Allen & Erdmann, 2008
	<i>Hemiscyllium henryi</i> Allen & Erdmann, 2008
	<i>Heteroconger mercyae</i> Allen & Erdmann, 2009
	<i>Hoplolatilus erdmanni</i> Allen, 2007
	<i>Manonichthys jamali</i> Allen & Erdmann, 2007
	<i>Opistognathus rufilineatus</i> Smith-Vaniz & Allen, 2007
	<i>Paracheilinus nursalim</i> Allen & Erdmann, 2008
	<i>Pomacentrus fakfakensis</i> Allen & Erdmann, 2008
	<i>Pseudochromis jace</i> Allen, Gill & Erdmann, 2008

Conservation Impacts

While the MarineRAP surveys certainly succeeded in revealing the tremendous marine biodiversity of the Bird's Head Seascape, their overall conservation impacts in the region have far surpassed simple species lists, and they continue to play a catalytic role to this day.

As a direct result of the BHS RAP surveys, a total of seven new MPAs totaling over 1.7 million hectares in area were gazetted (six in Raja Ampat and one in Kaimana). Combined with existing MPAs in the seascape, the BHS now boasts a network of 10 MPAs nearly 3.6 million hectares in total area – over one-third of the entire Indonesian national MPA system. Importantly, the Cenderawasih RAP survey also resulted in a significant increase in annual budget allocation to Teluk Cendrawasih National Park and reinvigorated park rangers with a new sense of pride in their work.

Even today, as the individual MPAs in the BHS network strive to complete their management and zonation plans, data from the BHS RAP surveys continue to be a primary driver – especially information on habitat type distribution, location of spawning aggregation sites and turtle nesting beaches, and genetic connectivity between reefs. A comprehensive analysis of coral community types conducted using the data collected from the three BHS RAP surveys has provided a clear blueprint for designing an overall zonation system for the MPA network which prioritizes representation of all community types in strict protection zones.

Positive publicity from the BHS RAP surveys (which were covered in hundreds of newspapers, magazines and TV news programs around the world and reached an estimated 50 million people in the US alone) produced a dramatic increase in the awareness and pride of community members and local and national governments of the unique natural heritage in the Bird's Head. This in turn has ensured that BHS MPAs are prioritized in spatial plans and annual governmental budget allocations.

This widespread publicity was also a key factor in the success of the “Blue Auction”, wherein the naming rights to 10 new fish species discovered during the BHS RAP surveys were auctioned off in a charity auction in Monaco. The auction, hosted by Prince Albert of Monaco, raised just over \$2 million in funding for three priority marine conservation programs in the Bird's Head.

The media buzz created by the BHS RAP surveys was also responsible for launching the rapid expansion of marine tourism in the seascape. Prior to the 2001 Raja Ampat MarineRAP survey, less than 300 guests visited the seascape each year and were limited to a choice of one eco-resort and one live-aboard dive vessel; in 2010, Raja Ampat alone will host over 4000 guests and there are now six eco-resorts and at least 25 live-aboard dive vessels offering itineraries in the BHS (and hundreds of local jobs to coastal communities). Importantly, CI has helped local governments to devise a tourism entrance fee system which now collects approximately \$200,000/year, proceeds of which fund an urgently-needed healthcare program for pregnant and nursing mothers in Raja Ampat.



Marine conservation education vessel *MV Kalabia* also funded by the “Blue Auction”



Children learning on board *MV Kalabia*



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High fish biomass in the Bird's Head Seascape

Data from the BHS RAP surveys have also been used in developing national and regional policies. In late 2009, Indonesia's Ministry of Marine Affairs and Fisheries asked CI to lead a national process to define geographic priorities for marine biodiversity conservation. Using data from the BHS RAP surveys and other similar assessments conducted across the Indonesian archipelago, an expert team of 20 marine taxonomists concluded that the BHS is the number one priority region nationally for marine conservation investment by the government. These prioritization results are now directly influencing both national budget allocations and investments by international development assistance programs including those in the six-country, multi-donor Coral Triangle Initiative.

Taken in total, the influence of these three strategic MarineRAP surveys in the Bird's Head has far surpassed expectations, leading directly to development of the largest MPA network in Indonesia and a conservation investment in the BHS of nearly \$25 million over the past 9 years by a wide range of donors. Based on this experience, CI-Indonesia adheres strictly to the principle that any proposed expansion of our work in other

areas of Indonesia must begin with a properly-conducted MarineRAP survey as the basis of all future conservation investment in that area.

