Tributes to Bob Johannes

The people of Palau formally pay tribute to Bob and extend their condolences to his family.

SIXTH OLBIIL ERA KELULAU

Eight Regular Session, October 2002 **House Joint Res. No. 6-49-8**

A HOUSE JOINT RESOLUTION

To express condolences and sympathy to the family and relatives of the late Dr. Robert E. Johannes.

WHEREAS, Robert "Bob" E. Johannes earned his Bachelor of Science in Zoology and his Master of Science in Fisheries at the University of British Columbia, Canada and his Doctor of Philosophy (Ph.D.) in Marine Biology from the University of Hawaii, and

WHEREAS, Dr. Johannes was the recipient of a number of prestigious awards, including a Guggenheim Foundation Fellowship in 1974–1975, the CSIRO Medal in 1990, and a Pew Fellowship in 1993, and

WHEREAS, Dr. Johannes was already a world renowned marine scientist, one of the pioneers of marine microbial ecology and a leader in tropical marine ecology, before recognizing and advocating the critical importance of indigenous ecological knowledge and community-based management systems to marine conservation, and

WHEREAS, his pioneering study highlighted the value of traditional marine knowledge and was undertaken with Ngiraklang Malsol in Ngeremlengui in the mid-1970s, with the subsequent publication of the "Words of the Lagoon: Fishing and Marine Lore in the Palau District of Micronesia" and a number of technical publications, and

WHEREAS, this work bestowed international recognition and status on Palau and Palauan fishermen, and raised awareness within Palau of our conservation ethic and the importance of retaining and applying traditional knowledge, and

WHEREAS, Dr. Johannes continued to assist Palau with the management of our marine resources, contributing to the development of the "Marine Protection Act of 1994", and leading a collaborative study of grouper aggregation sites in Ngarchelong and Koror States, which led to the establishment of Ebiil as a protected area and increased protection at Ngerumekaol, and

WHEREAS, in 1989 Dr. Johannes nominated Palau to CEDAM International's list of the Seven Underwater Wonders of the World to draw international attention to Palau's highly diverse but vulnerable marine biodiversity, and

WHEREAS, in recent years he had concerns with this celebrated listing, and warned that while it has increased Palau's appeal as a diving destination, the rapidly increasing tourism has also had impacts on Palau's marine environment and culture, and

WHEREAS, Dr. Johannes had many true friends and admirers in Palau, and they are very saddened by his passing away on September 4, 2002; Now, therefore

BE IT RESOLVED, by the House of Delegates of the Sixth Olbiil Era Kelulau, the Senate concurring, that the Sixth Olbiil Era Kelulau, on behalf of the people of the Republic of Palau, hereby extends its condolences and sympathies to Dr. Robert E. Johannes' wife, Christa, his son Greg, and other relatives during their time of grief, with the hope and prayer that the Almighty God will console them and grant unto Dr. Robert Johannes the abundance of His merciful love; and

BE IT FURTHER RESOLVED, certified copies of this Resolution be transmitted to the family of Dr. Robert E. Johannes, his wife Christa and son Greg; the family of Ngiraklang Malsol, Lucius "Lakius" Malsol; the Honorable Tommy E. Remengesau, Jr., President of the Republic of Palau; John B. Skebong, Governor of Ngeremlengui State; John C. Gibbons, Governor of Koror State; Browny Salvador, Governor of Ngarchelong State; Palau Conservation Society; Pew Charitable Trust; South Pacific Regional Environment Programme; Forum Fisheries Agency; the Secretariat of the Pacific Community; The Nature Conservancy; the Speaker of the House of Delegates and the President of the Senate of the Sixth Olbiil Era Kelulau.

ADOPTED: October 31, 2002

AS CERTIFIED AND ATTESTED TO BY:

Mario S. Gulibert, Speaker
House of Delegates

Seit Andres, President
The Senate

Yusim Sato, Clerk
House of Delegates

Feliciano S. Watanabe, Clerk
The Senate

In memory of Bob Johannes:

Eulogy at the Pew Marine Conservation Fellows' Annual Meeting, dedicated to him.

Bonaire, Netherlands Antilles 20 October 2002

The knowledge that Bob had died came as a terrible shock to me, as to so many others. He was an extraordinary man and a remarkable scientist, whose influence reached into many domains. He was also very generous with his time and energies.

My friendship with Bob grew mostly from long discussions that ranged from the practical to the philosophical and back again. I gained courage from his example of determined and energetic thinking. He crossed disciplinary boundaries and stuck his neck out for conservation. He saw merit in highly technical models but was never in awe of them, repeatedly insisting that the fishers and their knowledge were the keys to successful fisheries management. He was generous and realistic and modest. His passions were real, and he allowed them to show.

I am often sad that obituaries focus on the person's achievements later in life when I want to know about their early life, and what made them so. In the flurry of emails that followed Bob's death, I got to know the young Bob a little. In junior school, for example, Bob was the Absolute School Marble Champion. In high school, he excelled at sports, but never went to team tryouts because he was busy looking after a very complicated fishpond he had built in his garden, complete with running water. When he was an undergraduate at the University of British Columbia, Bob, filling himself up with chocolate bars, rowed a boat 30 miles as the escort for a friend who had decided to swim the Strait of Juan de Fuca. And, in a harbinger of things to come, Bob once dragged the same friend off a beach, where she was happily lounging in the sun, and took her to his house to see a new fish he had just acquired for his aquarium. As she put it, perhaps somewhat wryly, "his enthusiasm for fish was contagious".

Indeed his enthusiasm for fish never wavered. Bob established credentials in a great many different areas of ecology, and ended up as he began, keen on fish. He was one of the pioneers in microbial ecology, before beginning what one friend and colleague called "sudden and often daring changes of direction in life."

I recently sat down to re-read some of his publications and was struck again by his many different roles, apparently disparate but actually tightly linked in space and time. For example, his interest in reef fish spawning aggregations was closely related to his awareness of Pacific Islanders' traditional prohibition

from fishing on these groups. It was also what led him to pursue his seminal study on the use of cyanide to catch fish, primarily groupers, for the live reef fish trade.

At the same time as he was forging new understandings of marine conservation issues, Bob knew how to enjoy life, to the extent that one friend claimed "working with Bob was always a continuous, globe-trotting party."

Many different plans are afoot to commemorate Bob's life. Along with a wide range of other tributes, his friends and colleagues are hoping to start a scholarship fund in his name, to allow exchanges between Pacific Islanders and western-trained scientists, that they may learn from each other. And of course, our own Pew meeting is dedicated to Bob.

All these gestures are well enough but I suspect that Bob would be most delighted if I repeated the message that he sent so energetically in the last years of his life . . . As he put it in one paper: "Conventional biological training has focused our attention so single-mindedly on the rigorous quantitative description of marine resources before committing ourselves to managing them, that we are likely to feel guilty if we diverge from this track, and worse still, may even criticise others who do so. But when vital resources are rapidly degrading, as are coral reefs and other nearshore habitats around the world, we often have neither the time nor the resources for such data gathering. The choice is not between giving perfect or imperfect advice. It is between giving imperfect advice or none at all." He felt that we could not afford to wait, but must instead act.

One friend and colleague commented on Bob's career by saying that, "When the moment came to move on, Bob wasted no time in doing it." Well, the time came for Bob to move on again, this time out of our lives. We will miss him.

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A half-century of memories

Perhaps you will share in my memories of Bob that go back to 1954 when we met as undergraduate students who wanted to enjoy the fun of being "journalists" at the student newspaper at the University of British Columbia. We became friends.

That summer, in a fit of adolescent exuberance I suppose, I decided to swim across the Strait of Juan de Fuca — and Bob, filling himself up with chocolate bars, rowed the boat — it was a 22 mile stretch direct, and since we had to meet the tides, it was closer to 30 miles. It was an act of friendship.

He later lived for a short while at my parents' home when his parents moved to California before he had completed his BSc. One day I was enjoying a relaxed visit to the local beach. Suddenly Bob appeared, quite excited, please would I come immediately with him to look at his new fish. Yes, fish. And yes, of course, I pulled my clothes over the bathing suit and went with him to his house (I guess this was before he was living with us) to see a fish in his aquarium. His enthusiasm for fish was contagious.