Literature Cited

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Contributed by Mark Erdmann

Indonesia

Raja Ampat Islands, Bird's Head Seascape
March 27 – April 10, 2001



Coleman shrimp (*Periclimenes colemani*)



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Located near the heart of the Coral Triangle – the richest area of coral reefs on Earth – the Raja Ampat Islands’ diverse array of marine life, coupled with striking island scenery, make it one of the world’s most spectacular tropical wildlife areas. The Archipelago lies west of Papua Province, Indonesia and is surrounded by approximately 4,000,000 hectares of sea. The Raja Ampat Islands are composed of four main islands (Misool, Salawati, Batanta, and Waigeo) and hundreds of smaller islands, cays, and shoals. The population consists of just under 49,000 residents, most of Papuan origin, inhabiting 89 villages, with about seven people per km². The survey area covered approximately 600,000 ha, encompassing reefs of the Dampier Strait between northern Batanta and Waigeo. The survey was implemented by Conservation International in collaboration with the University of Cenderawasih and the Research and Development Center for Oceanology, a branch of the Indonesian Institute of Sciences.

The main objectives of the survey were: 1) to document local marine biodiversity of the three selected indicator taxa of mollusks, hard corals and coral reef fishes, 2) to assess the condition of coral reefs, 3) to take an initial snapshot of the existing level of fisheries exploitation and 4) to assess the importance of marine resources to the economic livelihood and general well-being of local

villagers. The purpose in collecting such data was to guide regional planning, marine conservation, and the use of sustainable marine resources. Forty-five different MarineRAP biodiversity survey sites were reached by motor boats, operating from base camps at Kri Island and Alyui Bay. For the socioeconomic component of the survey, the MarineRAP team visited 22 villages and sought input from about 7,700 people. These villages ranged in size from Arborek with just 98 people, to Fam with 785 inhabitants.

The MarineRAP survey results indicated an extraordinary marine fauna. Totals for the three major indicator groups surpassed those for all previous MarineRAP surveys at that time in Indonesia, Papua New Guinea, and the Philippines. Researchers identified 456 species of hard corals, more than half the world’s total. For mollusks, a total of 699 species were recorded during the survey. Among reef fish, 828 species, including four species never before recorded by science, were documented raising the total known from the area to 972 species. Reefs were generally in very good condition compared to most areas of Indonesia, with high live coral diversity and minimal stress due to natural phenomenon such as cyclones, predation and freshwater runoff. Almost every village in the area complained about the use of explosives for fishing by outsiders (i.e., non-villagers) and explosive

damage was noted at 13.3% of the survey sites. Illegal logging (in designated nature reserve areas) that can lead to heavy siltation stress and ultimately death for the delicate coral reefs was also noted.

More than 90% of the adult population of this area is engaged in sustenance-level fishing. At most villages there is relatively little commercial activity, although some people collect sea cucumbers (relatives of starfish) that are sold to merchants in Sorong, the nearest large population center on the mainland. Fishers from at least seven villages were found to be using chemicals containing cyanide to catch Napoleon Wrasse and large groupers. Many villagers expressed concern about various illegal fishing methods. There was a scarcity of large groupers, Maori or Napoleon Wrasse, and sharks observed during the survey. This represents a potential consequence of being targeted by illegal fishers, either for the lucrative live fish trade or for food.

Although much of the area is already gazetted as a wildlife reserve, there is no real enforcement of conservation laws as evidenced by the illegal logging and destructive fishing practices. There is an urgent need for marine and terrestrial conservation action. Several sites were identified as deserving of special attention and included Cape Kri, Kri Island, Gam-Waigeo Passage, Majalibit Passage and the adjacent Majalibit Bay Pam Islands, Equator Islands, Saripa Bay and Wayag Islands. Further recommendations were for more RAP surveys, both terrestrial and marine, such as those that subsequently took place in 2006 (see MarineRAP profiles of Fakfak-Kaimana and Teluk-Cenderawasih Bay). The results of the Raja Ampat survey catalyzed local communities, the government, and non-governmental organizations to develop a strategic conservation plan for the region. Conservation work in the region grew from that point onward to form the multi-national Coral Triangle Initiative, a new multilateral partnership to safeguard the region's extraordinary marine and coastal biological resources.