After university, we lost touch for awhile, and when we remet we were on different wavelengths and I deeply regret that for a few years we were incommunicado. Then one day I was in the office of a colleague in anthropology, and there was a new book on his desk by Robert Earl Johannes — of course I knew it was dear Bob, and I wrote to him with some trepidation, would he forgive me for having forfeited a wonderful friendship because of some idiotic difference of opinion, my fault entirely, and I was so happy when he replied with enthusiasm that of course… We resumed a friendship, correspondence, visits between him and Chris and myself and Bill, and it was a great joy to be back into communication with him. I always felt toward him as a sibling, we had simply developed a platonic relationship on that basis and I cared deeply for him and for Chris. We were able to talk about all sorts of things, and as I recall limited by nothing except a different taste in music!

I have gone on at some length, but I found your various memories helpful to me, and I hope my memories of this dear friend, going back to our teenage years, will bring comfort to you.

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Life with an arboreal octopus chaser

As a child, being Bob Johannes' son meant a life of opportunity and adventure. By the age of 10 I'd dived on the coral reefs of Palau, Fiji, Hawaii and Western Australia. I'd lived in a remote island village where the locals still thought the waterfall was haunted, and pointed to an island in the middle of Kaneohe Bay when people asked me where my dad worked. And my bedrooms and backyards had been filled, from earliest memory, with aquariums and ponds and jars with tadpoles.

Of course, at the time I thought nothing of this. People asked me why I moved around so much and I said simply: "because my dad's a marine biologist."

When I think back I remember the oddest things about his approach to life in the seventies. I remember that he didn't drink beer or coffee and that people in "polite company" found this hard to accept. I remember the competitions we would have before my grandmother visited in which each of us was allowed to swear once a day, and any profanity uttered thereafter led to a five cent fine. And I remember once telling him that I wasn't afraid of diving with sharks because he would protect me, only to have him destroy my idealistic image by telling me that if the shark attacked he didn't think he'd be of much use.

I first became aware of his science in Palau. Before then, marine biology was just something Dad did on those weeks on end he spent away from home in mythical-sounding places like "Enewetak" and "Babeldaob".

Palau was an adventure from day one. No sooner had the plane literally bounced into the airport than he and my mother had purchased a small motorcycle and a dog and we were all travelling together down bumpy roads laced with stunning seashells. A few weeks later we had a zodiac and my mother managed to insert a spear tip into the pontoon as we motored along through the middle of nowhere with all our possessions on the way to Ngeremlengui. Twenty-five years later my father still swore that he had never been so angry with my mother in his life.

In Palau, Dad would spend hours and hours talking with village elders and then come running back to the house to tell us excitedly what he'd learned. The (still never verified) story of the arboreal octopus was always my favourite.

Or he'd go out spearfishing with the men of the village and when I asked him the inevitable child's question, "Who caught the most?" on his return, he'd push me behind his leg and whisper quietly that I shouldn't ask that question because it wasn't polite.

Or he and my mother would collect plant fronds and tie them together in a vaguely conical shape and call them a "Christmas tree" for a whiny five-year-old.

It would be 20 years before I would realize the significance of Dad's work while we were there. In between then, during the eighties and early nineties, I watched him work on issues ranging from the impact of fresh groundwater seepage on coastal zones in Perth to dioxin levels associated with pulp mills. But his greatest scientific love, and arguably his greatest contribution, grew directly from the lessons he learned in Palau.

My father was a practical champion for the principles of sustainable development long before the Bruntlandt Report ever hit the table. He understood that the cultures of indigenous peoples were under just as much pressure as their natural resources, and that helping those peoples to sustain one would automatically help them to sustain the other.

Dad felt that the most important thing he could do in this regard was to help local people gain more control over the marine resources which had sustained them and their cultures for centuries. Just as impor-

tantly, he gave them that control not by preaching the virtues of western science over traditional knowledge, but by identifying and combining the best of both.

I learned many lessons from my father during his years as a scientist. Three of my favourites are:

No matter where you are in the hierarchy, give credit where it's due. I vividly remember the day in Hawaii when my father was investigating the phenomenon of cornet fish "catching" moray eels. He discovered that certain eels would go completely limp when firm upward pressure was exerted on the roof of their mouths. Then my 13-year-old fishing buddy at the time observed that cornet fish expand their mouths when feeding and that this action might be the trigger. Sure enough, my Dad credited the 13-year-old formally with this discovery in his next book.

Scientific creativity and genius do not maketh the handyman. My father was many things to many people, but he was a craftsman to no-one. My favourite memorial to my father is the bathroom door in his house, which sports the fourteen different drill holes that were needed to attach a four-screw shelf.

Seize the day. Dad was never bored, because every minute of every day saw him learning something, or trying something, or doing something. He hit a good golf ball and knew how to work a tennis court. He was a reliable provedore of wild trout and an authority on saving houses from forest fires. He was a passable cook and a very good gardener. He had an excellent music collection and read very widely. He was all these things because each day was an opportunity for him to do something new, and he never liked to miss an opportunity. There was always one more road he wanted to drive down, and one more corner he wanted to fish around.

Dad loved life and lived every day to the fullest. His biggest regret in leaving would've been all the opportunities that he hadn't yet had the time to take advantage of. And from a scientific point of view, I think his greatest wish would be to see the basis of his approach — to respect traditional knowledge and combine it with the best of the west to sustain indigenous cultures — continue in a new generation of researchers and writers.

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Tribute to Bob Johannes

Bob was one of my heroes. He was truly inspirational, and our discussions and debates were a vital part of my development. Bob had a huge influence on the direction of my work — ever since I read *Words of the Lagoon* in the early eighties, a magical book. Armed with Bob's book I returned to Kenya determined to discover traditional knowledge on groupers from the Giriama fishers where I lived. Unfortunately, their knowledge did not match the fishers from Palau, or maybe I lacked Bob's questioning skills! Undaunted, I later picked up on his interviews with a key fisherman in north Queensland, Lyle Squire, and there began my fruitful and exciting research on the spawning aggregations of coral trout on the Great Barrier Reef. This was hugely influenced by Lyle's keen knowledge, and Bob's own work on this phenomenon in the Pacific Islands. It was inspiring to finally meet Bob at this time, and to be given such support and encouragement.

I greatly admire Bob's ability to cross disciplinary boundaries and his courage to stick his neck out for conservation, which often incurred criticism from marine scientists (invariably from developed countries). His innovation and leadership in marine conservation will continue to inspire me to carry his work and ideas forward, especially on groupers, spawning aggregations, and working with subsistence fishers.

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Remembering Bob Johannes

Through his long and productive career, Bob Johannes entered the lives and minds of many. I am one of those many and consider myself much the richer, both professionally and personally, from knowing and working with him.

As a biologist and advocate, Bob was one of those few and fortunate individuals who combined talent, insight and passion, enabling him to not only explore new perspectives on biological and related social issues, but also to communicate with, and inspire, others to know and to care. One example that comes to mind is the live reef food fish trade (LRFFT). In the early nineties, Bob learned from an obscure government report, about an export trade in live reef fish. Curious to know more about this trade he found funds to carry out a detailed overview which, published in 1995, identified the now famous LRFFT as a significant management and conservation issue in the Indo-Pacific. His powerful CNN interview shortly afterwards brought the issue to world attention. The Live Reef Fish Bulletin (produced by the Secretariat of the Pacific Community) that he subsequently edited (the tenth volume came out just before his death) had a wide circulation and Bob worked hard to ensure that it reflected a broad range of views and perspectives on the trade in live reef fishes (for food and for the aquarium trade). This breadth of coverage has much enhanced debate on the trades. Pulling each issue together took an enormous amount of effort on his part, from continually encouraging and chasing up potential authors to painstakingly editing and even rewriting articles by those unaccustomed to expressing themselves on paper (this he did without complaint; I only learned of it by chance). His own excellent writing ability meant not only that he could communicate effectively but also revealed his compassion and deep personal interest in the communities he worked with and the problems that many of them faced. His pragmatism and respect for the views of others (particularly refreshing in a biologist) enabled him to reach many who might otherwise never have been engaged, or swayed to part with their knowledge or to change their views.

As a friend and colleague, Bob was always generous with his time and knowledge. I enormously enjoyed our debates and discussions, often the more when we explored, and then resolved, contrasting perspectives. I never found him to be dogmatic but, instead, was truly interested in understanding issues and then finding a way to tackle them. He was also prepared to take a controversial stance, not for the sake of it, but because of something he believed in. An example of this was the high regard he openly held for the role of fisher knowledge and experience in biology, despite scepticism from many of his colleagues. For such personal attributes I respected Bob, as I did and still do, for his genuine conviction, his intuition and his integrity.

In the last months of his life, I knew of Bob's anguish and frustration at no longer being able to participate in one of the areas that had long been of considerable concern to him. This was the pressing need to protect spawning aggregations, a subject that only within the last few years has finally attracted the attention it deserves. Bob had long written on this subject and had documented some important Indo-Pacific examples of reported aggregation declines and losses. He was due to work with the newly formed Society for the Conservation of Reef Fish Aggregations (of which he was one of the founding members) in the western Pacific. It is of some comfort to know that Bob was aware of the attention finally being paid to spawning aggregations. Personally, though, I shall miss very much sharing in the development of this work with him.

Bob's presence will long be felt in many aspects and areas of fisheries in the western and central Pacific because of his extensive history of work and love for the region. For these he is appreciated and remembered with fondness and with pleasure.

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For Bob Johannes

I first encountered Bob in the early seventies while I was based in Fiji. He was fresh with the enthusiasm he derived from his one-year Palau village stay that led to that "milestone" publication *Words of the Lagoon*. At the time, I was developing an interest in Fijian traditional marine tenure and fisheries knowledge. I became one of the many to become "fired up" by Bob's wisdom and enthusiasm.

A particularly satisfying aspect of my association with Bob that deserves to be recalled in his memory was our three-week collaboration in Marovo, Solomon Islands, in the mid-eighties. Edvard Hviding was at the time resident in Marovo and had passed on to me an estimated date for coral trout spawning aggregations that had been provided by local fishing experts. I was based in Honiara, working with the Solomon Islands government and was able to access funding to get Bob up from Australia, and arrange the inevitable "research permit". Having collected him from the airport I was able to get him "cleared" by an important Marovo "chief" and then shipped off to Marovo. The spawning prediction was correct, and Bob spent nights diving and observing, much to the consternation of local villagers as the narrow reef passage in question was in use by speeding tuna catcher boats.

What was so significant about this particular study was the smooth efficiency with which everything fell into place in a situation where as Bob said at the time, had he attempted to do it alone it would have involved a year of approvals and preparations. Bob's ability to work sensitively in partnership with village fishers had convinced Edvard and me that we were prepared to commit our credibility with the Solomons authorities, both formal and traditional, in order to facilitate his research. We were not disappointed, and nor were the Marovo villagers. His fishing stories to them were as entertaining as those they told him. Many people are the poorer for Bob's passing.

Graham Baines

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Thank you for providing a focus!

Shortly after beginning graduate school, I was faced with the daunting task of putting into writing the goals of my proposed work — the dreaded research proposal. As a student new to ecological anthropology, I was at a loss as to how exactly to combine my two goals: marine resource conservation and discovering all I could about the communities using those resources.

Luckily, I was blessed with an ecological anthropology program directed by an individual who is as open-minded as he is intelligent, and although he confessed to knowing little of the marine realm, suggested that I read *Words of the Lagoon* by Robert E. Johannes. Dr Johannes' book opened up a whole new world to me. It demonstrated that my goals as an ecologist were obtainable and that there existed a real need for ecological anthropologists with a marine focus.

Many of Robert Johannes' papers call for the inclusion in marine conservation plans of a person tasked with the study of research-based ecological information, which includes the local people as one of the organisms in the ecosystem, with information disseminated in forms readily understandable by the community — an individual who lives in the community for weeks or months at a time and serves as liaison between local people and government planners and resource managers. Every time I read one of his papers that includes such a call, I know that I chose the right program and am following the right path.

I cannot put into words exactly how much I have been inspired by the work of Robert Johannes. His passing marks the loss of what I can only describe as one of my heroes — my fondest wish would be to follow directly in his footsteps.

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A note on indigenous ecological knowledge and management of the river mullet, *Cestraeus goldiei*, in the Vurulata River, south Choiseul Island, Solomon Islands

Two weeks before he died, Bob Johannes emailed me to ask if I wanted to co-author a paper with him about indigenous ecological knowledge **(**IEK) of mullet. I had remarked earlier that I had heard all sorts of fascinating snippets of folklore, suggesting the existence of a lot of IEK about mullets of various species in the Solomons, but to my regret I have not actually been able to record much of it. One of the more tantalizing stories, which I heard from a number of people is that they sometimes experience hallucinatory dreams after eating mullet from certain locations (Makira Island in the Solomons was one of these). This may have something to do with what mullet eat, which for some of the common species includes the algal/fungal mat on the surface of sandy seabeds. However, despite having heard a lot of bits and pieces, the only mullet lore I have of any substance is what I present here. Although the following brief note concerns only one species, I thought it would be an appropriate, if small, contribution to a compilation in honour of Bob, because since I first corresponded with him, I noticed that the ecology and IEK of mullets had always intrigued and fascinated him.

Bob Johannes was always an inspiration to me. Indeed it was his wonderful and seminal book, *Words of the Lagoon*, that inspired me as a University of Queensland zoology honours student, in 1984, to do my PhD on the indigenous fishing knowledge of Solomon Islanders. I was born and grew up in the Solomons, and have many fond memories of wagging school to accompany Langalanga men and women on fishing trips during that time. The very idea, put forward so eloquently and persuasively by Bob, that people without degrees in biology (indeed, people who may not even be literate) knew more about many aspects of the ecology and biology of tropical fish than the leading scientists of the time, completely captivated me (and still does!).

Soon after that, I started corresponding with Bob by email and eventually met him in Hobart, when he was still working for CSIRO in 1990. He was always helpful and encouraging, and through him I came into contact with a lot of wonderful and interesting people working in this fascinating field. Although I once argued with him about some of the finer points of one his papers (Johannes 1998), he won the argument hands down! Bob's scholarship was always impressively broad and watertight, but more importantly, his ability to distill often overwhelmingly complex issues into pithy, lucid arguments, without cutting corners or neglecting critical points, never ceased to impress me. He always had an eye to the practical, was intolerant of any form of intellectual pretension, and was always at the cutting edge with usable, affordable policy recommendations for fishery management in cash-poor, developing countries. He was always ahead of the field in this respect. Bob's 1998 paper in *Trends in Ecology and Evolution*, "The case for data-less marine resource management", the paper I quibbled with, is I think one of his most important, and indeed one of *the* most important papers about fishery management in the developing world. I am shocked and dismayed that he has gone, and will miss him.

The story of *bori*

The information contained in this note was obtained during and after a trip that I made to Rarakisi Village, on the Vurulata River of southern Choiseul Island, Solomon Islands, on 17 and 18 April 2000. The purpose of the trip was to follow up on a request from the Rarakisi community to investigate the declining population of local river mullet, called *bori* in the local Sengga language (or *buri*, in the neighbouring Babatana language). This trip was made when I was employed as Senior Technical Advisor for the WWF Community Resource Conservation and Development Project.

A small group from the WWF project based in Gizo, Western Province, traveled to Raraksi on the south central Choiseul coast, and after discussing the problem of the declining *bori* population with various community members, we headed upstream to try to find some of the fish, so as to see where the fish lived and try to determine its scientific identification. After about four or five hours of walking and paddling upstream with two dugout canoes borrowed from Rarakisi people, we arrived at Leadley Jonata's two garden houses, where we overnighted. In the morning Leadley, with a small team, went out to find a *bori*. They did not take long to bring one back (plus a couple of other species), which was then photographed and measured. *Bori* belongs to the mullet family Mugilidae (*lipa* in Solomon Pijin), which contains several members that occur in fresh water. I later sent the photographs to Gerry Allen, who immediately identified it as *Cestraeus goldiei* (Macleay, 1883), the river mullet. *C. goldiei* is a very unusual looking fish with a strangely underslung bottom jaw and thick lips. A quick glance at FishBase

The *bori* (*Cestraeus goldiei*) and the speargun used to catch it

The bori (*Cestraeus goldiei*) head

A gravid bori (*Cestraeus goldiei*)

indicates that the species has also been reported from PNG and the Philippines, and probably has quite a wide distribution in Asia and the western Pacific. However there does not appear to be a great deal of scientific information available about this species.