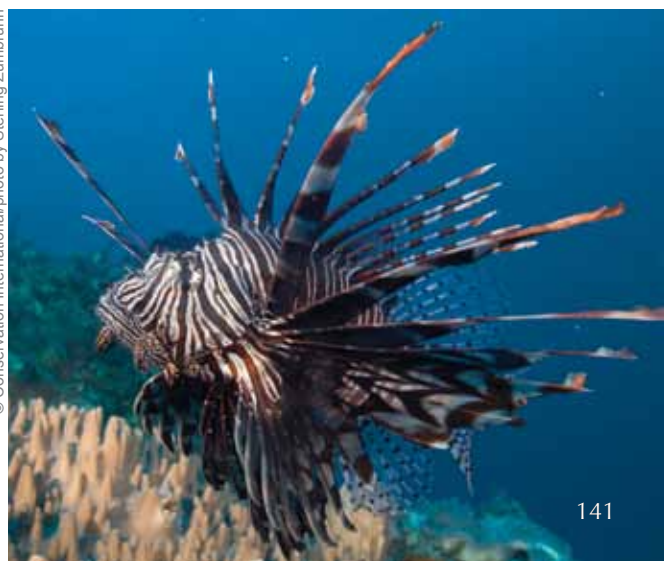
Contributed by Sheila A. McKenna, Gerry Allen, and Suer Suryadi



Wayag Islands



Mayalibit Village



Lionfish (*Pterois* sp.)

Indonesia

Teluk Cenderawasih National Park, Bird's Head Seascape
February 9 – 26, 2006



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Coral (*Anacropora dendracis*)

© Emre Turak



© Graham Abbott

Healthy coral reefs of Cenderawasih Bay

Situated in the far eastern reaches of the Bird's Head Seascape in West Papua, Indonesia, Teluk Cenderawasih is a large bay of nearly 5,000,000 hectares which reaches depths of almost 2,000 meters in its center. The mouth of the bay is nearly blocked off by the reef-fringed islands of Yapen, Biak and Numfor, while the inner bay has a multitude of small islands, atolls and fringing reefs which are protected by nearly pristine watersheds. Teluk Cenderawasih National Park is Indonesia's largest marine national park at just over 1,500,000 hectares in size.

This MarineRAP survey had five main objectives: 1) assess the current conservation status (including reef condition and biodiversity values) of Cenderawasih National Park; 2) identify areas of outstanding conservation importance (due to the presence of endemic or globally threatened species, fish spawning aggregation sites, turtle nesting beaches, etc.) to inform the park's zonation process; 3) conduct socioeconomic and fisheries surveys of coastal villages to identify conservation threats and opportunities arising from local attitudes and practices; 4) assess the potential for the development of marine tourism in the park; and 5) estimate levels of ecological and genetic connectivity between the reefs of Cenderawasih and those in Raja Ampat and Kaimana to inform seascape-level management strategies.

The MarineRAP survey team assessed 33 sites over the course of an 850 nautical mile route covering most of Cenderawasih Bay, with over 450 man-hours recorded underwater. While the team's findings confirmed that Cenderawasih is an area of extremely high biodiversity, no one predicted the spectacular levels of endemism that were revealed in the bay's marine populations. Of the nearly 500 hard coral species recorded, 22 are undescribed and apparently endemic to the bay! Likewise, five of the 37 stomatopod crustacean species collected were new and found nowhere else, while at least eight of the 716 reef fishes recorded were also new and endemic, including a charismatic species of *Hemiscyllium* "walking" shark. Moreover, at least a dozen species of reef fish displayed color patterns unique to populations in the bay, adding further evidence of past oceanographic isolation of the bay. Population genetic analyses of over 50 different species of marine organisms further elucidated this pattern of repeated isolation of the bay over the past 14 million years; this evidence, combined with tectonic reconstructions of the area, helped the team to hypothesize a rare case of a marine "species factory" within the bay.

Perhaps just as importantly, the survey revealed that the reefs of the national park were generally in very healthy condition (>47% average live coral cover on the reef crest), with excellent recovery

from previous blast-fishing damage and rebuilding stocks of large reef fishes including groupers and sharks. Socioeconomic surveys in 18 coastal villages revealed strong conservation awareness and support for the national park – a tribute to the dedicated ranger staff working in this remote area. Incidence of blast and cyanide fishing was greatly reduced from what had been recorded a decade previous.

Based upon the striking levels of endemism exhibited in the bay, the generally excellent condition of the reefs and the impressive community support for conservation, the team strongly recommended that Cenderawasih National Park receive much higher priority by the Indonesian government in terms of funding and community engagement programs. Two fish spawning aggregation sites were recommended for inclusion in no-take zones, while steep coastal forests were slated for inclusion in a buffer zone to protect the fragile watersheds in the bay. Finally, the team recommended that the provincial government immediately prioritize development of well-managed, sustainable marine tourism as well as pushing the University of Papua to initiate active marine biological research in the bay. A number of these recommendations have recently been put in to practice (see Indonesia Regional Summary).

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Cenderawasih fairy wrasse (*Cirrhilabrus cenderawasih*)



Healthy coral reef of Cenderawasih Bay

Cenderawasih walking shark (*Hemiscyllium galei*)



Indonesia

Fakfak-Kaimana Coastline, Bird's Head Seascape
April 18 – May 7, 2006



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Rounding out the trio of Bird's Head Seascape MarineRAP surveys, this survey covered the topographically complex southern coastline of West Papua province from Fakfak to Kaimana regencies, including the Bomberai Peninsula and Triton Bay.

As with Cenderawasih Bay, this MarineRAP survey had five main objectives: 1) assess the reef condition, fish biomass and marine biodiversity values of the southern Bird's Head Seascape; 2) identify any areas of outstanding marine conservation importance that should be prioritized for inclusion in marine protected areas (MPAs); 3) conduct socioeconomic and fisheries surveys of coastal villages to identify conservation threats and opportunities arising from local attitudes and practices; 4) assess the potential for the development of marine tourism in the region; and 5) estimate levels of ecological and genetic connectivity between the reefs of the southern Bird's Head and those in Raja Ampat and Cenderawasih to inform seascape-level management strategies.

The MarineRAP survey visited 39 sites over an 1,300 km route, with over 550 man hours underwater recorded. The first half of the survey covered the stunning reefs of Fakfak and the Bomberai Peninsula, revealing excellent hard coral cover (particularly in Sebakor Bay) and a host of new coral species (up to 16, most of which are con-

sidered endemic). Three of these sites contained world-record coral diversity, with over 250 coral species recorded at each site.

As the survey entered the waters of Kaimana Regency and Triton Bay, the tremendous influx of freshwater from large coastal river systems led to a dramatic shift in reef communities. Hard corals became few and far between, while stunning soft coral gardens replaced them. Reef fish diversity, apparently enhanced by the presence of extensive soft bottom habitats in immediate proximity to the reefs, skyrocketed; a world record 330 fish species were recorded at a single survey site at Tanjung Papisol! The team was amazed at the diversity and abundance of normally rare fish species like tilefishes, jawfishes and garden eels. At least ten new fish species were uncovered, as well as three new stomatopod mantis shrimp species.

The reefs around Kaimana were not only diverse, they were thick with at least 232 different species of economically important reef food fish including groupers and snappers: the team recorded the highest reef fish biomasses of anywhere previously surveyed in SE Asia, averaging 228 tons/km². Perhaps taking advantage of this abundance, a unique resident population of Bryde's whales (*Balaenoptera brydei*) was also uncovered in the area, as well as a hammerhead shark (*Sphyrna lewini*) pupping ground in Triton Bay.

Unfortunately, the team also determined that local communities lacked the conservation awareness seen elsewhere in the Bird's Head, with shark-finning and turtle poaching (eggs and adults) rampant throughout the region. On the bright side, the local government was extremely enthusiastic about the MarineRAP survey findings and keen to both develop a new MPA and marine tourism in the area.

The team highlighted three areas of extreme conservation value for possible gazettelement in new MPAs, including Sebakor Bay (due to its stunning and endemic coral gardens), Tanjung Papisol (outstanding reef fish biodiversity and near pristine coastal watersheds), and Triton Bay (unique soft-coral dominated reefs with extremely high fish biomass and resident Bryde's whale population). They also recommended that the local and national government immediately institute a turtle nest-guarding program on the highly endangered nesting beaches in Pulau Venu Nature Reserve. Finally, the team highlighted the strong potential for marine tourism development in the southern Bird's Head as a potential source of sustainable income for local coastal communities. For an update on the follow-through with the recommendations of this and the other two Bird's Head Seascape MarineRAP surveys, see the Indonesia Regional Summary on page 272.

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Mantis shrimp (*Busquilla plantae*)



Endemic tilefish (*Hoplolatilus erdmanni*)

Kaimana fish