The local knowledge that I was given about this fish, especially by Leadley Jonata, was quite detailed and impressive. According to Leadley and other Rarakisi people, the fish used to be extremely abundant and could easily be caught quite close to Rarakisi. Now it is very scarce, as evidenced by our long trip up-river to find one. *Bori* feed on a slimy green alga, *lapa*, which grows on the stones in the river, as well as the fruits of the *koa* tree that grows along the banks of the river. Its breeding is seasonal and involves a migration downstream every May and June to an area just inside the mouth of the river where it lays its eggs on the hairy roots of the *renggisi* vine (*susunduru* in Babatana). This vine hangs from trees on the side of the riverbank. Unfortunately I was not able to determine the scientific names of any of these plants. People used to catch the fish in large numbers with nets when they were making this annual breeding migration downstream. The *bori* individual that Leadley and the team caught was a gravid female and was about 30 cm long.

The Rarakisi people said that the overharvesting of the fish had almost certainly been the result of using gill nets during the fish's spawning migrations down the river. A factor that may add to the destructive influence of overfishing on the already declining local population of this fish, is the possibility that the large infestation of water hyacinth near the mouth of the Vurulata River is killing the fish's eggs and larvae. This would be due to the water hyacinth reducing levels of oxygen and nutrients such that survival of *bori* eggs and larvae is affected. Without local information about the annual downstream spawning migrations made by the fish, this potential vulnerability may well have gone unnoticed.

A clear conclusion from the above report is that the *bori* population in the Vurulata River has declined to an alarmingly small size and appears to be in danger of becoming even smaller. This decline would definitely accelerate if the eggs and juveniles died as a result of the declining water quality near the river mouth because of the water hyacinth infestation. At the time, my recommendation to the leaders of the Rarakisi community was to try their best to carefully regulate the harvesting of *bori* in the future. I suggested that the population of the fish would recover most rapidly if all harvesting stopped for a minimum of about three to five years. This suggestion was essentially a wild guess since it is impossible to know anything about recruitment rates for that population without a great deal more work. But after three to five years the locals would at least have a good idea how the population had fared, and could no doubt work out for themselves whether they needed to continue the ban a little longer or relax it. In any case, a lifting of the ban would ideally be accompanied by the kinds of per-family quotas that were proposed as part of a more elaborate resource management program.

This is drawn up by the Michi Community in Marovo Lagoon, as part of a Resource Management Order, which WWF have also been assisting with.

Given the broad distribution of this species, it is clearly able to go to sea, despite spending most of its time in rivers. This means that adults can migrate between rivers, and populations may not be as completely vulnerable as they would be if they were stenohaline freshwater fish. Nevertheless, such migrations may take a long time to occur, which would mean that the recovery of local populations is more likely to be accelerated by local management measures.

The WWF project made a number of inquiries, trying to work with the national government to start a biological control program to kill the water hyacinth. The government responded with enthusiasm, but since the coup in June 2000 this plan has been shelved. In the meantime we noticed that the Rarakisi people wasted no time in taking to the water hyacinth with bush knives, and manually clearing it from the mouth of the river. Given the seriousness with which the Choiseul people tend to treat environmental issues, I have no doubt that they will also do their best to manage populations of this intriguing (and undoubtedly delicious) fish in the future. With some luck and a lot of good communication, perhaps the same village-based fishery management snowball effect that Francis Hickey and Bob recently reported for Vanuatu (in the last issue of this bulletin) will soon take hold in the Solomons and elsewhere. If those of us working in this area can maintain the kind of momentum that Bob so passionately and determinedly generated during his inspiring career, I'm sure it will happen.

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A giant grouper forever

I first met Bob at FAO, in Rome, in December of 1978, at a small gathering on TURF (Territorial Use Rights in Fisheries). I guess I was one of the youngest participants; at any rate Bob's first impression of me was that I was unbelievably young. (Actually I was 32 years old at that time!) Bob initially came to know me through my paper on the ethnoichythyology of the Lau, Solomon Islands. Since that first time we met again in Osaka, Hong Kong and Bolinao.

Bob's experienced and insightful knowledge on marine biology always inspired me, since I have been interested in the same field as an ecological anthropologist. As he suggested, the discipline is a useful tool for us to talk with cheerful artisanal fishermen, over a glass of beer or local spirits in a coastal hut and other places. We both believed that the approach is also effective in understanding indigenous ecological knowledge retained by local fishermen, (e.g. voices of the lagoon). In the long run, that may help both scientists and policy-makers to pursue collaborative management measures in marine resource use. His philosophy will surely be a bible to direct the future of relevant fields.

Yes, indeed we drank a lot and sang at a karaoke bar in downtown Osaka. That too is important to recall.

And his recent editorial work on live reef fish should further be promoted by those who have shared the work with him, and who loved him. Bob Johannes, surely a giant grouper forever!

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"It is the utility of research and information that really counts"

Robert Johannes did a great service in exposing us to the prevalence and sophistication of customary marine tenure systems in the Pacific — systems that until recently were being largely abandoned throughout the region. Bob's detailed investigation and documentation of these systems — and of the amazing breadth and depth of fishermen's ecological knowledge that fed these systems — make for fascinating reading. But Bob's most important message — at least the one that got to me — was about the *utility* of these things — about their potential to alleviate the problems we face today. His interest in customary marine tenure systems focused on their potential to serve as cost-effective models for managing today's fisheries. His research on traditional ecological knowledge highlighted its value in informing fisheries management, particularly the fact that it was a readily available and therefore a cost-effective source of information.

In 2002, Bob wrote an article called, "The renaissance of community-based marine resource management in Oceania,"[1] in which he recounts the remarkable changes that have occurred since 1978, when he wrote, somewhat less optimistically, "Traditional marine conservation methods in Oceania and their demise."[2] Although Bob took no credit for these positive changes, they can easily be traced in large part to his efforts during the last 25 years to reveal the value of customary models of resource management, as well as his success at inspiring others to help salvage what was left of them.

Like his interest in customary resource management systems and traditional ecological knowledge, Bob's interest in reef fish spawning aggregations centered on their value as conservation tools. He explored the possibility of taking advantage of the aggregating nature of reef fish (a behavior that serves to effectively round-up a large portion of a population into a small area at predictable times and places, making them easy to count and observe) to provide cost-effective information on stock status. In fact, Bob was disappointed to find that the grouper aggregations he studied in Palau appeared to have too much unpredictable variability to make routine underwater monitoring cost-effective for the purpose of management. He highlighted this finding in his article, "The case for data-less marine resource management: Examples from tropical nearshore finfisheries."[3] And he noted that the only information needed to protect these aggregations from overfishing — their seasonality — was already readily available in the knowledge of local fishermen. It is in this article that Bob addresses most directly the aspect of his work that makes me think of him as an economist (a label I'm not sure he'd appreciate). He argues convincingly that for tropical nearshore fisheries, and to a large extent for marine resources in general, simple management systems that are based on readily available and generally non-quantitative information are likely to be the most cost-effective ones. The quantitative information needed for the more complex management tools is simply not worth what it would cost to obtain. One of the few fisheries researchers able to keep his eye on the bottom line, Bob was constantly having to remind the rest of us that management or conservation success cannot be judged by outputs alone — that inputs have to be accounted for, as well.

I am very grateful to Bob for exposing me to a fascinating world of fish, fishing and fishermen and inspiring me to learn more about that world. I especially appreciate his persistent message that it is the *utility* of research, and more generally, of information — both how it can be put to use and how much it costs to obtain — that really counts.

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Vale Bob Johannes

The marine conservation, fisheries and aquaculture community is saddened by the passing away of Dr Robert Johannes, a pioneer in the approach to fisheries management and marine biodiversity conservation, which blended traditional knowledge and marine resource management practices with Western-based scientific management. He worked mostly in Southeast Asia and the Pacific Islands, but the outcomes of his work have had wider application.

Bob Johannes — with scientific objectivity and passionate advocacy — made a wide audience aware and understand the harms wrought on resources and people's lives by unsustainable fishing practices associated with the live reef food fish trade in the Asia-Pacific region. In 1993, he embarked on the first significant study of this developing trade, with the support of a Pew Fellowship and additional assistance from The Nature Conservancy and the Forum Fisheries Agency. With this study, he brought to the world's attention the impacts that the trade had in many areas, such as overfishing and the environmental impacts of using cyanide to capture live reef fish. But beyond focusing attention on problems, Bob worked on measures to put this trade on an environmentally and economically sustainable basis. These included a three-year research project to develop an economically realistic and simple method for locating, monitoring and managing reef fish stocks based on their spawning aggregations. As editor of the Secretariat of the Pacific Community's *Live Reef Fish Information Bulletin*, Bob continued to stress the impacts of the live reef fish trade and to provide a forum for solutions.

Bob's pioneering work on the live reef food fish trade gave a strong push for the development of sustainable grouper aquaculture as an alternative supply to the live reef food fish markets. Bob supported the development of sustainable grouper aquaculture, rightly pointing out that while this was a long-term project, immediate solutions were also necessary. Subsequent assistance to the development of sustainable grouper aquaculture by numerous agencies and funding bodies, is due in no small part to Bob's contribution to our understanding of the impacts of the trade in live reef food fish. The wave of support in this area that Bob's pioneering work had built up, has undoubtedly washed on the Asia-Pacific Grouper Network and its successor, the Asia-Pacific Marine Finfish Aquaculture Network, and contributed to what the network has so far achieved.

Bob received many formal honours during his career, including a Guggenheim Foundation Fellowship (1974–1975), the CSIRO Medal (1990), and a Pew Fellowship in Marine Conservation (1993). He was respected and liked by his professional colleagues.

His work lives on, in the continuing effort to make live reef food fishing sustainable and socially responsible, promote alternative livelihoods for coastal communities, and to better understand and use more effectively the traditional knowledge in marine resource management. All who knew and worked with him will miss Bob Johannes.

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"The small fisher is a professional"

We were all greatly saddened by Bob's untimely death. We worked together in Samoa and Vietnam and have kept in quite close touch over the past eight years. His contribution to project designs was always original and creative, with a clear perspective on the social and cultural issues and needs from development assistance. Apart from his professionalism, he was always a pleasure to work with. His *Words of the Lagoon* has made a big impression on all who have read it. It has been instrumental in convincing many people of the wealth of knowledge and information available from small-scale fishers and farmers and that (to paraphrase the words of Robert Chambers of the Institute of Development Studies in Sussex) "the small fisher is a professional".

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Thanks Bob, we will miss you

I first met Bob in 1977 on the lawn in front of the Ratskeller at the University of Miami during the 3rd International Coral Reef Symposium. Bob and other heroes like Len Muscatine, David Stoddart etc. were happy to talk about science to a recent PhD graduate who had just cited their names in a thesis. That started a 25-year friendship in science, a love of bushwalking, trout fishing and life; that for Bob ended on Wednesday, 4 September 2002.

He was known for starting many fields in coral reef science. Many of these fields have gone on to develop further, as he moved onto the next area that interested him — and his interests were very wide because he read voraciously across disciplines. Bob did pioneering work in many areas, including nutrient transfer and exchanges across reefs and corals (remember the Eniwetok experiments), the role of zooplankton on reefs, etc. He was probably the first microbial ecologist to work on reefs. I have just picked two of his many areas of expertise.

Bob was never afraid to attempt something different. He was criticised by the science establishment as "going troppo" when he packed up his wife Chris and son Greg and lived for a year in a fishing village in Palau. Bob gained the confidence of the local fishers through his patience, knowledge and the fact that he was a competent fisherman and could hold his own with them in spearfishing competitions. The scientific community gained an order of magnitude in its knowledge of coral reef fishes and he spawned two very popular themes of current coral reef activities — ethnobiology and the study and conservation of mass spawning aggregations of coral reef fishes. When he first proposed that many of the larger target species of fishes (serranids, lutjanids, etc.) would assemble in thousands on specific days around the new moon to spawn, many fisheries biologists disbelieved him because most studies then were on small, site-attached species. The fishers in Palau knew about the aggregations and Bob was able confirm these via direct observations. I recommend that you read *Words of the Lagoon*[1] published in 1981. Bob tried to move on from ethnobiology, but this field developed rapidly, especially as a valuable tool to assist management through the use of traditional ecological knowledge and management systems (TEKMS), he was regularly invited to conferences as the keynote speaker. This also resulted in him becoming a leader in attempting to make the live reef food fish trade sustainable by working with everyone, from the suppliers in developing countries to the wholesalers in Hong Kong.

He also became frustrated at the reluctance of scientists to promote the necessary urgent management action until they had sufficient data. May I also suggest that you read the case for data-less management[2] — which is another way of expressing the precautionary principle.

Bob was particularly calm in a crisis and the master of understatement. One anecdote concerns shifting a piano upstairs; his companions paused and put it down, then Bob quietly asked could they please lift it off his foot. Another occurred during experiments to assess nutrient exchanges across the flats of the Abrolhos reefs in Western Australia. I looked over to see Bob bent double in water up to his knees with one hand under water. He quietly called, "Steve (S.V. Smith), I think I have a problem". Bob had been searching for a meal of octopus and had his hand firmly stuck in the mouth of a moral eel. He then continued to work with a shredded hand.

Like me, many people around the world regarded Bob as a very good friend, somebody who was always willing to listen and assist. He was a real hero of the coral reef world and to reef peoples, especially those in the Pacific whose lives are enmeshed totally in reef resources and are asking for assistance in their management. It is up to the rest of us to continue this work — a job made harder without one of the truly great personalities of our coral reef world. Thanks Bob — we will miss you.

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Stone fish weirs of Yap

Bob Johannes visited Yap when he was contemplating the work that lead to *Words of the Lagoon*. On one of his visits we spent a wonderful afternoon diving after manta shrimp — as much for the joy of free diving, as to collect the shrimp. Later my Yapese father-in-law, Blas Lubuw, explained how we could have saved all that energy and caught the shrimp by placing a half coconut shell over their hole with a hinged mantis claw tied to a stick extending through the hole of the shell. The shrimp would swim up out of its hole toward the light coming through the hole of the coconut shell, slide by the hinged claw and then become impaled on the claw when it retracted back. A wiggling stick indicated a hooked shrimp. Of such marvellous increments was our appreciation of traditional knowledge built. Through the years, Bob was to come to our aid with information and advice on addressing environmental impacts that threatened marine resources, and along with them an island heritage. His enthusiasm helped maintain our efforts. Here we share an abstract of an ongoing project that began about the time the co-author of this paper was born and Bob and Chris had moved to Palau. We spoke of stone fish weirs as there were only a few in Palau but many in Yap — so many, that we wondered about their use and management. In time Lubuw, Martin Faimau and I set out to map these weirs as a step toward deciphering the knowledge left written in them.

Located in the western Caroline Islands of Micronesia, the high islands of Yap are best known as the land of stone money. There are other remarkable structures made of stone as well. As one flies into the state's main islands, large stone arrows, generally pointing away from the island, can be seen in the lagoon. So prominent are these large stone fish weirs, called *ach*, that some 52 are mapped on the 1983 USGS map of Yap. Through field and aerial surveys we have now found and mapped at least another 752. *Ach* are an example of Yapese nature-integrated technology.

Rather than chase fish around each time they go fishing, Yapese of the past built *ach* to make use of tides and fish behavior to concentrate fish. These large stone weirs make use of the properties of both land and coral rocks. With foundation stones placed so that wave action tends to wedge them together, the weirs have remained in place through many typhoons. Indeed, an *ach* shown on a map made in 1885 is still in place. The large weirs were built in three main configurations: arrow-shaped, V-shaped and zig-zag; with variations on these patterns adapted to different purposes and site conditions.

In the basic arrow-shaped *ach* (Fig. 1) the long central shaft directs fish toward the main holding compartment at the tip of the arrow. Here the fish swim about freely, but as the tide recedes, the configuration of the weir and currents direct them toward smaller chambers where they may be trapped. Some *ach* have stone chambers called *lieb* to hold fish. In others it is necessary to install a bamboo trap and holding box, *yinup ko ach*, to retain the fish when the tide rises over the walls of the *ach*. The fish caught in *ach* are captured gently, without a struggle, ensuring their good quality and taste. When not in use, gaps in the rock walls are left open allowing fish to swim right on through the *ach*.

Some weirs, especially those located on sand and reef flats along routes taken by fish are built without the central shaft. The V-shaped body of the weirs (Fig. 2) are often extended by a single rock wall. In some weirs, the central compartment is the most prominent part; in others, the extended walls lead to a smaller, triangle-shaped holding compartment.

On some reef flats there are a series of single-walled, V-shaped weirs alternately arranged so they form zig-zag bands similar in appearance to the *ume iki* of Hawaii (Farber 1997). These weirs lack the central compartment and serve like funnels to concentrate fish where they are caught with hand nets at the apex of weirs that point toward land on the incoming tide and at the apex of weirs pointing toward the reef on the outgoing tide.

Of the over 800 weirs we have mapped (counting each V with or without elaborations, as a separate weir), about 67 per cent are basically arrow-shaped. Some 33 per cent are basically V-shaped; with about 42 per cent of these consisting of sets of alternating V-shaped formations on the reef flat. There are many variations on the basic configurations of weirs, with some *ach* having long extensions on the central holding compartments, and some having intricate configurations of the chambers within the main compartment. Figure 2 shows *ach* with the central shaft placed at such an obtuse angle that they are essentially V-shaped. Some *ach* are linked by extended arms, and at times leaf sweeps made of palm fronds twisted about a rope may be used to herd fish toward *ach* to obtain large catches for especially big community events. Most weirs point away from the island or towards a blue hole or channel; however, some in the outer lagoon point toward the island, and a few are parallel to shore. Some areas of Yap's lagoon have greater concentrations of *ach* than others, with the number of *ach* per quadrant of the USGS map ranging

Figure 1.
An arrow-shaped ach with an extended arm, series of compartments and a holding chamber, *lieb*.

Figure 2.
V-shaped weirs on the reef flat. There are submerged weirs between and to the lower left of the two prominent weirs.

from 0 to 24. A number of *ach* are paired and a number are composite, with two to four sets of V-shaped compartments on a single shaft. Many of the weirs we have mapped are quite eroded and some of these appear like shadows of nearby *ach*, suggesting that they were built at different times, or were relocated. Twenty-eight percent of weirs are located in areas exposed at low tide, about 20 per cent are located along the edges of Yap's "blue holes", to catch fish retreating to these depressions within the lagoon at low tide. Another 20 per cent are associated with a channel and about 28% are located on sand flats or the reef flat.

Most *ach* must have been built at a time when Yap's population was very dense as they represent a considerable investment of human energy, although once built, they conserve energy. Yap's population declined from pre-contact peaks estimated at 3367 people/km^2 to a low of about 27 people/km^2 at the end of the Japanese administration (calculations of people/km^2 based on Lingenfelter 1975). Maintenance of *ach* declined during this period and today with the advent and widespread use of monofilament nets, only a few *ach* are actively maintained. Now with a rapidly rising population, increasing environmental pressures and both subsistence and commercial exploitation, improved stewardship of fisheries resources is greatly needed. The stone fish weirs of Yap provide opportunity for a synergy of modern science with a traditional technology and system of resource management. *Ach* apply past knowledge of fish behavior, tidal patterns and marine engineering to concentrate fish for capture. When not in use, the weirs do not entrap fish. The great number, variety and distribution of *ach* thus provides a potential tool for monitoring fish stocks and aggregations. Inasmuch as *ach* are associated with specific estates, with their use governed by the head of the estate, they may also provide a regulated venue for mariculture and perhaps even ecotourism activities, thus diversifying and enhancing fisheries in neotraditional ways.

Acknowledgements

We thank the many Yapese fishermen who helped us, especially Blas Lubuw, Sam Falanruw, Tamagyurun of Bechiyal, Fathebeyad, and Fiteg; and Martin Faimau who helped with fieldwork and mapping. Special thanks are due to Bob Johannes for encouragement, advice and friendship over many years; and for elevating traditional marine knowledge into a recognized field that contributes to the stewardship of marine resources and enrichment of our lives.

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Johannes as a pioneer

Bob Johannes was a real pioneer because he was true to himself. The paths he took were his own judgements of what was critical or what was the important key issue at that time. His pioneering work was exceptionally original and influential because he followed his own insight into truly important processes and was not constrained by the mainstream paradigms and by the perspectives of his administrators. It is compelling for most scientists to follow the mainstream flow of technological advances such as mapping of reefs from satellites that are circling the globe, and mapping of genetic populations by microsatellites in the genetic chemistry. But Bob was able to recognize the value of the knowledge of peoples of other perspectives and he observed that Pacific Islanders knew their coral reef fishes far better than scientists, and that their traditional management practices were more effective. He was able to listen to local fishermen, placing their knowledge as complementary to science, rather than patronizing them with his technical training. It really took an open mind to be the first to listen to uneducated people as peers, but he was able to recognize that many of their ideas were correct.

Bob Johannes was also the first to recognize the importance of having the general public be aware of implications of new findings in coral reef ecology. He produced a movie on Hawaiian coral reef degradation, *Cloud Over a Coral Reef*, for the general public in the hopes that some action would be taken to correct the problem. Some of his colleagues gave him flack for this. At the time, they felt that scientists should remain solely with basic science and communicating with the public was for someone else to do, as may still be the case in some Asian nations. His dataless adaptive management will be the most effective approach to the complex and unpredictable interactions and replenishment of coral reef resources. This radically different approach was risky for a career, but history will show that his ideas will ultimately be among the most effective and influential, hopefully in turning society around and guiding us to effectively manage resources.

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Fieldwork with Bob: "The first man to dive all night"

Bob Johannes was a respectful and respected scholar and humanist with a profound disregard for disciplinary boundaries. He was a dear colleague to people representing many knowledges, whether local or academic. And so Bob will also be fondly remembered and missed by people of countless Pacific Island villages, with whom he spent intense hours, days, nights and weeks on beaches, in canoes, on reefs, underwater, and in conversation in hurricane lamp light under leaf roofs. Bob's interests in the inhabitants of sea and reef dovetailed with those of so many Pacific Islanders, and in his gentle but insisting explanations of the scientific greatness of local knowledge he boosted intergenerational pride in the value of that knowledge, more often than not capped by his lectures in a village meeting hall or church about pragmatic and locally understandable forms of marine conservation, building on what people of the village already knew. Bob's long-term efforts as a marine biologist towards enabling Pacific Island fisheries managers and scholars to further carry on the kind of work that he developed — we might well say founded — is an example to follow.

This small personal memoir of Bob in the field is based on work he and I, as marine biologist and social anthropologist (but with overlapping agendas), did together with fishermen of Marovo Lagoon, Solomon Islands in 1987. I hope to be able to invoke and celebrate some of Bob's unique qualities as fieldworker, friend and fellow fisherman — qualities that transcended cultural and linguistic boundaries too. Let me pay my initial respects by establishing that I would never have arrived in Marovo Lagoon had it not been for Bob. Having first been made aware of sea tenure issues in the Pacific by Bob's influential early papers, I wrote to him in early 1985 to test out some ideas I had for fieldwork in Micronesia. Bob wrote a long reply, starting out by saying that he had a hunch that more fertile and less well-plowed fields might be found in the Solomon Islands. Bob put me in touch with Graham Baines, then developing what was in the mid-eighties a novelty: a community-based project for coastal zone management, with Solomon Islands, and Marovo Lagoon specifically, as pilot site. Through this generous assistance I was able to start 18 months of fieldwork from April 1986, affiliated to the project developed by Graham in the great lagoon of Marovo, following requests made by chiefs, Area Council, and other local people of political influence.

I kept up correspondence with Bob as I worked and travelled the seas and reefs of Marovo Lagoon with the men and women who depend on this fabulously rich marine environment. It became clear that the Marovo people's knowledge of such things as lunar spawning cycles of reef fishes is of extraordinary scope and detail; and Graham Baines worked out an arrangement whereby the Commonwealth Science Council (the sponsors of the "Marovo Lagoon Resource Management Project") would fund a brief visit by Bob to Marovo. Bob's visit was duly timed to coincide with "the rising of the serranids" in certain places during the last quarter of the moon, a phenomenon reported in great detail throughout the diving-oriented villages of Marovo. On 6 May 1987, at the moon's first quarter, I met Bob as he climbed off the Twin Otter flight from Honiara. We boarded my motorized canoe for a quick orientation around central parts of Marovo Lagoon, including the deep dropoffs along the ocean-facing shores of the magnificent forested barrier reef islands. A torrential downpour forced us to seek shelter in a fishermen's shed on the reef, and while it rained we set the agenda for the next three weeks, giving emphasis to grouper spawning, mullet migrations and the general Marovo repertoire of lunar cycles in reef fish aggregations. The "Marovo Project" had a network throughout many villages, and advance requests for a visit by Bob had been made by important persons who deemed themselves or their village to be representative of a particular fishing-related expertise. These requests were duly incorporated into the itinerary planning, working from my established home base in the village of Chea, famous for its underwater spearfishermen.

The next three weeks developed into a whirlpool of fish talk, as Bob dived headlong into my existing network of elderly master fishermen and younger active divers and net fishers across Marovo. Those petrol-spending weeks indeed turned out to be an essential experience of intensive cross-cultural interpretation of uninterrupted conversation between giants in the field of tropical reef fish knowledge — questions and responses flowing both ways.

As conversations about creatures of sea and reef developed on sun-scorched seashores, in canoes on fishing grounds, and in houses at night, Bob and the local experts cultivated innumerable topics of mutual interest. Lunar spawning cycles of two dozen fishes were examined in detail, as was a repertoire of 14 types of fish aggregation. Remembering Palau habits, Bob initiated Marovo fishermen into a non-Marovo form of "tour ration": pieces of freshly caught fish quickly marinated in the diving mask with lime. From 8 to 18 May I accompanied Bob to half a dozen villages scattered along most of the 100 kilometres of Marovo Lagoon. I left him for a few days in the northern parts of the lagoon (home of specialists on mullet, barracuda, dugong and green turtle) in the care of Vincent Vaguni and Frank Riqeo, two of the local coordinators of the "Marovo Project". After that excursion Bob returned to home base in Chea with good

material for the anthropologist too; he had picked up a mysterious ogre tale about "The Great Eater", and he had made insightful observations at a village wedding (noting especially the staggering numbers of pre-marital relationships implied by the pastor for both bride and groom). But above all he had connected to a tradition of mullet knowledge and capture, which he saw as perhaps an unparalleled opportunity to increase the scientific understanding of this important tropical food fish.

The 18 May "cut-off date" for lagoon wanderings was a result of thorough planning by all involved. From that day, Bob's work in Marovo followed from day to day the famous and imminent rise of serranids in the Charopoana Passage. Of particular interest was a coral trout initially thought by Bob to be *Plectropomus leopardus*, which he soon discovered was the slightly different *Plectropomus areolatus*. A team (hereafter The Team) was formed to pursue this quest. Ilo, a renowned spearfisherman from Chea's neighbour village Sasaghana, was hired as Bob's specimen shooter and counterpart in underwater work, and my fieldwork partner Harold Jimuru, took overall responsibility for Team logistics using his own fibreglass canoe and my outboard motor. The Marovo divers had been much impressed with Bob's free-diving abilities, never having seen a white man go so deep and — important to them — move so effortlessly about the dropoff. But Bob had tested, and expressed profound distrust of, the long but rickety homemade spearguns of Marovo's divers, so the daily need for fresh (and eminently edible) specimens for checking gonads and so forth was met by Ilo, who had a reputation for being able to shoot any underwater creature on request.

In a report to the 6th International Coral Reef Symposium, Bob summed up his methodology as follows: "The study began on May 19, 1987, eight days before the new moon. Each morning for ten days I swam a transect the length of Charopoana Passage . . . over water depths of 4 to 10 m along the entire channel slope on the south side, counting all the *P. areolatus* I could see." While The Team also kept a parallel watch in the deep passage of Mogo further north, early morning trips were made to Bob's Charopoana transect every day from 19 to 26 May. For the first five days, only small numbers of the selected coral trout were seen; specimens were shot (sometimes with Ilo waving off intrusive grey reef sharks) but there was little evidence of anything special developing, until (again, as predicted by Marovo experts) things intensified on 24 May, with a large aggregation present, in which Bob observed telltale patterns in the state of and association between male and female fish. As the moon was about to disappear, Bob, Ilo, and Harold engaged in a joint quest where enthusiasm, expertise, and epistemology converged.

"On May 26, the eve of the new moon, I observed the twilight and nocturnal behaviour of the fish . . . The fish were checked by diving with an underwater light throughout the night. None were active between 1845 h, May 26 and 0605 h, May 27, at which time, before sunrise on the day of the new moon, they began to emerge from their sleeping places." This condensed quote from the Coral Reef Symposium paper says nothing about the status achieved by Bob Johannes during those twelve hours. Bob remains known in Marovo as "The First Man To Dive All Night".

During the late afternoon of 26 May, Bob had become rather tense; it was as if a climax of research performance and discovery was drawing near. He wanted to be left alone through the night in the biggest fibreglass canoe of the village, anchored in 10 m depth at the outermost point of his transect in Charopoana Passage, with water and a few baked sweet potatoes for refreshment. From this vantage location he intended to dive with torchlight exactly every hour to check the development of the fish aggregation. He declined any offer of personal assistance, not to say company. We all decided that at least he needed some good food to take him through such a harrowing night, and I obtained a good-sized freshly cooked coconut crab for him.

Ronter Amos, the owner of the big canoe, took a silent Bob out to anchor before dusk and then paddled away in a small dugout they had taken in tow. The night's Team set up camp and lit a fire on the beach some 500 m further down the passage, across from the small diving resort at Uipi. The Team's logistics manager, Harold, decided that, since "Bobby" was so mad as to insist on a full night of hourly dives alone in the shark-infested passage, we must maintain "security". We took turns wading out to a point on the fringing reef from which the big canoe could be seen riding at anchor in the starlit passage, and a succession of "guards" saw that Bob did emerge from his uncomfortable rest every hour to disappear, light in hand, into the sea before reappearing after a while. It was concluded, especially after Ronter made a spot check for resident sharks, "Bobby's study is going well."

Then a new and direct threat to "Bobby's study" appeared on the scene. At 0300 the engine of a tuna catcherboat was heard from far down the lagoon. Their onboard wells teeming with recently netted live baitfish, these fast vessels usually left the Marovo Lagoon for offshore fishing grounds around this time every night. In the Marovo Lagoon of the 1980s, catcherboats of the Solomon Taiyo joint-venture company were notorious for speeding through the Charopoana Passage, which is why the Uipi Resort avoided having boats moored at night by its wharf. Canoe owner Ronter's prophecy was simple: "Bob's going to be caught by the waves, break loose and slam ashore! End of study too!" Ronter and I paddled out to Bob

to warn him, not a little worried about disturbing his scholarly peace of mind. We put the case to a drowsy Bob, suggesting that the canoe should be moved to safe waters until the catcherboat had passed. Bob reacted instantly: "There's no way, absolutely no way, that I'm going to leave my diving transect now! Let that tuna boat come! I don't care! I'm in the middle of something great here, don't you see? Now, will you guys just let me be!" Who could argue against Bob in such a mood. Who, indeed, can argue against such dedicated scientific quest. We shrugged, Ronter gave Bob some advice on how to start the unreliable old outboard motor, and we paddled back to camp.

All good powers were with Bob on that still, dark night in Charopoana Passage. Soon the engine noise tapered off as the tuna catcherboat left the lagoon through the southern entrance instead. At 0600 I paddled out to Bob to check the state of the night's affairs. The First Man To Dive All Night was no longer morose, but beaming with satisfaction, just emerging from the night's final hourly dive, having reached some tentative but sound conclusions. The rest of the story — including how Bob's exact and rigorous observations during the 10-day "rising of serranids" connected to his discussions with Chea's fishermen immediately after his all-night diving feat — is reported in Bob's paper for the 6th International Coral Reef Symposium.

Two days later, Bob took leave of us and Marovo Lagoon, carrying a selection of the renowned Marovo woodcarvings home to Hobart. But that was not the end of friendships and joint projects. Having developed a joint passion for passages after weeks of working in the deep passages that connect Marovo Lagoon with the ocean, Bob and I often discussed via letters, during visits by me to Hobart, and by him to Bergen, and later via email, how we ought to do a properly holistic analysis of the multiple significances — ecological and biodiversity, oceanographic, cultural, social, nutritional and so forth — of such strange and magnificent places as the deep passages where serranids rise. Alas, that was never to be.

Bob's reputation in Marovo as The First Man to Dive All Night was alive and well in 1996 during my fieldwork there. And indeed, Bob was to return to the passages where his Marovo fame was made. As his engagement in the consequences of the live reef fish trade grew, he returned to the Solomons in 1997. This led to several more visits, and in 1998 Bob returned to Chea village in connection with a study of what the live reef fish trade would mean for, quite specifically, the serranid aggregations in Charopoana Passage. When Bob reported to me via email on his 1998 meeting with Harold and other members of The Team of 1987, and as he passed on messages and regards to me from them, time and space seemed to evaporate.

I'd like to think of Bob as still having a wonderful presence right out there in the passages where he dived all through the night. I know the Marovo people will think of him in that way. Thank you, Bob. *Leana uka pa mua tinavete va susua mamu ko valeana hoi*, they say in Marovo Lagoon. Thank you for taking everyone along in all your leading work. Thank you for the examples you set.

Edvard Hviding

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I owe who I am today to you, Bob

I was first exposed to your work when I took a graduate course in Rhode Island called the Economics of Love, Altruism and other Moral Sentiments. The course focused on exceptions to the economic paradigm that individuals always act in their best interests. I read your book *Words of the Lagoon* on customary marine tenure systems in Palau, and it changed my life. Years later, when I joined the World Bank, I went to work in the Pacific to pursue that vision. So much of where we are today is due to you, Bob. You inspired a whole generation of workers with your unfaltering dedication to bring forward the voices of Pacific communities. Your work and vision will be with us forever.

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Dear friends of Bob

As buddies through our teens (1944–1956), I would like to fill in some early times.

Bob's first claim to fame was in public school, grades 4 through 6. He was the Absolute School Marble Champion. Between the ages 12 and 17, Bob was a member of Marine Drive Golf Club, one of only five private golf courses in British Columbia at the time. When we finished high school his handicap was down to single digits.

Bob's other athletic skills flourished in grades 11 and 12. He was an excellent player of baseball, basketball and football, and could have easily made any team. He never went to tryouts because he had another priority. Out in his back yard he built a very complicated fishpond complete with running water. We stocked it with local trout, stickleback, catfish, tadpoles, and 17-inch frogs. The fauna around and in the fishpond was gathered from all over the Vancouver area and southern Vancouver Island. This included some very rare species such as flycatcher plants, which had to be fed by hand in order to grow. Every evening we were in Bob's back yard feeding sliced hot dogs to the catfish. Needless to say they became very large.

Bob was very proud of his academic achievements. He was one of those rare classmates at 13 years old who knew exactly was he wanted to do with his life. Marine biology! He vigorously pursued everything that moved, wiggled and grew around every stream, swamp, backwater, and ocean shore. His library on this topic became extensive at this young age and he often observed that many important topics were yet to be included.

After high school we had different interests but we saw each other on Sunday afternoons at our weekly touch football game. He came to live with us while he attended University of British Columbia completing his Masters. My mother became very attached to Bob and took such great care of him that he found it difficult to leave us.

Bob and I have had many wonderful experiences in the wilds of BC. My wife and I even spent part of our honeymoon with him as he gathered fish stomachs in jars out of Paul Lake, BC. When he visited us from Tasmania, Bob and I continued to compete in golf, billiards and even marbles on the living room floor. Writing these memories has been very helpful to me as I stew about Bob's last years. I thank you all and hope you get a few laughs and insights into our beginnings.

Bob Anderson

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For my first post-doctoral associate

Bob was my first post-doctoral associate, 40 years ago. He selected me, not the reverse, and this proved to be typical of Bob's strongly inner-directed control of life. He made seemingly sudden and often daring changes of direction in life, but it was clear that these were not really sudden or casual decisions. When the moment came to move on, he wasted no time in doing it. There were many different things Bob wanted to accomplish, and he could allot only so much time to any one of them. As a result, he had multiple careers, making significant and lasting contributions in each one.

Bob was one of the true pioneers of marine microbial ecology — before there was a recognized field of marine microbial ecology. His work is still cited as landmark stuff. But that was not really what he wanted to do, and he moved on to other, as yet uncultivated fields. Despite his ambitious goals, Bob was no grind. He knew how to enjoy life to the full, and he allotted time to that just as meticulously. Working with Bob was always a continuous, globe-trotting party. He was a valued colleague and a cherished friend. As I respected his decisions in life, I respect his decision in death.

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To Bert from Ing

I still remember the first time I met Bob, a tall man (by Micronesian standards), the silvery grey hair and beard. In the traditions of Kiribati, these were true symbols of a respected man; full of wisdom or as the Kiribati traditional saying goes " . . . he has eaten far many more coconuts than most of the others. . . " And truly enough, Bob did not fail to live up to these expectations. As I got to know him better, working with him among local communities in Kiribati (see photos on the back of this issue), sharing his stories, his experience and his passion of the marine environment with older respected fishermen in the local villages, he was able to quickly obtain respect and a sense of acceptance from local fishermen.

Bob's background as a fisheries biologist, accompanied by his field experiences and fishy stories seemed to go down well with the fishermen. His relaxed and constructive approach was an important aspect in the success of his information gathering exercises. He was able to describe and translate biological processes in simple concepts that made sense to fishermen. Fishermen we talked to became interested very quickly in what we were doing and in most cases responded positively by willingly sharing their ideas and traditional fishing knowledge, either on fishing techniques, fishing seasons or spawning migration patterns (seasons and areas) of different fish species. Bob also had a way of asking important questions in a simple way and using the responses quickly and cleverly to build on and get more information or to verify information he had already collected. It was truly a skill that I learned by working closely with him, and which I have found very useful in obtaining information from local communities.

The experience I had working with Bob and seeing him in action in the field was an eye opener for me. As a Pacific Islander, I began to realise and appreciate the amount of useful traditional knowledge of local fishermen. Some of the information I have taken for granted and never cared about. I also quickly realised the sadness of how a lot of this precious knowledge is being lost and nothing is being done to save it. Without knowing it, Bob had introduced me to the area of ethnobiology. A new term to me then, and what I thought was an area of study that I don't know much about. Very quickly though, I realised that it is one of the areas I am probably most familiar with and which is of great relevance and importance to me. True enough, it was Bob's wish and strong belief that more and more local people should be involved in this area, especially those who are committed and have a heart for saving their heritage. Picking such individuals is easier said than done, but yet again Bob seems to also have an eye for that. I do not intend to start listing names here but I am sure that those few Pacific colleagues that have had the privilege of working with such a great man would agree with me and would feel in their heart a commitment to continue what Bob has started. In his article "The plight of the osfish…"[1] Bob told the story of Ing (a local islander) and Bert (a foreigner scientist). At that time, I found many common points between Ing and myself. But more importantly, this story was, and still is, a reminder for Pacific Islanders that there are so many important lessons to learn from our own people and traditions, so much worth to save before it is lost.

Bob was also a man of vision in his pioneering work in the Pacific; he always seemed to be a step ahead of future potential issues. And not only that, he also got things started and set appropriate directions. The Pacific region indeed owes him a lot for a number of major fisheries initiatives, many of which focused on sustainable resource management and providing a livelihood for local communities. I believe that Bob has been instrumental in setting this direction. Without his efforts and visions, the Pacific would probably have taken many more years to appreciate the importance and the implications of this. For this he will be greatly missed, but I am sure that his voice through his efforts will never be forgotten.

Bob was a good friend, a good teacher, a colleague and my mentor. I have always enjoyed working with him. This and knowing him are experiences I will always treasure. Not only did I learn a lot through his wisdom and experience, which he was always willing to share, but he also made me believe in myself. I certainly owe him a lot for his continuing support and words of encouragement. In his own way, he has been a great influence in my academic endeavours and my career.

Bob, I thank you.

Being Yeeting

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1. Johannes, R.E. 1993. The plight of the osfish, or why quantitative sophistication is no substitute for asking the rights questions. Naga 16(1):4–5.

Robert E. Johannes

26 September 1936 – 4 September 2002

Achievements and contributions

Education

- BSc University of British Columbia (1958)
- MSc University of British Columbia (1959)
- PhD University of Hawaii (1963)

Awards

- Pew Foundation Scholarship in Conservation and the Environment 1993–1997
- CSIRO Medal 1990
- Guggenheim Foundation Fellowship 1974–75
- British Columbia Fisheries Association Scholarship 1958
- National Federation of Canadian University Students Exchange Scholarship 1956

Publications

Editorship

Editor, Live Reef Fish Information Bulletin, published by the Secretariat of the Pacific Community 1996–2002

Books

R.E. Johannes and W. MacFarlane. 1991. Traditional Fishing in the Torres Strait Islands. Hobart: CSIRO. 268 p.

R.E. Johannes. 1981. Words of the Lagoon: Fishing and Marine Lore in the Palau District of Micronesia. Berkeley: University of California Press. 245 p.

Books edited

Ruddle, K. and R.E. Johannes (eds). 1990. Traditional Marine Resource Management in the Pacific Basin: An Anthology. Jakarta: UNESCO.

Johannes, R.E. (ed). 1990. Contribution of Traditional Knowledge to Environmental Science. International Union for the Conservation of Nature and Natural Resources, IUCN Conservation Science Series No. 1.

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